



**BUREAU
VERITAS**

Certificate of compliance

Certificate No.: 2088AP1001N008003

Product: SOLAR INVERTER

Brand Name:



HUAWEI

Test Model No.: SUN2000-3KTL-M0, SUN2000-4KTL-M0, SUN2000-5KTL-M0,
SUN2000-6KTL-M0, SUN2000-8KTL-M0, SUN2000-10KTL-M0,
SUN2000-3KTL-M1, SUN2000-4KTL-M1, SUN2000-5KTL-M1,
SUN2000-6KTL-M1, SUN2000-8KTL-M1, SUN2000-10KTL-M1

Applicant: Huawei Technologies Co., Ltd.

Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129, P.R. China

Report No.: PVUK180906N022-1-R2

Use in accordance with regulations:

Automatic disconnection device with three-phases mains surveillance in accordance with Engineering Recommendation G99/1-6 for photovoltaic systems with a three-phases parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter. This automatic disconnection device serves as a replacement for the disconnection device with isolating function that can access the distribution network provider at any time.

Applied rules and standards

Engineering Recommendation G99/1-6:2020

Requirements for the connection of generation equipment in parallel with public distribution networks
- For Type A inverter connected Power Generating Modules

DIN V VDE V 0126-1-1:2006-02 (Functional safety)

Automatic disconnection device between a generator and the public low-voltage grid



Name: James Huang

Technical Manager / New Energy Team

Date: 2020-11-16

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Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch.

Information given in this document is related to the tested specimen of the described electrical sample



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Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Ratings	SUN2000-3KTL-M0, SUN2000-3KTL-M1	SUN2000-4KTL-M0, SUN2000-4KTL-M1	SUN2000-5KTL-M0, SUN2000-5KTL-M1
MPP DC voltage range [V]	140-980		
Input DC voltage range [V]	140-1100, max. 1100		
Input DC current [A]	Max. 11 x 2 strings		
Battery side DC voltage range [V] ...	max.1100		
Battery side DC current [A]	Max. 16		
Output AC voltage [V]	230/400, 3(N)~ + PE, 50Hz		
Output AC current [A]	Max. 5,1	Max. 6,8	Max. 8,5
Nominal Output power [kVA]	3,0	4,0	5,0
Maximum Output power [kVA]	3,3	4,4	5,5
Ratings	SUN2000-6KTL-M0, SUN2000-6KTL-M1	SUN2000-8KTL-M0, SUN2000-8KTL-M1	SUN2000-10KTL-M0, SUN2000-10KTL-M1
MPP DC voltage range [V]	140-980		
Input DC voltage range [V]	140-1100, max. 1100		
Input DC current [A]	Max. 11 x 2 strings		
Battery side DC voltage range [V] ...	max.1100		
Battery side DC current [A]	Max. 16		
Output AC voltage [V]	230/400, 3(N)~ + PE, 50Hz		
Output AC current [A]	Max. 10,1	Max. 13,5	Max. 16,9
Nominal Output power [kVA]	6,0	8,0	10,0
Maximum Output power [kVA]	6,6	8,8	10,0



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules			
Extract from test report according to the Engineering Recommendation G99		Nr. PVUK180906N022-1-R2	
Type Approval and declaration of compliance with the requirements of Engineering Recommendation G99.			
PGM Technology:	SOLAR INVERTER		
Manufacturer / applicant:	Huawei Technologies Co., Ltd.		
Address:	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R. China		
Tel	+86 0755-28780808	Fax:	+86 0755-28780808
Email:	support@huawei.com	Website:	http://www.huawei.com
Firmware version	V100R001		
Measurement period:	2018-09-06 to 2019-02-20 & 2020-09-08 to 2020-10-16		
Description of the structure of the power generation unit:			
<p>The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on two series-connected relays in line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.</p>			
<p>The above stated Generating Units are tested according the requirements in the Engineering Recommendation G99/1. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the Engineering Recommendation G99/1.</p>			



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules	
Extract from test report according to the Engineering Recommendation G99	
Nr. PVUK180906N022-1-R2	
Operating Range.	
Test 1	Voltage = 85% of nominal (195,5V) Frequency = 47Hz Power Factor = 1 Period of test 20 s
Connection:	Always connected
Limit:	Always connected
Test 2	Voltage = 85% of nominal (195,5V) Frequency = 47,5Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 3	Voltage = 110% of nominal (253V) Frequency = 51,5Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 4	Voltage = 110% of nominal (253V) Frequency = 52,0Hz Power Factor = 1 Period of test 15 minutes
Connection:	Always connected
Limit:	Always connected
Test 5	Confirm that the Power Generating Module is capable of staying connected to the Distribution Network and operate at rates of change of frequency up to 1 Hzs ⁻¹ as measured over a period of 500ms. Note that this is not expected to be demonstrated on site.
Connection:	Always connected
Limit:	Always connected



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules						
Extract from test report according to the Engineering Recommendation G99					Nr. PVUK180906N022-1-R2	
Protection. Voltage tests.						
Phase 1						
Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184,0	2,5	182,9	2,572	188V /5,0s	No trip
					180V /2,45s	No trip
O/V stage 1	262,2	1,0	261,0	1,062	258,2V /5,0s	No trip
O/V stage 2	273,7	0,5	272,6	0,563	269,7V /0,95s	No trip
					277,7V /0,45s	No trip
Phase 2						
Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184	2,5	185,4	2,552	188V /5,0s	No trip
					180V /2,45s	No trip
O/V stage 1	262,2	1,0	263,6	1,077	258,2V /5,0s	No trip
O/V stage 2	273,7	0,5	275,4	0,583	269,7V /0,95s	No trip
					277,7V /0,45s	No trip



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules						
Extract from test report according to the Engineering Recommendation G99					Nr. PVUK180906N022-1-R2	
Protection. Voltage tests.						
Phase 3						
Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184	2,5	184,5	2,556	188V /5,0s	No trip
					180V /2,45s	No trip
O/V stage 1	262,2	1,0	262,1	1,074	258,2V /5,0s	No trip
O/V stage 2	273,7	0,5	274,1	0,558	269,7V /0,95s	No trip
					277,7V /0,45s	No trip

Note. For Voltage tests the Voltage required to trip is the setting $\pm 3,45V$. 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 $\pm 4V$ and for the relevant times as shown in the table above to ensure that the protection will not trip in error.



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Protection. Frequency tests.

Function	Setting		Trip test		No trip test	
	Frequency [Hz]	Time delay [s]	Frequency [Hz]	Time delay [s]	Frequency / time	Confirm no trip
U/F stage 1	47,5	20	47,49	20,065	47,7Hz / 30s	No trip
U/F stage 2	47	0,5	47,00	0,567	47,2Hz / 19,5s	No trip
					46,8Hz / 0,45s	No trip
O/F stage 2	52	0,5	52,00	0,560	51,8Hz / 120s	No trip
					52,2Hz / 0,45s	No trip

Note. For Frequency Trip tests the Frequency required to trip is the setting $\pm 0,1$ Hz. In order to measure the time delay a larger deviation than the minimum required to operate the projection can be used. The "No-trip tests" need to be carried out at the setting $\pm 0,2$ Hz 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.

Inverters tested according to BS EN 62116.

Balancing load on islanded network	33% of -5% Q Test 2	66% of -5% Q Test 12	100% of -5% P Test 3	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time. Ph1 fuse removed [s]	0,169	0,173	0,291	0,255	0,248	0,270
Trip time. Ph2 fuse removed [s]	0,169	0,173	0,291	0,255	0,248	0,270
Trip time. Ph3 fuse removed [s]	0,169	0,173	0,291	0,255	0,248	0,270

Note. Trip time limit is 0,5s.



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules				
Extract from test report according to the Engineering Recommendation G99			Nr. PVUK180906N022-1-R2	
Protection. Re-connection timer.				
Test should prove that the reconnection sequence starts in no less than 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 10.1.				
Over Voltage				
Time delay setting		Measured delay		
20s		125,4s		
Under Voltage				
Time delay setting		Measured delay		
20s		54,8s		
Over Frequency				
Time delay setting		Measured delay		
20s		124,8s		
Under Frequency				
Time delay setting		Measured delay		
20s		125,2s		
	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 266,2V	At 180,0V	At 47,4Hz	At 52,1Hz
Confirmation that the Generating Unit does not re-connect.	No reconnection	No reconnection	No reconnection	No reconnection



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Protection. Frequency change, Stability test.

