Type Verification Test Report (UK-G59 Issue 3)

It includes the Generating Units supplier declaration of compliance with the requirements of Engineering Recommendation G59/3.			
Type Tested Reference Number	Photovoltaic Grid-tied Inverter		
Generating Unit Type	SolarRiver 4400TL/SolarRiver 5200TL		
System Supplier Name	Samil Power Co., Ltd.		
Address	No.6 Xuefengshan Road, Suqian High-tech Industrial Development Zone, Jiangsu Province, P. R. China		
Tel	+86-510-83593132	**Fax**	+86-510-83593136
E:mail	info@samilpower.com	**Web site**	www.samilpower.com

Maximum Rated Capacity	**Connection Option**	
	4.4	kW single phase (SolarRiver 4400TL)
	5.0	kW single phase (SolarRiver 5200TL)
	NA	kW three phases
	NA	kW two phases in three phases system
	NA	kW two phases split phases system

SSEG manufacturer/supplier declaration.

I certify on behalf of the company named above as a supplier of a generating unit, that all products supplied by the company with the above Type Test reference number will be manufactured and tested to ensure that they perform as stated in this document, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of G59/3.

Signed		**On behalf of**	Samil Power Co., Ltd.

山东新能源股份有限公司
SAMIL POWER CO., LTD

SolarRiver 4400TL				
Power Quality. Harmonics.				
SSEG rating per phase (rpp)		4 **kW**		
Harmonic	**At 45-55% of rated output**	**100% of rated output**		
	Measured Value (MV) in Amps	**Measured Value (MV) in Amps**	**Limit in BS EN 61000-3-2 in Amps**	**Higher limit for odd harmonics 21 and above**
2	0.001	0.003	1.080	
3	0.145	0.177	2.300	
4	0.004	0.006	0.430	
5	0.104	0.111	1.140	
6	0.003	0.006	0.300	
7	0.053	0.073	0.770	
8	0.002	0.004	0.230	
9	0.056	0.051	0.400	
10	0.002	0.005	0.184	
11	0.071	0.032	0.330	
12	0.016	0.004	0.153	
13	0.053	0.033	0.210	
14	0.001	0.017	0.131	
15	0.066	0.028	0.150	
16	0.006	0.018	0.115	
17	0.077	0.024	0.132	
18	0.030	0.003	0.102	
19	0.102	0.014	0.118	
20	0.033	0.024	0.092	
21	0.087	0.008	0.107	0.160
22	0.016	0.016	0.084	
23	0.074	0.009	0.098	0.147
24	0.005	0.006	0.077	
25	0.091	0.010	0.090	0.135
26	0.004	0.005	0.071	

27	0.076	0.028	0.083	0.124
28	0.018	0.005	0.066	
29	0.081	0.010	0.078	0.117
30	0.004	0.012	0.061	
31	0.072	0.007	0.073	0.109
32	0.009	0.013	0.058	
33	0.055	0.012	0.068	0.102
34	0.006	0.012	0.054	
35	0.052	0.011	0.064	0.096
36	0.004	0.004	0.051	
37	0.049	0.017	0.061	0.091
38	0.005	0.012	0.048	
39	0.044	0.016	0.058	0.087
40	0.004	0.010	0.046	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.

SolarRiver 5200TL				
Power Quality. Harmonics.				
SSEG rating per phase (rpp)		4.6 **kW**		
Harmonic	**At 45-55% of rated output**	**100% of rated output**		
	Measured Value (MV) in Amps	**Measured Value (MV) in Amps**	**Limit in BS EN 61000-3-2 in Amps**	**Higher limit for odd harmonics 21 and above**
2	0.002	0.014	1.080	
3	0.169	0.140	2.300	
4	0.007	0.013	0.430	
5	0.105	0.083	1.140	
6	0.009	0.009	0.300	
7	0.068	0.034	0.770	
8	0.015	0.013	0.230	
9	0.041	0.105	0.400	
10	0.014	0.008	0.184	
11	0.029	0.099	0.330	
12	0.003	0.005	0.153	
13	0.016	0.099	0.210	
14	0.008	0.005	0.131	
15	0.028	0.145	0.150	
16	0.007	0.010	0.115	
17	0.023	0.128	0.132	
18	0.007	0.005	0.102	
19	0.027	0.131	0.118	
20	0.006	0.006	0.092	
21	0.023	0.132	0.107	0.160
22	0.006	0.010	0.084	
23	0.018	0.109	0.098	0.147
24	0.002	0.010	0.077	
25	0.046	0.132	0.090	0.135
26	0.011	0.011	0.071	