	Start Frequency [Hz]	Change	Test Duration	Confirm no trip
Positive Vector Shift	49,5	+50 degrees		No trip
Negative Vector Shift	50,5	-50 degrees		No trip
Positive Frequency drift	49,0 to 51,0	+0,95Hz/sec	2,1s	No trip
Negative Frequency drift	51,0 to 49,0	-0,95Hz/sec	2,1s	No trip

Limited Frequency Sensitive Mode – Over Frequency

1-min mean value [Hz]:	a) 50,00	b) 50,45	c) 50,70	d) 51,15	e) 50,70	f) 50,45	g) 50,00
1. Measurement a) to g): Active power output > 80% Pn							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P_{expected} [kW]:	N/A	9,880	9,390	8,480	9,390	9,880	N/A
P_{measured} [kW]:	10,000	9,884	9,384	8,483	9,384	9,884	10,000
2. Measurement a) to g): Active power output 40% and 60% Pn							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P_{expected} [kW]:	N/A	5,001	4,751	4,295	4,748	5,003	N/A
P_{measured} [kW]:	5,070	5,003	4,750	4,293	4,750	5,003	5,558



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

SUN2000-3KTL-M0

Generating Unit rating per phase (rpp)			1,0kW					
	At 45-55%% of rated output 0,613kW per phase					Harmonic %		
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	2,677	2,660	2,659	--	--	--	-	-
2nd	0,032	0,041	0,031	1,195	1,541	1,166	8,00	8,00
3rd	0,030	0,034	0,038	1,121	1,278	1,429	21,60	N/A
4th	0,022	0,019	0,022	0,822	0,714	0,827	4,00	4,00
5th	0,015	0,013	0,018	0,560	0,489	0,677	10,70	10,70
6th	0,012	0,011	0,013	0,448	0,414	0,489	2,67	2,67
7th	0,013	0,010	0,013	0,486	0,376	0,489	7,20	7,20
8th	0,011	0,010	0,011	0,411	0,376	0,414	2,00	2,00
9th	0,013	0,013	0,013	0,486	0,489	0,489	3,80	N/A
10th	0,012	0,010	0,010	0,448	0,376	0,376	1,60	1,60
11th	0,011	0,010	0,011	0,411	0,376	0,414	3,10	3,10
12th	0,012	0,010	0,012	0,448	0,376	0,451	1,33	1,33
13th	0,012	0,012	0,011	0,448	0,451	0,414	2,00	2,00
14th	0,010	0,011	0,011	0,374	0,414	0,414	N/A	N/A
15th	0,012	0,017	0,013	0,448	0,639	0,489	N/A	N/A
16th	0,009	0,009	0,010	0,336	0,338	0,376	N/A	N/A
17th	0,009	0,009	0,010	0,336	0,338	0,376	N/A	N/A
18th	0,008	0,009	0,009	0,299	0,338	0,338	N/A	N/A
19th	0,008	0,008	0,009	0,299	0,301	0,338	N/A	N/A
20th	0,007	0,008	0,008	0,261	0,301	0,301	N/A	N/A
21th	0,008	0,010	0,007	0,299	0,376	0,263	N/A	N/A
22th	0,006	0,006	0,006	0,224	0,226	0,226	N/A	N/A
23th	0,006	0,006	0,007	0,224	0,226	0,263	N/A	N/A
24th	0,006	0,005	0,005	0,224	0,188	0,188	N/A	N/A
25th	0,006	0,005	0,005	0,224	0,188	0,188	N/A	N/A



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Extract from test report according to the Engineering Recommendation G99							Nr. PVUK180906N022-1-R2	
Power Quality. Harmonics.								
26th	0,004	0,004	0,005	0,149	0,150	0,188	N/A	N/A
27th	0,005	0,005	0,005	0,187	0,188	0,188	N/A	N/A
28th	0,003	0,003	0,004	0,112	0,113	0,150	N/A	N/A
29th	0,005	0,004	0,006	0,187	0,150	0,226	N/A	N/A
30th	0,004	0,004	0,004	0,149	0,150	0,150	N/A	N/A
31th	0,004	0,004	0,004	0,149	0,150	0,150	N/A	N/A
32th	0,003	0,003	0,004	0,112	0,113	0,150	N/A	N/A
33th	0,013	0,015	0,010	0,486	0,564	0,376	N/A	N/A
34th	0,003	0,003	0,003	0,112	0,113	0,113	N/A	N/A
35th	0,012	0,012	0,012	0,448	0,451	0,451	N/A	N/A
36th	0,004	0,004	0,004	0,149	0,150	0,150	N/A	N/A
37th	0,017	0,018	0,018	0,635	0,677	0,677	N/A	N/A
38th	0,004	0,004	0,004	0,149	0,150	0,150	N/A	N/A
39th	0,016	0,020	0,015	0,598	0,752	0,564	N/A	N/A
40th	0,004	0,004	0,004	0,149	0,150	0,150	N/A	N/A
41th	0,019	0,018	0,019	0,710	0,677	0,715	N/A	N/A
42th	0,004	0,004	0,004	0,149	0,150	0,150	N/A	N/A
43th	0,014	0,016	0,015	0,523	0,602	0,564	N/A	N/A
44th	0,003	0,003	0,003	0,112	0,113	0,113	N/A	N/A
45th	0,007	0,007	0,007	0,261	0,263	0,263	N/A	N/A
46th	0,003	0,003	0,003	0,112	0,113	0,113	N/A	N/A
47th	0,009	0,008	0,008	0,336	0,301	0,301	N/A	N/A
48th	0,003	0,003	0,003	0,112	0,113	0,113	N/A	N/A
49th	0,018	0,018	0,017	0,672	0,677	0,639	N/A	N/A
50th	0,003	0,003	0,003	0,112	0,113	0,113	N/A	N/A
THD_ [%]	--	--	--	3,052	3,284	3,206	23	13
PWHD_ [%]	--	--	--	11,727	12,502	11,757	23	22
Note: The test had been performed on the model SUN2000-3KTL-M0, and the test results are valid for the SUN2000-3KTL-M1 since it is identical in rated output power.								



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Power Quality. Harmonics.								
Generating Unit tested to BS EN 61000-3-12								
SUN2000-3KTL-M0								
Generating Unit rating per phase (rpp)				1,0kW			Harmonic %	
	At 100%% of rated output 1,002kW per phase							
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	4,357	4,385	4,360	--	--	--	-	-
2nd	0,008	0,009	0,006	0,184	0,205	0,138	8,00	8,00
3rd	0,012	0,025	0,014	0,275	0,570	0,321	21,60	N/A
4th	0,006	0,007	0,007	0,138	0,160	0,161	4,00	4,00
5th	0,009	0,009	0,006	0,207	0,205	0,138	10,70	10,70
6th	0,005	0,005	0,005	0,115	0,114	0,115	2,67	2,67
7th	0,007	0,008	0,006	0,161	0,182	0,138	7,20	7,20
8th	0,004	0,005	0,006	0,092	0,114	0,138	2,00	2,00
9th	0,009	0,007	0,008	0,207	0,160	0,183	3,80	N/A
10th	0,005	0,006	0,006	0,115	0,137	0,138	1,60	1,60
11th	0,007	0,007	0,005	0,161	0,160	0,115	3,10	3,10
12th	0,005	0,005	0,005	0,115	0,114	0,115	1,33	1,33
13th	0,006	0,006	0,006	0,138	0,137	0,138	2,00	2,00
14th	0,005	0,005	0,005	0,115	0,114	0,115	N/A	N/A
15th	0,007	0,007	0,009	0,161	0,160	0,206	N/A	N/A
16th	0,004	0,005	0,005	0,092	0,114	0,115	N/A	N/A
17th	0,007	0,007	0,007	0,161	0,160	0,161	N/A	N/A
18th	0,005	0,006	0,006	0,115	0,137	0,138	N/A	N/A
19th	0,006	0,006	0,005	0,138	0,137	0,115	N/A	N/A
20th	0,005	0,005	0,006	0,115	0,114	0,138	N/A	N/A
21th	0,006	0,008	0,007	0,138	0,182	0,161	N/A	N/A
22th	0,005	0,005	0,006	0,115	0,114	0,138	N/A	N/A



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

23th	0,007	0,007	0,006	0,161	0,160	0,138	N/A	N/A
24th	0,006	0,007	0,007	0,138	0,160	0,161	N/A	N/A
25th	0,007	0,008	0,007	0,161	0,182	0,161	N/A	N/A
26th	0,006	0,006	0,007	0,138	0,137	0,161	N/A	N/A
27th	0,006	0,009	0,010	0,138	0,205	0,229	N/A	N/A
28th	0,006	0,005	0,006	0,138	0,114	0,138	N/A	N/A
29th	0,006	0,006	0,005	0,138	0,137	0,115	N/A	N/A
30th	0,006	0,006	0,005	0,138	0,137	0,115	N/A	N/A
31th	0,005	0,006	0,005	0,115	0,137	0,115	N/A	N/A
32th	0,007	0,006	0,005	0,161	0,137	0,115	N/A	N/A
33th	0,007	0,007	0,013	0,161	0,160	0,298	N/A	N/A
34th	0,004	0,005	0,005	0,092	0,114	0,115	N/A	N/A
35th	0,005	0,005	0,005	0,115	0,114	0,115	N/A	N/A
36th	0,005	0,006	0,006	0,115	0,137	0,138	N/A	N/A
37th	0,005	0,005	0,005	0,115	0,114	0,115	N/A	N/A
38th	0,004	0,004	0,005	0,092	0,091	0,115	N/A	N/A
39th	0,004	0,007	0,007	0,092	0,160	0,161	N/A	N/A
40th	0,004	0,004	0,005	0,092	0,091	0,115	N/A	N/A
41th	0,038	0,036	0,036	0,872	0,821	0,826	N/A	N/A
42th	0,004	0,005	0,005	0,092	0,114	0,115	N/A	N/A
43th	0,027	0,024	0,026	0,620	0,547	0,596	N/A	N/A
44th	0,003	0,005	0,005	0,069	0,114	0,115	N/A	N/A
45th	0,005	0,005	0,006	0,115	0,114	0,138	N/A	N/A
46th	0,004	0,004	0,004	0,092	0,091	0,092	N/A	N/A
47th	0,022	0,023	0,023	0,505	0,525	0,528	N/A	N/A
48th	0,004	0,004	0,003	0,092	0,091	0,069	N/A	N/A
49th	0,021	0,018	0,021	0,482	0,410	0,482	N/A	N/A
50th	0,004	0,005	0,004	0,092	0,114	0,092	N/A	N/A
THD_ [%]	--	--	--	1,572	1,617	1,594	23	13
PWHD_ [%]	--	--	--	9,234	8,878	9,331	23	22

Note:

The test had been performed on the model SUN2000-3KTL-M0, and the test results are valid for the SUN2000-3KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-4KTL-M0

Generating Unit rating per phase (rpp)			1,333kW			Harmonic %		
At 45-55% of rated output 0,736kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	3,203	3,179	3,181	--	--	--	-	-
2nd	0,028	0,040	0,029	0,874	1,258	0,912	8,00	8,00
3rd	0,024	0,028	0,036	0,749	0,881	1,132	21,60	N/A
4th	0,024	0,022	0,024	0,749	0,692	0,754	4,00	4,00
5th	0,014	0,010	0,014	0,437	0,315	0,440	10,70	10,70
6th	0,013	0,010	0,013	0,406	0,315	0,409	2,67	2,67
7th	0,012	0,008	0,010	0,375	0,252	0,314	7,20	7,20
8th	0,011	0,010	0,010	0,343	0,315	0,314	2,00	2,00
9th	0,009	0,008	0,011	0,281	0,252	0,346	3,80	N/A
10th	0,011	0,010	0,010	0,343	0,315	0,314	1,60	1,60
11th	0,010	0,007	0,010	0,312	0,220	0,314	3,10	3,10
12th	0,013	0,011	0,013	0,406	0,346	0,409	1,33	1,33
13th	0,010	0,009	0,009	0,312	0,283	0,283	2,00	2,00
14th	0,011	0,011	0,010	0,343	0,346	0,314	N/A	N/A
15th	0,008	0,014	0,009	0,250	0,440	0,283	N/A	N/A
16th	0,010	0,011	0,010	0,312	0,346	0,314	N/A	N/A
17th	0,008	0,007	0,007	0,250	0,220	0,220	N/A	N/A
18th	0,009	0,009	0,010	0,281	0,283	0,314	N/A	N/A
19th	0,007	0,006	0,007	0,219	0,189	0,220	N/A	N/A
20th	0,007	0,008	0,007	0,219	0,252	0,220	N/A	N/A
21th	0,007	0,007	0,005	0,219	0,220	0,157	N/A	N/A
22th	0,008	0,007	0,007	0,250	0,220	0,220	N/A	N/A
23th	0,005	0,006	0,005	0,156	0,189	0,157	N/A	N/A

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

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Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Extract from test report according to the Engineering Recommendation G99 **Nr. PVUK180906N022-1-R2**

Power Quality. Harmonics.

24th	0,006	0,006	0,006	0,187	0,189	0,189	N/A	N/A
25th	0,005	0,005	0,004	0,156	0,157	0,126	N/A	N/A
26th	0,005	0,004	0,005	0,156	0,126	0,157	N/A	N/A
27th	0,005	0,007	0,004	0,156	0,220	0,126	N/A	N/A
28th	0,005	0,005	0,004	0,156	0,157	0,126	N/A	N/A
29th	0,005	0,005	0,005	0,156	0,157	0,157	N/A	N/A
30th	0,004	0,004	0,005	0,125	0,126	0,157	N/A	N/A
31th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
32th	0,003	0,003	0,004	0,094	0,094	0,126	N/A	N/A
33th	0,011	0,013	0,009	0,343	0,409	0,283	N/A	N/A
34th	0,003	0,004	0,003	0,094	0,126	0,094	N/A	N/A
35th	0,013	0,013	0,013	0,406	0,409	0,409	N/A	N/A
36th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
37th	0,019	0,018	0,018	0,593	0,566	0,566	N/A	N/A
38th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
39th	0,013	0,015	0,012	0,406	0,472	0,377	N/A	N/A
40th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
41th	0,013	0,012	0,013	0,406	0,377	0,409	N/A	N/A
42th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
43th	0,014	0,015	0,013	0,437	0,472	0,409	N/A	N/A
44th	0,004	0,003	0,004	0,125	0,094	0,126	N/A	N/A
45th	0,008	0,009	0,008	0,250	0,283	0,251	N/A	N/A
46th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
47th	0,010	0,010	0,010	0,312	0,315	0,314	N/A	N/A
48th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
49th	0,013	0,013	0,013	0,406	0,409	0,409	N/A	N/A
50th	0,004	0,004	0,004	0,125	0,126	0,126	N/A	N/A
THD_ [%]	--	--	--	2,349	2,518	2,474	23	13
PWHD_ [%]	--	--	--	9,055	9,430	8,795	23	22

Note:

The test had been performed on the model SUN2000-4KTL-M0, and the test results are valid for the SUN2000-4KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-4KTL-M0

Generating Unit rating per phase (rpp)			1,333kW			Harmonic %		
At 100%% of rated output 1,350kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	5,870	5,902	5,872	--	--	--	-	-
2nd	0,038	0,023	0,031	0,647	0,390	0,528	8,00	8,00
3rd	0,017	0,010	0,012	0,290	0,169	0,204	21,60	N/A
4th	0,016	0,016	0,014	0,273	0,271	0,238	4,00	4,00
5th	0,026	0,027	0,035	0,443	0,457	0,596	10,70	10,70
6th	0,005	0,005	0,006	0,085	0,085	0,102	2,67	2,67
7th	0,033	0,029	0,033	0,562	0,491	0,562	7,20	7,20
8th	0,012	0,016	0,013	0,204	0,271	0,221	2,00	2,00
9th	0,007	0,016	0,007	0,119	0,271	0,119	3,80	N/A
10th	0,017	0,018	0,018	0,290	0,305	0,307	1,60	1,60
11th	0,014	0,014	0,011	0,239	0,237	0,187	3,10	3,10
12th	0,007	0,008	0,005	0,119	0,136	0,085	1,33	1,33
13th	0,023	0,022	0,025	0,392	0,373	0,426	2,00	2,00
14th	0,004	0,007	0,006	0,068	0,119	0,102	N/A	N/A
15th	0,007	0,006	0,008	0,119	0,102	0,136	N/A	N/A
16th	0,007	0,007	0,006	0,119	0,119	0,102	N/A	N/A
17th	0,069	0,069	0,070	1,175	1,169	1,192	N/A	N/A
18th	0,007	0,006	0,006	0,119	0,102	0,102	N/A	N/A
19th	0,045	0,045	0,046	0,767	0,762	0,783	N/A	N/A
20th	0,006	0,007	0,007	0,102	0,119	0,119	N/A	N/A
21th	0,006	0,008	0,006	0,102	0,136	0,102	N/A	N/A
22th	0,007	0,007	0,007	0,119	0,119	0,119	N/A	N/A
23th	0,009	0,010	0,011	0,153	0,169	0,187	N/A	N/A



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules								
Extract from test report according to the Engineering Recommendation G99							Nr. PVUK180906N022-1-R2	
Power Quality. Harmonics.								
24th	0,007	0,008	0,007	0,119	0,136	0,119	N/A	N/A
25th	0,015	0,014	0,014	0,256	0,237	0,238	N/A	N/A
26th	0,011	0,012	0,009	0,187	0,203	0,153	N/A	N/A
27th	0,007	0,008	0,008	0,119	0,136	0,136	N/A	N/A
28th	0,011	0,013	0,010	0,187	0,220	0,170	N/A	N/A
29th	0,012	0,009	0,010	0,204	0,152	0,170	N/A	N/A
30th	0,009	0,007	0,007	0,153	0,119	0,119	N/A	N/A
31th	0,010	0,008	0,007	0,170	0,136	0,119	N/A	N/A
32th	0,020	0,010	0,014	0,341	0,169	0,238	N/A	N/A
33th	0,008	0,009	0,006	0,136	0,152	0,102	N/A	N/A
34th	0,014	0,010	0,013	0,239	0,169	0,221	N/A	N/A
35th	0,009	0,007	0,008	0,153	0,119	0,136	N/A	N/A
36th	0,007	0,008	0,007	0,119	0,136	0,119	N/A	N/A
37th	0,012	0,012	0,010	0,204	0,203	0,170	N/A	N/A
38th	0,012	0,014	0,011	0,204	0,237	0,187	N/A	N/A
39th	0,011	0,008	0,009	0,187	0,136	0,153	N/A	N/A
40th	0,012	0,013	0,009	0,204	0,220	0,153	N/A	N/A
41th	0,029	0,025	0,027	0,494	0,424	0,460	N/A	N/A
42th	0,008	0,007	0,005	0,136	0,119	0,085	N/A	N/A
43th	0,014	0,016	0,012	0,239	0,271	0,204	N/A	N/A
44th	0,012	0,010	0,006	0,204	0,169	0,102	N/A	N/A
45th	0,005	0,005	0,005	0,085	0,085	0,085	N/A	N/A
46th	0,010	0,011	0,012	0,170	0,186	0,204	N/A	N/A
47th	0,021	0,017	0,021	0,358	0,288	0,358	N/A	N/A
48th	0,005	0,007	0,005	0,085	0,119	0,085	N/A	N/A
49th	0,008	0,007	0,009	0,136	0,119	0,153	N/A	N/A
50th	0,009	0,006	0,009	0,153	0,102	0,153	N/A	N/A
THD_ [%]	--	--	--	2,182	2,053	2,135	23	13
PWHD_ [%]	--	--	--	9,095	8,564	8,662	23	22
Note: The test had been performed on the model SUN2000-4KTL-M0, and the test results are valid for the SUN2000-4KTL-M1 since it is identical in rated output power.								