27	0.015	0.130	0.083	0.124
28	0.018	0.007	0.066	
29	0.031	0.105	0.078	0.117
30	0.010	0.012	0.061	
31	0.031	0.095	0.073	0.109
32	0.015	0.008	0.058	
33	0.027	0.076	0.068	0.102
34	0.013	0.008	0.054	
35	0.014	0.075	0.064	0.096
36	0.006	0.005	0.051	
37	0.022	0.069	0.061	0.091
38	0.002	0.004	0.048	
39	0.021	0.061	0.058	0.087
40	0.005	0.000	0.046	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.

SolarRiver 4400TL								
Power Quality. Voltage fluctuations and Flicker.								
	Starting			**Stopping**			**Running**	
	d_{max} [%]	**d_c [%]**	**$d_{(t)}$ [%]**	**d_{max} [%]**	**d_c [%]**	**$d_{(t)}$ [%]**	**P_{st}**	**P_{lt} 2 hours**
Measured Values	0.37	1.0	0.44	0.37	1.0	0.44	0.164	0.085
Normalised to standard impedance and 3.68kW for multiple units	0.65	1.76	0.77	0.65	1.76	0.77	0.287	0.149
Limits set under BS EN 61000-3-2	**4%**	**3.3%**	**3.3% 500ms**	**4%**	**3.3%**	**3.3% 500ms**	**1.0**	**0.65**
Test start date	01\06\2010			**Test end date**		01\06\2010		
Test location	Laboratories No.52, HuiGu Innovation Park, Huishan District, Wuxi City, Jiangsu Province							

SolarRiver 5200TL								
Power Quality. Voltage fluctuations and Flicker.								
	Starting			**Stopping**			**Running**	
	d_{max} [%]	**d_c [%]**	**$d_{(t)}$ [%]**	**d_{max} [%]**	**d_c [%]**	**$d_{(t)}$ [%]**	**P_{st}**	**P_{lt} 2 hours**
Measured Values	0.37	1.0	0.44	0.37	1.0	0.44	0.164	0.085
Normalised to standard impedance and 3.68kW for multiple units	0.65	1.76	0.77	0.65	1.76	0.77	0.287	0.149
Limits set under BS EN 61000-3-2	**4%**	**3.3%**	**3.3% 500ms**	**4%**	**3.3%**	**3.3% 500ms**	**1.0**	**0.65**
Test start date	01\06\2010			**Test end date**		01\06\2010		
Test location	Laboratories No.52, HuiGu Innovation Park, Huishan District, Wuxi City, Jiangsu Province							

SolarRiver 4400TL				
Power Quality. DC injection.				
Test power level	**10%**	**55%**	**100%**	
Recorded value	0.035	0.032	0.021	
as % of rated AC current	0.159	0.145	0.095	
Limit	**0.25%**	**0.25%**	**0.25%**	

SolarRiver 5200TL				
Power Quality. DC injection.				
Test power level	**10%**	**55%**	**100%**	
Recorded value	0.034	0.032	0.014	
as % of rated AC current	0.142	0.133	0.058	
Limit	**0.25%**	**0.25%**	**0.25%**	

SolarRiver 4400TL				
Power Quality. Power factor.				
	216.2V	**230V**	**253V**	**Measured at three voltage levels and at full output. Voltage to be maintained within ±1.5% of the stated level during the test.**
Measured value	0.9980	0.9976	0.9966	
Limit	**>0.95**	**>0.95**	**>0.95**	