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules								
Extract from test report according to the Engineering Recommendation G99						Nr. PVUK180906N022-1-R2		
Power Quality. Harmonics.								
Generating Unit tested to BS EN 61000-3-12								
SUN2000-5KTL-M0								
Generating Unit rating per phase (rpp)				1,666kW			Harmonic %	
At 45-55% of rated output power				0,989kW per phase				
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	4,301	4,275	4,269	--	--	--	-	-
2nd	0,015	0,022	0,014	0,349	0,515	0,328	8,00	8,00
3rd	0,008	0,008	0,024	0,186	0,187	0,562	21,60	N/A
4th	0,010	0,010	0,008	0,233	0,234	0,187	4,00	4,00
5th	0,007	0,007	0,007	0,163	0,164	0,164	10,70	10,70
6th	0,009	0,008	0,009	0,209	0,187	0,211	2,67	2,67
7th	0,009	0,006	0,007	0,209	0,140	0,164	7,20	7,20
8th	0,007	0,007	0,007	0,163	0,164	0,164	2,00	2,00
9th	0,007	0,005	0,008	0,163	0,117	0,187	3,80	N/A
10th	0,010	0,009	0,009	0,233	0,211	0,211	1,60	1,60
11th	0,008	0,005	0,008	0,186	0,117	0,187	3,10	3,10
12th	0,012	0,010	0,012	0,279	0,234	0,281	1,33	1,33
13th	0,006	0,007	0,008	0,140	0,164	0,187	2,00	2,00
14th	0,010	0,009	0,008	0,233	0,211	0,187	N/A	N/A
15th	0,006	0,009	0,008	0,140	0,211	0,187	N/A	N/A
16th	0,011	0,010	0,009	0,256	0,234	0,211	N/A	N/A
17th	0,008	0,005	0,007	0,186	0,117	0,164	N/A	N/A
18th	0,009	0,009	0,010	0,209	0,211	0,234	N/A	N/A
19th	0,005	0,006	0,006	0,116	0,140	0,141	N/A	N/A
20th	0,007	0,007	0,007	0,163	0,164	0,164	N/A	N/A
21th	0,005	0,010	0,005	0,116	0,234	0,117	N/A	N/A
22th	0,008	0,007	0,007	0,186	0,164	0,164	N/A	N/A



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.								
23th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
24th	0,006	0,006	0,006	0,140	0,140	0,141	N/A	N/A
25th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
26th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
27th	0,004	0,005	0,004	0,093	0,117	0,094	N/A	N/A
28th	0,005	0,005	0,004	0,116	0,117	0,094	N/A	N/A
29th	0,004	0,004	0,005	0,093	0,094	0,117	N/A	N/A
30th	0,005	0,004	0,005	0,116	0,094	0,117	N/A	N/A
31th	0,005	0,006	0,005	0,116	0,140	0,117	N/A	N/A
32th	0,003	0,003	0,003	0,070	0,070	0,070	N/A	N/A
33th	0,013	0,013	0,010	0,302	0,304	0,234	N/A	N/A
34th	0,003	0,004	0,003	0,070	0,094	0,070	N/A	N/A
35th	0,017	0,017	0,018	0,395	0,398	0,422	N/A	N/A
36th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
37th	0,015	0,015	0,015	0,349	0,351	0,351	N/A	N/A
38th	0,003	0,004	0,003	0,070	0,094	0,070	N/A	N/A
39th	0,017	0,022	0,016	0,395	0,515	0,375	N/A	N/A
40th	0,003	0,004	0,004	0,070	0,094	0,094	N/A	N/A
41th	0,014	0,015	0,014	0,326	0,351	0,328	N/A	N/A
42th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
43th	0,017	0,017	0,017	0,395	0,398	0,398	N/A	N/A
44th	0,003	0,003	0,003	0,070	0,070	0,070	N/A	N/A
45th	0,008	0,009	0,008	0,186	0,211	0,187	N/A	N/A
46th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
47th	0,011	0,011	0,011	0,256	0,257	0,258	N/A	N/A
48th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
49th	0,014	0,016	0,014	0,326	0,374	0,328	N/A	N/A
50th	0,004	0,004	0,004	0,093	0,094	0,094	N/A	N/A
THD_ [%]	--	--	--	1,426	1,519	1,498	23	13
PWHD_ [%]	--	--	--	7,134	7,709	7,079	23	22

Note:
The test had been performed on the model SUN2000-5KTL-M0, and the test results are valid for the SUN2000-5KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-5KTL-M0

Generating Unit rating per phase (rpp)				1,666kW			Harmonic %	
At 100% of rated output power 1,688kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	7,340	7,335	7,297	--	--	--	-	-
2nd	0,015	0,010	0,015	0,204	0,136	0,206	8,00	8,00
3rd	0,017	0,025	0,009	0,232	0,341	0,123	21,60	N/A
4th	0,007	0,007	0,007	0,095	0,095	0,096	4,00	4,00
5th	0,041	0,036	0,048	0,559	0,491	0,658	10,70	10,70
6th	0,007	0,007	0,005	0,095	0,095	0,069	2,67	2,67
7th	0,031	0,030	0,035	0,422	0,409	0,480	7,20	7,20
8th	0,005	0,006	0,006	0,068	0,082	0,082	2,00	2,00
9th	0,008	0,007	0,006	0,109	0,095	0,082	3,80	N/A
10th	0,006	0,006	0,005	0,082	0,082	0,069	1,60	1,60
11th	0,032	0,030	0,029	0,436	0,409	0,397	3,10	3,10
12th	0,006	0,006	0,005	0,082	0,082	0,069	1,33	1,33
13th	0,013	0,014	0,010	0,177	0,191	0,137	2,00	2,00
14th	0,007	0,007	0,006	0,095	0,095	0,082	N/A	N/A
15th	0,009	0,009	0,007	0,123	0,123	0,096	N/A	N/A
16th	0,006	0,007	0,007	0,082	0,095	0,096	N/A	N/A
17th	0,032	0,029	0,023	0,436	0,395	0,315	N/A	N/A
18th	0,006	0,009	0,008	0,082	0,123	0,110	N/A	N/A
19th	0,048	0,045	0,044	0,654	0,613	0,603	N/A	N/A
20th	0,008	0,010	0,007	0,109	0,136	0,096	N/A	N/A
21th	0,011	0,008	0,008	0,150	0,109	0,110	N/A	N/A
22th	0,006	0,007	0,006	0,082	0,095	0,082	N/A	N/A



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.								
23th	0,012	0,011	0,011	0,163	0,150	0,151	N/A	N/A
24th	0,007	0,007	0,007	0,095	0,095	0,096	N/A	N/A
25th	0,012	0,012	0,009	0,163	0,164	0,123	N/A	N/A
26th	0,009	0,007	0,007	0,123	0,095	0,096	N/A	N/A
27th	0,009	0,008	0,010	0,123	0,109	0,137	N/A	N/A
28th	0,008	0,008	0,008	0,109	0,109	0,110	N/A	N/A
29th	0,010	0,007	0,010	0,136	0,095	0,137	N/A	N/A
30th	0,010	0,011	0,008	0,136	0,150	0,110	N/A	N/A
31th	0,009	0,007	0,008	0,123	0,095	0,110	N/A	N/A
32th	0,010	0,010	0,010	0,136	0,136	0,137	N/A	N/A
33th	0,009	0,009	0,010	0,123	0,123	0,137	N/A	N/A
34th	0,008	0,009	0,008	0,109	0,123	0,110	N/A	N/A
35th	0,009	0,008	0,008	0,123	0,109	0,110	N/A	N/A
36th	0,009	0,009	0,009	0,123	0,123	0,123	N/A	N/A
37th	0,007	0,010	0,010	0,095	0,136	0,137	N/A	N/A
38th	0,010	0,010	0,008	0,136	0,136	0,110	N/A	N/A
39th	0,009	0,008	0,011	0,123	0,109	0,151	N/A	N/A
40th	0,008	0,010	0,009	0,109	0,136	0,123	N/A	N/A
41th	0,009	0,017	0,017	0,123	0,232	0,233	N/A	N/A
42th	0,008	0,013	0,010	0,109	0,177	0,137	N/A	N/A
43th	0,025	0,018	0,018	0,341	0,245	0,247	N/A	N/A
44th	0,008	0,009	0,008	0,109	0,123	0,110	N/A	N/A
45th	0,009	0,010	0,008	0,123	0,136	0,110	N/A	N/A
46th	0,006	0,008	0,007	0,082	0,109	0,096	N/A	N/A
47th	0,027	0,026	0,027	0,368	0,354	0,370	N/A	N/A
48th	0,007	0,007	0,008	0,095	0,095	0,110	N/A	N/A
49th	0,008	0,012	0,010	0,109	0,164	0,137	N/A	N/A
50th	0,007	0,007	0,006	0,095	0,095	0,082	N/A	N/A
THD_ [%]	--	--	--	1,477	1,432	1,442	23	13
PWHD_ [%]	--	--	--	6,090	6,029	5,822	23	22

Note:
The test had been performed on the model SUN2000-5KTL-M0, and the test results are valid for the SUN2000-5KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-6KTL-M0

Generating Unit rating per phase (rpp)			2,0kW per phase			Harmonic %		
At 45-55% of rated output power 1,002kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	4,357	4,385	4,360	--	--	--	-	-
2nd	0,008	0,009	0,006	0,184	0,205	0,138	8,00	8,00
3rd	0,012	0,025	0,014	0,275	0,570	0,321	21,60	N/A
4th	0,006	0,007	0,007	0,138	0,160	0,161	4,00	4,00
5th	0,009	0,009	0,006	0,207	0,205	0,138	10,70	10,70
6th	0,005	0,005	0,005	0,115	0,114	0,115	2,67	2,67
7th	0,007	0,008	0,006	0,161	0,182	0,138	7,20	7,20
8th	0,004	0,005	0,006	0,092	0,114	0,138	2,00	2,00
9th	0,009	0,007	0,008	0,207	0,160	0,183	3,80	N/A
10th	0,005	0,006	0,006	0,115	0,137	0,138	1,60	1,60
11th	0,007	0,007	0,005	0,161	0,160	0,115	3,10	3,10
12th	0,005	0,005	0,005	0,115	0,114	0,115	1,33	1,33
13th	0,006	0,006	0,006	0,138	0,137	0,138	2,00	2,00
14th	0,005	0,005	0,005	0,115	0,114	0,115	N/A	N/A
15th	0,007	0,007	0,009	0,161	0,160	0,206	N/A	N/A
16th	0,004	0,005	0,005	0,092	0,114	0,115	N/A	N/A
17th	0,007	0,007	0,007	0,161	0,160	0,161	N/A	N/A
18th	0,005	0,006	0,006	0,115	0,137	0,138	N/A	N/A
19th	0,006	0,006	0,005	0,138	0,137	0,115	N/A	N/A
20th	0,005	0,005	0,006	0,115	0,114	0,138	N/A	N/A
21th	0,006	0,008	0,007	0,138	0,182	0,161	N/A	N/A
22th	0,005	0,005	0,006	0,115	0,114	0,138	N/A	N/A



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules								
Extract from test report according to the Engineering Recommendation G99							Nr. PVUK180906N022-1-R2	
Power Quality. Harmonics.								
23th	0,007	0,007	0,006	0,161	0,160	0,138	N/A	N/A
24th	0,006	0,007	0,007	0,138	0,160	0,161	N/A	N/A
25th	0,007	0,008	0,007	0,161	0,182	0,161	N/A	N/A
26th	0,006	0,006	0,007	0,138	0,137	0,161	N/A	N/A
27th	0,006	0,009	0,010	0,138	0,205	0,229	N/A	N/A
28th	0,006	0,005	0,006	0,138	0,114	0,138	N/A	N/A
29th	0,006	0,006	0,005	0,138	0,137	0,115	N/A	N/A
30th	0,006	0,006	0,005	0,138	0,137	0,115	N/A	N/A
31th	0,005	0,006	0,005	0,115	0,137	0,115	N/A	N/A
32th	0,007	0,006	0,005	0,161	0,137	0,115	N/A	N/A
33th	0,007	0,007	0,013	0,161	0,160	0,298	N/A	N/A
34th	0,004	0,005	0,005	0,092	0,114	0,115	N/A	N/A
35th	0,005	0,005	0,005	0,115	0,114	0,115	N/A	N/A
36th	0,005	0,006	0,006	0,115	0,137	0,138	N/A	N/A
37th	0,005	0,005	0,005	0,115	0,114	0,115	N/A	N/A
38th	0,004	0,004	0,005	0,092	0,091	0,115	N/A	N/A
39th	0,004	0,007	0,007	0,092	0,160	0,161	N/A	N/A
40th	0,004	0,004	0,005	0,092	0,091	0,115	N/A	N/A
41th	0,038	0,036	0,036	0,872	0,821	0,826	N/A	N/A
42th	0,004	0,005	0,005	0,092	0,114	0,115	N/A	N/A
43th	0,027	0,024	0,026	0,620	0,547	0,596	N/A	N/A
44th	0,003	0,005	0,005	0,069	0,114	0,115	N/A	N/A
45th	0,005	0,005	0,006	0,115	0,114	0,138	N/A	N/A
46th	0,004	0,004	0,004	0,092	0,091	0,092	N/A	N/A
47th	0,022	0,023	0,023	0,505	0,525	0,528	N/A	N/A
48th	0,004	0,004	0,003	0,092	0,091	0,069	N/A	N/A
49th	0,021	0,018	0,021	0,482	0,410	0,482	N/A	N/A
50th	0,004	0,005	0,004	0,092	0,114	0,092	N/A	N/A
THD_ [%]	--	--	--	1,572	1,617	1,594	23	13
PWHD_ [%]	--	--	--	9,234	8,878	9,331	23	22

Note:
The test had been performed on the model SUN2000-6KTL-M0, and the test results are valid for the SUN2000-6KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-6KTL-M0

Generating Unit rating per phase (rpp)			2,0kW per phase			Harmonic %		
At 100% of rated output power 2,014kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	8,756	8,750	8,706	--	--	--	-	-
2nd	0,012	0,010	0,009	0,137	0,114	0,103	8,00	8,00
3rd	0,018	0,024	0,013	0,206	0,274	0,149	21,60	N/A
4th	0,007	0,008	0,007	0,080	0,091	0,080	4,00	4,00
5th	0,037	0,035	0,048	0,423	0,400	0,551	10,70	10,70
6th	0,008	0,007	0,007	0,091	0,080	0,080	2,67	2,67
7th	0,030	0,033	0,034	0,343	0,377	0,391	7,20	7,20
8th	0,006	0,008	0,007	0,069	0,091	0,080	2,00	2,00
9th	0,011	0,006	0,005	0,126	0,069	0,057	3,80	N/A
10th	0,006	0,006	0,007	0,069	0,069	0,080	1,60	1,60
11th	0,005	0,009	0,007	0,057	0,103	0,080	3,10	3,10
12th	0,007	0,007	0,006	0,080	0,080	0,069	1,33	1,33
13th	0,024	0,021	0,027	0,274	0,240	0,310	2,00	2,00
14th	0,007	0,007	0,007	0,080	0,080	0,080	N/A	N/A
15th	0,006	0,009	0,008	0,069	0,103	0,092	N/A	N/A
16th	0,006	0,006	0,007	0,069	0,069	0,080	N/A	N/A
17th	0,052	0,049	0,049	0,594	0,560	0,563	N/A	N/A
18th	0,009	0,009	0,007	0,103	0,103	0,080	N/A	N/A
19th	0,055	0,055	0,055	0,628	0,629	0,632	N/A	N/A
20th	0,009	0,008	0,009	0,103	0,091	0,103	N/A	N/A
21th	0,006	0,007	0,006	0,069	0,080	0,069	N/A	N/A
22th	0,006	0,008	0,008	0,069	0,091	0,092	N/A	N/A



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.								
23th	0,008	0,010	0,008	0,091	0,114	0,092	N/A	N/A
24th	0,010	0,010	0,008	0,114	0,114	0,092	N/A	N/A
25th	0,020	0,015	0,016	0,228	0,171	0,184	N/A	N/A
26th	0,009	0,010	0,008	0,103	0,114	0,092	N/A	N/A
27th	0,006	0,011	0,007	0,069	0,126	0,080	N/A	N/A
28th	0,007	0,009	0,008	0,080	0,103	0,092	N/A	N/A
29th	0,008	0,014	0,017	0,091	0,160	0,195	N/A	N/A
30th	0,010	0,011	0,010	0,114	0,126	0,115	N/A	N/A
31th	0,008	0,012	0,012	0,091	0,137	0,138	N/A	N/A
32th	0,010	0,011	0,008	0,114	0,126	0,092	N/A	N/A
33th	0,010	0,009	0,008	0,114	0,103	0,092	N/A	N/A
34th	0,008	0,010	0,009	0,091	0,114	0,103	N/A	N/A
35th	0,007	0,009	0,009	0,080	0,103	0,103	N/A	N/A
36th	0,009	0,011	0,008	0,103	0,126	0,092	N/A	N/A
37th	0,017	0,010	0,015	0,194	0,114	0,172	N/A	N/A
38th	0,008	0,009	0,007	0,091	0,103	0,080	N/A	N/A
39th	0,007	0,015	0,008	0,080	0,171	0,092	N/A	N/A
40th	0,007	0,009	0,007	0,080	0,103	0,080	N/A	N/A
41th	0,039	0,044	0,043	0,445	0,503	0,494	N/A	N/A
42th	0,009	0,010	0,007	0,103	0,114	0,080	N/A	N/A
43th	0,021	0,020	0,018	0,240	0,229	0,207	N/A	N/A
44th	0,008	0,009	0,006	0,091	0,103	0,069	N/A	N/A
45th	0,006	0,007	0,006	0,069	0,080	0,069	N/A	N/A
46th	0,005	0,008	0,006	0,057	0,091	0,069	N/A	N/A
47th	0,033	0,037	0,038	0,377	0,423	0,436	N/A	N/A
48th	0,008	0,007	0,006	0,091	0,080	0,069	N/A	N/A
49th	0,013	0,011	0,008	0,148	0,126	0,092	N/A	N/A
50th	0,006	0,007	0,005	0,069	0,080	0,057	N/A	N/A
THD_ [%]	--	--	--	1,404	1,448	1,466	23	13
PWHD_ [%]	--	--	--	6,460	6,845	6,626	23	22

Note:
The test had been performed on the model SUN2000-6KTL-M0, and the test results are valid for the SUN2000-6KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-8KTL-M0