SolarRiver 5200TL				
Power Quality. Power factor.				
	216.2V	**230V**	**253V**	**Measured at three voltage levels and at full output. Voltage to be maintained within ±1.5% of the stated level during the test.**
Measured value	0.9992	0.9989	0.9980	
Limit	**>0.95**	**>0.95**	**>0.95**	

Protection. Frequency tests						
Function	**Setting**		**Trip test**		**"No trip tests"**	
	Frequency	**Time delay**	**Frequency**	**Time delay**	**Frequency/Time**	**Confirm no trip**
U/F stage 1	**47.5Hz**	**20s**	47.5	20.085	**47.7Hz/ 25s**	No Trip
U/F stage 2	**47Hz**	**0.5s**	47.0	0.650	**47.2Hz/ 19.98s**	No Trip
					46.8Hz/ 0.48s	No Trip
O/F stage 1	**51.5Hz**	**90s**	51.50	90.117	**51.3Hz/ 95s**	No Trip
O/F stage 2	**52Hz**	**0.5s**	52.0	0.578	**51.8Hz/ 89.98s**	No Trip
					52.2Hz/0.48s	No Trip

Protection. Voltage tests						
Function	**Setting**		**Trip test**		**"No trip tests"**	
	Voltage	**Time delay**	**Voltage**	**Time delay**	**Voltage /Time**	**Confirm no trip**
U/V stage 1	**200.1 V**	**2.5s**	198.5	2.5	**204.1V/ 3.5s**	No trip
U/V stage 2	**184 V**	**0.5s**	182.2	0.502	**188V/ 2.48s**	No trip
					180V/ 0.48s	No trip
O/V stage 1	**262.2 V**	**1.0s**	262.5	1.0	**258.2V/ 2.0s**	No trip
O/V stage 2	**273.7 V**	**0.5s**	272.0	0.507	**269.7V/ 0.98s**	No trip
					277.7V/ 0.48s	No trip
Note for Voltage tests the Voltage required to trip is the setting ±3.45V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ±4V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.						

Protection. Loss of Mains test.						
To be carried out at three output power levels with a tolerance of plus or minus 5% in Test Power levels.						
Test Power	**10%**	**55%**	**100%**	**10%**	**55%**	**100%**
Balancing load on islanded network	**95% of SSEG output**	**95% of SSEG output**	**95% of SSEG output**	**105% of SSEG output**	**105% of SSEG output**	**105% of SSEG output**
Trip time. Limit is 0.5 seconds	0.22 s	0.17 s	0.21 s	0.25 s	0.26 s	0.22 s

Protection. Frequency change, Stability test				
	Start Frequency	**Change**	**End Frequency**	**Confirm no trip**
Positive Vector Shift	**49.5Hz**	**+9 degrees**		No trip
Negative Vector Shift	**50.5Hz**	**-9 degrees**		No trip
Positive Frequency Drift	**49.5Hz**	**+0.19Hz/sec**	**51.5Hz**	No trip
Negative Frequency Drift	**50.5Hz**	**-0.19Hz/sec**	**47.5Hz**	No trip

Protection. Re-connection timer.					
Test should prove that the reconnection sequence starts after a minimum delay of 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 1.					
Time delay setting	**Measured delay**	**Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.**			
30s	32s	**At 266.2V**	**At 196.1V**	**At 47.4Hz**	**At 51.6Hz**
Confirmation that the SSEG does not re-connect.		No re-connect	No re-connect	No re-connect	No re-connect

Fault level contribution.					
SolarRiver 4400TL			**SolarRiver 5200TL**		
For a Inverter SSEG			**For a Inverter SSEG**		
Time After Fault	**Volts**	**Amps**	**Time After Fault**	**Volts**	**Amps**
20ms	29.55	0.215	**20ms**	31.50	0.221
100ms	29.50	0.215	**100ms**	30.90	0.211
250ms	29.48	0.211	**250ms**	30.50	0.208
500ms	29.45	0.201	**500ms**	30.50	0.198
Time to trip	0.0206	In seconds	**Time to trip**	0.035	In seconds

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