Generating Unit rating per phase (rpp)				2,666kW			Harmonic %	
At 45-55% of rated output power 1,350kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	5,870	5,902	5,872	--	--	--	-	-
2nd	0,038	0,023	0,031	0,647	0,390	0,528	8,00	8,00
3rd	0,017	0,010	0,012	0,290	0,169	0,204	21,60	N/A
4th	0,016	0,016	0,014	0,273	0,271	0,238	4,00	4,00
5th	0,026	0,027	0,035	0,443	0,457	0,596	10,70	10,70
6th	0,005	0,005	0,006	0,085	0,085	0,102	2,67	2,67
7th	0,033	0,029	0,033	0,562	0,491	0,562	7,20	7,20
8th	0,012	0,016	0,013	0,204	0,271	0,221	2,00	2,00
9th	0,007	0,016	0,007	0,119	0,271	0,119	3,80	N/A
10th	0,017	0,018	0,018	0,290	0,305	0,307	1,60	1,60
11th	0,014	0,014	0,011	0,239	0,237	0,187	3,10	3,10
12th	0,007	0,008	0,005	0,119	0,136	0,085	1,33	1,33
13th	0,023	0,022	0,025	0,392	0,373	0,426	2,00	2,00
14th	0,004	0,007	0,006	0,068	0,119	0,102	N/A	N/A
15th	0,007	0,006	0,008	0,119	0,102	0,136	N/A	N/A
16th	0,007	0,007	0,006	0,119	0,119	0,102	N/A	N/A
17th	0,069	0,069	0,070	1,175	1,169	1,192	N/A	N/A
18th	0,007	0,006	0,006	0,119	0,102	0,102	N/A	N/A
19th	0,045	0,045	0,046	0,767	0,762	0,783	N/A	N/A
20th	0,006	0,007	0,007	0,102	0,119	0,119	N/A	N/A
21th	0,006	0,008	0,006	0,102	0,136	0,102	N/A	N/A
22th	0,007	0,007	0,007	0,119	0,119	0,119	N/A	N/A



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules								
Extract from test report according to the Engineering Recommendation G99							Nr. PVUK180906N022-1-R2	
Power Quality. Harmonics.								
23th	0,009	0,010	0,011	0,153	0,169	0,187	N/A	N/A
24th	0,007	0,008	0,007	0,119	0,136	0,119	N/A	N/A
25th	0,015	0,014	0,014	0,256	0,237	0,238	N/A	N/A
26th	0,011	0,012	0,009	0,187	0,203	0,153	N/A	N/A
27th	0,007	0,008	0,008	0,119	0,136	0,136	N/A	N/A
28th	0,011	0,013	0,010	0,187	0,220	0,170	N/A	N/A
29th	0,012	0,009	0,010	0,204	0,152	0,170	N/A	N/A
30th	0,009	0,007	0,007	0,153	0,119	0,119	N/A	N/A
31th	0,010	0,008	0,007	0,170	0,136	0,119	N/A	N/A
32th	0,020	0,010	0,014	0,341	0,169	0,238	N/A	N/A
33th	0,008	0,009	0,006	0,136	0,152	0,102	N/A	N/A
34th	0,014	0,010	0,013	0,239	0,169	0,221	N/A	N/A
35th	0,009	0,007	0,008	0,153	0,119	0,136	N/A	N/A
36th	0,007	0,008	0,007	0,119	0,136	0,119	N/A	N/A
37th	0,012	0,012	0,010	0,204	0,203	0,170	N/A	N/A
38th	0,012	0,014	0,011	0,204	0,237	0,187	N/A	N/A
39th	0,011	0,008	0,009	0,187	0,136	0,153	N/A	N/A
40th	0,012	0,013	0,009	0,204	0,220	0,153	N/A	N/A
41th	0,029	0,025	0,027	0,494	0,424	0,460	N/A	N/A
42th	0,008	0,007	0,005	0,136	0,119	0,085	N/A	N/A
43th	0,014	0,016	0,012	0,239	0,271	0,204	N/A	N/A
44th	0,012	0,010	0,006	0,204	0,169	0,102	N/A	N/A
45th	0,005	0,005	0,005	0,085	0,085	0,085	N/A	N/A
46th	0,010	0,011	0,012	0,170	0,186	0,204	N/A	N/A
47th	0,021	0,017	0,021	0,358	0,288	0,358	N/A	N/A
48th	0,005	0,007	0,005	0,085	0,119	0,085	N/A	N/A
49th	0,008	0,007	0,009	0,136	0,119	0,153	N/A	N/A
50th	0,009	0,006	0,009	0,153	0,102	0,153	N/A	N/A
THD_ [%]	--	--	--	2,182	2,053	2,135	23	13
PWHD_ [%]	--	--	--	9,095	8,564	8,662	23	22

Note:
The test had been performed on the model SUN2000-8KTL-M0, and the test results are valid for the SUN2000-8KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-8KTL-M0

Generating Unit rating per phase (rpp)				2,666kW			Harmonic %	
At 100% of rated output power 2,678kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	11,646	11,640	11,583	--	--	--	-	-
2nd	0,017	0,015	0,007	0,146	0,129	0,060	8,00	8,00
3rd	0,023	0,027	0,018	0,197	0,232	0,155	21,60	N/A
4th	0,009	0,010	0,008	0,077	0,086	0,069	4,00	4,00
5th	0,058	0,053	0,074	0,498	0,455	0,639	10,70	10,70
6th	0,006	0,007	0,007	0,052	0,060	0,060	2,67	2,67
7th	0,031	0,033	0,035	0,266	0,284	0,302	7,20	7,20
8th	0,006	0,006	0,006	0,052	0,052	0,052	2,00	2,00
9th	0,016	0,007	0,007	0,137	0,060	0,060	3,80	N/A
10th	0,007	0,007	0,006	0,060	0,060	0,052	1,60	1,60
11th	0,007	0,006	0,007	0,060	0,052	0,060	3,10	3,10
12th	0,006	0,006	0,006	0,052	0,052	0,052	1,33	1,33
13th	0,030	0,029	0,032	0,258	0,249	0,276	2,00	2,00
14th	0,006	0,008	0,006	0,052	0,069	0,052	N/A	N/A
15th	0,005	0,009	0,008	0,043	0,077	0,069	N/A	N/A
16th	0,007	0,007	0,008	0,060	0,060	0,069	N/A	N/A
17th	0,026	0,020	0,025	0,223	0,172	0,216	N/A	N/A
18th	0,009	0,007	0,007	0,077	0,060	0,060	N/A	N/A
19th	0,034	0,036	0,034	0,292	0,309	0,294	N/A	N/A
20th	0,010	0,009	0,008	0,086	0,077	0,069	N/A	N/A
21th	0,008	0,011	0,007	0,069	0,095	0,060	N/A	N/A
22th	0,008	0,008	0,008	0,069	0,069	0,069	N/A	N/A



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules								
Extract from test report according to the Engineering Recommendation G99							Nr. PVUK180906N022-1-R2	
Power Quality. Harmonics.								
23th	0,009	0,009	0,008	0,077	0,077	0,069	N/A	N/A
24th	0,011	0,009	0,007	0,094	0,077	0,060	N/A	N/A
25th	0,015	0,017	0,017	0,129	0,146	0,147	N/A	N/A
26th	0,010	0,009	0,010	0,086	0,077	0,086	N/A	N/A
27th	0,009	0,008	0,010	0,077	0,069	0,086	N/A	N/A
28th	0,010	0,011	0,010	0,086	0,095	0,086	N/A	N/A
29th	0,009	0,012	0,014	0,077	0,103	0,121	N/A	N/A
30th	0,014	0,013	0,012	0,120	0,112	0,104	N/A	N/A
31th	0,016	0,016	0,014	0,137	0,137	0,121	N/A	N/A
32th	0,014	0,015	0,011	0,120	0,129	0,095	N/A	N/A
33th	0,011	0,012	0,011	0,094	0,103	0,095	N/A	N/A
34th	0,011	0,011	0,013	0,094	0,095	0,112	N/A	N/A
35th	0,012	0,017	0,015	0,103	0,146	0,130	N/A	N/A
36th	0,014	0,015	0,013	0,120	0,129	0,112	N/A	N/A
37th	0,010	0,012	0,010	0,086	0,103	0,086	N/A	N/A
38th	0,014	0,015	0,015	0,120	0,129	0,130	N/A	N/A
39th	0,014	0,014	0,013	0,120	0,120	0,112	N/A	N/A
40th	0,010	0,011	0,010	0,086	0,095	0,086	N/A	N/A
41th	0,034	0,032	0,031	0,292	0,275	0,268	N/A	N/A
42th	0,015	0,013	0,011	0,129	0,112	0,095	N/A	N/A
43th	0,037	0,036	0,038	0,318	0,309	0,328	N/A	N/A
44th	0,009	0,010	0,007	0,077	0,086	0,060	N/A	N/A
45th	0,010	0,010	0,010	0,086	0,086	0,086	N/A	N/A
46th	0,008	0,009	0,009	0,069	0,077	0,078	N/A	N/A
47th	0,017	0,014	0,018	0,146	0,120	0,155	N/A	N/A
48th	0,010	0,011	0,011	0,086	0,095	0,095	N/A	N/A
49th	0,027	0,023	0,022	0,232	0,198	0,190	N/A	N/A
50th	0,009	0,008	0,008	0,077	0,069	0,069	N/A	N/A
THD_ [%]	--	--	--	1,074	1,049	1,125	23	13
PWHD_ [%]	--	--	--	4,778	4,693	4,642	23	22

Note:
The test had been performed on the model SUN2000-8KTL-M0, and the test results are valid for the SUN2000-8KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-10KTL-M0

Generating Unit rating per phase (rpp)			3,333kW			Harmonic %		
At 45-55% of rated output power 1,688kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	7,340	7,335	7,297	--	--	--	-	-
2nd	0,015	0,010	0,015	0,204	0,136	0,206	8,00	8,00
3rd	0,017	0,025	0,009	0,232	0,341	0,123	21,60	N/A
4th	0,007	0,007	0,007	0,095	0,095	0,096	4,00	4,00
5th	0,041	0,036	0,048	0,559	0,491	0,658	10,70	10,70
6th	0,007	0,007	0,005	0,095	0,095	0,069	2,67	2,67
7th	0,031	0,030	0,035	0,422	0,409	0,480	7,20	7,20
8th	0,005	0,006	0,006	0,068	0,082	0,082	2,00	2,00
9th	0,008	0,007	0,006	0,109	0,095	0,082	3,80	N/A
10th	0,006	0,006	0,005	0,082	0,082	0,069	1,60	1,60
11th	0,032	0,030	0,029	0,436	0,409	0,397	3,10	3,10
12th	0,006	0,006	0,005	0,082	0,082	0,069	1,33	1,33
13th	0,013	0,014	0,010	0,177	0,191	0,137	2,00	2,00
14th	0,007	0,007	0,006	0,095	0,095	0,082	N/A	N/A
15th	0,009	0,009	0,007	0,123	0,123	0,096	N/A	N/A
16th	0,006	0,007	0,007	0,082	0,095	0,096	N/A	N/A
17th	0,032	0,029	0,023	0,436	0,395	0,315	N/A	N/A
18th	0,006	0,009	0,008	0,082	0,123	0,110	N/A	N/A
19th	0,048	0,045	0,044	0,654	0,613	0,603	N/A	N/A
20th	0,008	0,010	0,007	0,109	0,136	0,096	N/A	N/A
21th	0,011	0,008	0,008	0,150	0,109	0,110	N/A	N/A
22th	0,006	0,007	0,006	0,082	0,095	0,082	N/A	N/A



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 **Nr. PVUK180906N022-1-R2**

Power Quality. Harmonics.								
23th	0,012	0,011	0,011	0,163	0,150	0,151	N/A	N/A
24th	0,007	0,007	0,007	0,095	0,095	0,096	N/A	N/A
25th	0,012	0,012	0,009	0,163	0,164	0,123	N/A	N/A
26th	0,009	0,007	0,007	0,123	0,095	0,096	N/A	N/A
27th	0,009	0,008	0,010	0,123	0,109	0,137	N/A	N/A
28th	0,008	0,008	0,008	0,109	0,109	0,110	N/A	N/A
29th	0,010	0,007	0,010	0,136	0,095	0,137	N/A	N/A
30th	0,010	0,011	0,008	0,136	0,150	0,110	N/A	N/A
31th	0,009	0,007	0,008	0,123	0,095	0,110	N/A	N/A
32th	0,010	0,010	0,010	0,136	0,136	0,137	N/A	N/A
33th	0,009	0,009	0,010	0,123	0,123	0,137	N/A	N/A
34th	0,008	0,009	0,008	0,109	0,123	0,110	N/A	N/A
35th	0,009	0,008	0,008	0,123	0,109	0,110	N/A	N/A
36th	0,009	0,009	0,009	0,123	0,123	0,123	N/A	N/A
37th	0,007	0,010	0,010	0,095	0,136	0,137	N/A	N/A
38th	0,010	0,010	0,008	0,136	0,136	0,110	N/A	N/A
39th	0,009	0,008	0,011	0,123	0,109	0,151	N/A	N/A
40th	0,008	0,010	0,009	0,109	0,136	0,123	N/A	N/A
41th	0,009	0,017	0,017	0,123	0,232	0,233	N/A	N/A
42th	0,008	0,013	0,010	0,109	0,177	0,137	N/A	N/A
43th	0,025	0,018	0,018	0,341	0,245	0,247	N/A	N/A
44th	0,008	0,009	0,008	0,109	0,123	0,110	N/A	N/A
45th	0,009	0,010	0,008	0,123	0,136	0,110	N/A	N/A
46th	0,006	0,008	0,007	0,082	0,109	0,096	N/A	N/A
47th	0,027	0,026	0,027	0,368	0,354	0,370	N/A	N/A
48th	0,007	0,007	0,008	0,095	0,095	0,110	N/A	N/A
49th	0,008	0,012	0,010	0,109	0,164	0,137	N/A	N/A
50th	0,007	0,007	0,006	0,095	0,095	0,082	N/A	N/A
THD_ [%]	--	--	--	1,477	1,432	1,442	23	13
PWHD_ [%]	--	--	--	6,090	6,029	5,822	23	22

Note:
The test had been performed on the model SUN2000-10KTL-M0, and the test results are valid for the SUN2000-10KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Harmonics.

Generating Unit tested to BS EN 61000-3-12

SUN2000-10KTL-M0

Generating Unit rating per phase (rpp)			3,333kW			Harmonic %		
At 100%% of rated output power 3,314kW per phase								
Harmonic	Measured Value (MV) in Amps			Measured Value (MV) in %			Limit in BS EN61000-3-12 in Amps	
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
1st	14,408	14,521	14,423	--	--	--	-	-
2nd	0,030	0,016	0,025	0,208	0,110	0,173	8,00	8,00
3rd	0,043	0,016	0,036	0,298	0,110	0,250	21,60	N/A
4th	0,010	0,012	0,015	0,069	0,083	0,104	4,00	4,00
5th	0,017	0,018	0,016	0,118	0,124	0,111	10,70	10,70
6th	0,008	0,009	0,008	0,056	0,062	0,055	2,67	2,67
7th	0,011	0,009	0,012	0,076	0,062	0,083	7,20	7,20
8th	0,007	0,009	0,009	0,049	0,062	0,062	2,00	2,00
9th	0,010	0,014	0,008	0,069	0,096	0,055	3,80	N/A
10th	0,007	0,008	0,008	0,049	0,055	0,055	1,60	1,60
11th	0,010	0,010	0,011	0,069	0,069	0,076	3,10	3,10
12th	0,007	0,007	0,007	0,049	0,048	0,049	1,33	1,33
13th	0,009	0,012	0,012	0,062	0,083	0,083	2,00	2,00
14th	0,006	0,008	0,008	0,042	0,055	0,055	N/A	N/A
15th	0,006	0,007	0,009	0,042	0,048	0,062	N/A	N/A
16th	0,008	0,008	0,007	0,056	0,055	0,049	N/A	N/A
17th	0,009	0,009	0,008	0,062	0,062	0,055	N/A	N/A
18th	0,007	0,007	0,008	0,049	0,048	0,055	N/A	N/A
19th	0,008	0,009	0,009	0,056	0,062	0,062	N/A	N/A
20th	0,006	0,007	0,007	0,042	0,048	0,049	N/A	N/A
21th	0,006	0,007	0,009	0,042	0,048	0,062	N/A	N/A
22th	0,007	0,007	0,007	0,049	0,048	0,049	N/A	N/A



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 **Nr. PVUK180906N022-1-R2**

Power Quality. Harmonics.

23th	0,009	0,009	0,009	0,062	0,062	0,062	N/A	N/A
24th	0,008	0,008	0,007	0,056	0,055	0,049	N/A	N/A
25th	0,008	0,009	0,009	0,056	0,062	0,062	N/A	N/A
26th	0,006	0,007	0,007	0,042	0,048	0,049	N/A	N/A
27th	0,009	0,010	0,008	0,062	0,069	0,055	N/A	N/A
28th	0,008	0,010	0,010	0,056	0,069	0,069	N/A	N/A
29th	0,008	0,008	0,009	0,056	0,055	0,062	N/A	N/A
30th	0,009	0,011	0,011	0,062	0,076	0,076	N/A	N/A
31th	0,009	0,010	0,010	0,062	0,069	0,069	N/A	N/A
32th	0,009	0,018	0,017	0,062	0,124	0,118	N/A	N/A
33th	0,013	0,014	0,013	0,090	0,096	0,090	N/A	N/A
34th	0,013	0,018	0,015	0,090	0,124	0,104	N/A	N/A
35th	0,048	0,048	0,036	0,333	0,331	0,250	N/A	N/A
36th	0,017	0,020	0,016	0,118	0,138	0,111	N/A	N/A
37th	0,026	0,042	0,037	0,180	0,289	0,257	N/A	N/A
38th	0,011	0,025	0,026	0,076	0,172	0,180	N/A	N/A
39th	0,025	0,015	0,016	0,174	0,103	0,111	N/A	N/A
40th	0,016	0,025	0,019	0,111	0,172	0,132	N/A	N/A
41th	0,022	0,024	0,034	0,153	0,165	0,236	N/A	N/A
42th	0,016	0,023	0,018	0,111	0,158	0,125	N/A	N/A
43th	0,031	0,032	0,037	0,215	0,220	0,257	N/A	N/A
44th	0,013	0,022	0,020	0,090	0,152	0,139	N/A	N/A
45th	0,018	0,015	0,016	0,125	0,103	0,111	N/A	N/A
46th	0,012	0,019	0,017	0,083	0,131	0,118	N/A	N/A
47th	0,034	0,045	0,039	0,236	0,310	0,270	N/A	N/A
48th	0,014	0,015	0,015	0,097	0,103	0,104	N/A	N/A
49th	0,032	0,020	0,028	0,222	0,138	0,194	N/A	N/A
50th	0,010	0,023	0,020	0,069	0,158	0,139	N/A	N/A
THD_[%]	--	--	--	0,831	0,877	0,879	23	13
PWHD_[%]	--	--	--	4,463	5,181	4,957	23	22

Note:

The test had been performed on the model SUN2000-10KTL-M0, and the test results are valid for the SUN2000-10KTL-M1 since it is identical in rated output power.



Annex to the G99/1-6 certificate of compliance No. 2088AP1001N008003

Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Power Quality. Power factor.

SUN2000-3KTL-M0				
Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within $\pm 1,5\%$ of the stated level during the test.
20%	0,9955	0,9962	0,9951	
50%	0,9991	0,9992	0,9991	
75%	0,9996	0,9996	0,9996	
100%	0,9998	0,9998	0,9998	
Limit	>0,95	>0,95	>0,95	

SUN2000-10KTL-M0				
Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within $\pm 1,5\%$ of the stated level during the test.
20%	0,9996	0,9996	0,9995	
50%	0,9999	0,9993	0,9999	
75%	0,9999	0,9997	0,9999	
100%	0,9999	0,9998	0,9999	
Limit	>0,95	>0,95	>0,95	



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules									
Extract from test report according to the Engineering Recommendation G99								Nr. PVUK180906N022-1-R2	
Power Quality. Voltage fluctuation and Flicker.									
Phase 1									
		Starting			Stopping			Running	
		d _{max}	d _c	d(t)	d _{max}	d _c	d(t)	P _{st}	Plt 2 hours
Test: SUN2000-10KTL-M0									
		Starting			Stopping			Running	
		d _{max}	d _c	d(t)	d _{max}	d _c	d(t)	P _{st}	Plt 2 hours
Measured values at test impedance	L1	0,01	0,01	--	0,01	0,01	--	0,10	0,08
	L2	0,01	0,01	--	0,01	0,01	--	0,08	0,08
	L3	0,01	0,01	--	0,01	0,01	--	0,08	0,08
Normalised to standard impedance	L1	0,01	0,01	--	0,01	0,01	--	0,10	0,08
	L2	0,01	0,01	--	0,01	0,01	--	0,08	0,08
	L3	0,01	0,01	--	0,01	0,01	--	0,08	0,08
Normalised to required maximum impedance	L1	0,01	0,01	--	0,01	0,01	--	0,10	0,08
	L2	0,01	0,01	--	0,01	0,01	--	0,08	0,08
	L3	0,01	0,01	--	0,01	0,01	--	0,08	0,08
Limits set under BS EN 61000-3-11		4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65
Test impedance		R	0,240	Ω	XI	0,15	Ω		
		Z	0,283	Ω					
Standard impedance		R	0,240	Ω	XI	0,15	Ω		
		Z	0,283	Ω					
Maximum impedance		R	0,240	Ω	XI	0,15	Ω		
		Z	0,283	Ω					



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Voltage fluctuation and Flicker.

Test: SUN2000-8KTL-M0

		Starting			Stopping			Running	
		d _{max}	d _c	d _(t)	d _{max}	d _c	d _(t)	P _{St}	P _{It} 2 hours
Measured values at test impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to standard impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to required maximum impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Limits set under BS EN 61000-3-11		4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65

Test impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Standard impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Maximum impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Voltage fluctuation and Flicker.

Test: SUN2000-6KTL-M0

		Starting			Stopping			Running	
		d _{max}	d _c	d _(t)	d _{max}	d _c	d _(t)	P _{St}	P _{It} 2 hours
Measured values at test impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to standard impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to required maximum impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Limits set under BS EN 61000-3-11		4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65

Test impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Standard impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Maximum impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Voltage fluctuation and Flicker.

Test: SUN2000-5KTL-M0

		Starting			Stopping			Running	
		d _{max}	d _c	d _(t)	d _{max}	d _c	d _(t)	P _{St}	P _{It} 2 hours
Measured values at test impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to standard impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to required maximum impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Limits set under BS EN 61000-3-11		4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65

Test impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Standard impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Maximum impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Voltage fluctuation and Flicker.

Test: SUN2000-4KTL-M0

		Starting			Stopping			Running	
		d _{max}	d _c	d _(t)	d _{max}	d _c	d _(t)	P _{St}	P _{It} 2 hours
Measured values at test impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to standard impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to required maximum impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Limits set under BS EN 61000-3-11		4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65

Test impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Standard impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			
Maximum impedance	R	0,240	Ω	XI	0,15	Ω
	Z	0,283	Ω			



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99

Nr. PVUK180906N022-1-R2

Power Quality. Voltage fluctuation and Flicker.

Test: SUN2000-3KTL-M0

		Starting			Stopping			Running	
		d _{max}	d _c	d _(t)	d _{max}	d _c	d _(t)	P _{St}	P _{It} 2 hours
Measured values at test impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to standard impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Normalised to required maximum impedance	L1	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L2	0,01	0,01	--	0,01	0,01	--	0,07	0,07
	L3	0,01	0,01	--	0,01	0,01	--	0,07	0,07
Limits set under BS EN 61000-3-11		4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65
Test impedance		R	0,240	Ω	XI	0,15	Ω		
		Z	0,283	Ω					
Standard impedance		R	0,240	Ω	XI	0,15	Ω		
		Z	0,283	Ω					
Maximum impedance		R	0,240	Ω	XI	0,15	Ω		
		Z	0,283	Ω					



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules			
Extract from test report according to the Engineering Recommendation G99		Nr. PVUK180906N022-1-R2	
Power Quality. DC injection.			
SUN2000-3KTL-M0			
Phase 1			
Test level power [%]	10	55	100
Recorded value [mA]	5,7 mA	6,1 mA	4,0 mA
Recorded value [%]	0,11%	0,02%	0,08%
Limit [%]	0,25	0,25	0,25
Phase 2			
Test level power [%]	10	55	100
Recorded value [mA]	2,0mA	3,8 mA	4,1 mA
Recorded value [%]	0,04%	0,07%	0,08%
Limit [%]	0,25	0,25	0,25
Phase 3			
Test level power [%]	10	55	100
Recorded value [mA]	2,0mA	4,5 mA	2,1 mA
Recorded value [%]	0,04%	0,09%	0,04%
Limit [%]	0,25	0,25	0,25



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules			
Extract from test report according to the Engineering Recommendation G99		Nr. PVUK180906N022-1-R2	
Power Quality. DC injection.			
SUN2000-10KTL-M0			
Phase 1			
Test level power [%]	10	55	100
Recorded value [mA]	5,2 mA	5,7 mA	5,7mA
Recorded value [%]	0,03%	0,03%	0,03%
Limit [%]	0,25	0,25	0,25
Phase 2			
Test level power [%]	10	55	100
Recorded value [mA]	2,1mA	5,1 mA	5,2 mA
Recorded value [%]	0,01%	0,03%	0,03%
Limit [%]	0,25	0,25	0,25
Phase 3			
Test level power [%]	10	55	100
Recorded value [mA]	2,2mA	3,9 mA	4,5 mA
Recorded value [%]	0,01%	0,02%	0,03%
Limit [%]	0,25	0,25	0,25
Note. DC-injection is tested at each phase of the inverter and a limit of 0,25% per phase was used as pass criteria.			



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules					
Extract from test report according to the Engineering Recommendation G99				Nr. PVUK180906N022-1-R2	
Fault level Contribution.					
Phase 1					
For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I_p	N/A	20ms	54	12,9
Initial Value of aperiodic current	A	N/A	100ms	39	7,7
Initial symmetrical short-circuit current*	I_k	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	N/A	N/A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to Trip [s]	0,074	In seconds
Phase 2					
For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I_p	N/A	20ms	49	13,1
Initial Value of aperiodic current	A	N/A	100ms	38	8,2
Initial symmetrical short-circuit current*	I_k	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	N/A	N/A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to Trip [s]	0,074	In seconds



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Appendix A2-3 Compliance Verification Report for Inverter Connected Power Generating Modules

Extract from test report according to the Engineering Recommendation G99 Nr. PVUK180906N022-1-R2

Phase 3

For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I_p	N/A	20ms	37,0	13,3
Initial Value of aperiodic current	A	N/A	100ms	35,0	7,7
Initial symmetrical short-circuit current*	I_k	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	i_{dc}	N/A	500ms	N/A	N/A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to Trip [s]	0,074	In seconds

For rotating machines and linear piston machines the test should produce a 0s – 2s plot of the short circuit current as seen at the Generating Unit terminals.

* Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot.

Self Monitoring – Solid state switching.	N/A
It has been verified that in the event of the solid state switching device failing to disconnect the SSEG, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0,5 seconds.	N/A
<p>Note:</p> <p>Unit do not provide solid state switching relays. In case the semiconductor bridge is switched off, then the voltage on the output drops to 0. In this case the relays on the output will also open (Functional safety of the internal automatic disconnection device according to VDE 0126-1-1).</p>	

Wiring functional tests: If required by para 15.2.1.	N/A
Confirm that the relevant test schedule is attached (test to be undertaken at time of commissioning)	N/A

Logic Interface (input port)	P
Confirm that an input port is provided and can be used to shut down the module.	Yes



To whom it may concern

The purpose of this letter is to clarify that :

The models SUN2000-3KTL-M0, SUN2000-4KTL-M0, SUN2000-5KTL-M0, SUN2000-6KTL-M0, SUN2000-8KTL-M0, SUN2000-10KTL-M0 are identical in hardware and the output power derated by software. All the G98/G99 tests were performed on EUT* of SUN2000-10KTL-M0. Tests of the EUT of SUN2000-10KTL-M0 are applicable for the models SUN2000-3KTL-M0, SUN2000-4KTL-M0, SUN2000-5KTL-M0, SUN2000-6KTL-M0, SUN2000-8KTL-M0.

The models SUN2000-3KTL-M1, SUN2000-4KTL-M1, SUN2000-5KTL-M1, SUN2000-6KTL-M1, SUN2000-8KTL-M1, SUN2000-10KTL-M1 are identical in hardware to the equivalent M0 model except for the PLC chip which M0 do not have and is not relevant for the purpose of the tests. All the G98/G99 tests were performed on EUT* of SUN2000-10KTL-M0. Tests of the EUT of SUN2000-10KTL-M0 are applicable for the models SUN2000-3KTL-M1, SUN2000-4KTL-M1, SUN2000-5KTL-M1, SUN2000-6KTL-M1, SUN2000-8KTL-M1, SUN2000-10KTL-M1.

Shall there be additional questions, please feel free to contact us directly.

Sincerely,

Huawei Technology Co.,Ltd

**EUT: Equipment Under Test*