



Attestation Of Compliance

Certificate No.: 2388AP040084003
Product: Photovoltaic (PV) inverter
Brand Name:  **Solplanet**
Test Model No.: ASW75K-LT, ASW80K-LT, ASW100K-LT, ASW110K-LT
Applicant: AISWEI Technology Co., Ltd.
Room 905B, 757 Mengzi Road, Huangpu District, 200023 Shanghai,
P.R.China
Report No.: PVGB2211WDG0067-1-R3

Use in accordance with regulations:

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

Applied rules and standards:

Engineering Recommendation G99/1-9:2022

Requirements for the connection of generation equipment in parallel with public distribution networks

DIN VDE V 0124-100:2020 (5.5.2.1 Functional safety of network and system protection)

Grid integration of generator plants - Low-voltage - Test requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks


Name: Daniel Yu
Manager / New Energy
Date: 2023-10-20

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

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Type Approval and declaration of compliance with the requirements of Engineering Recommendation G99.

PGM Technology:	Photovoltaic (PV) inverter		
Manufacturer / applicant:	AISWEI Technology Co., Ltd.		
Address:	Room 905B, 757 Mengzi Road, Huangpu District, 200023 Shanghai, P.R.China		
Tel	-	Fax:	-
Email:	-	Website:	-

Rated values	ASW75K-LT	ASW80K-LT	ASW100K-LT	ASW110K-LT
Max. Input DC voltage [V]	1100V			
Input DC voltage range [V]	200-1000V			
Max. Input DC current [A]	8*32		10*32	
Output AC voltage [V]	3L/N/PE, 230V, 50Hz			
Max. Output AC current [A]	114,0	127,0	158,8	174,7
Nominal Output power [kW]	75	80	100	110
Max. Output power [kVA]	75	88	110	121

Firmware version	Main DSP Software version: V610-04001-00 Slave DSP Software version: V610-04002-00 Safety package (Flash) version: V610-12001-00
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Description of the structure of the power generation unit:

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.

Differences between Generating Units:

The models ASW75K-LT, ASW80K-LT, ASW100K-LT and ASW110K-LT are almost identical in hardware and software, expected the components are description as below table and the output power derated by software.

Item	Type	ASW75K-LT, ASW80K-LT	ASW100K-LT, ASW110K-LT
		Quantity	Quantity
PV connector	PV-FT-C2M-HSG	8*2	10*2
	PV-FT-C2F-HSG	8*2	10*2
DC switch	GHX5-32P/4P1100-32	1	2
BOOST-IGBT	MPBQ75N120BF	8	10
BOOST-DIODE	SDS120J040H2	8	10
BOOST-Inductor	TRDK3J3383-2-30-85-L9	0	1
	TRDK3J3383-2-30-85-L10	0	1

The model ASW110K-LT was tested for all applicable test items. The models ASW75K-LT, ASW80K-LT and ASW100K-LT were tested for test items as mentioned in relevant parts.

The registered capacity is: 75kW for ASW75K-LT, 88kW for ASW80K-LT, 110kW for ASW100K-LT and 121kW for ASW110K-LT.

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.

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

Extract from test report according to the Engineering Recommendation G99

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Operating Range.	
Test 1	Voltage = 85% of nominal (195,5V) Frequency = 47,0Hz 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	Voltage = 100% of nominal (230 V) Frequency = 50,0Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 6	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

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

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	2,5	184,6	2,523	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	262,6	1,004	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	274,1	0,519	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.						

Protection. Voltage tests.						
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	184,3	2,529	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	262,3	1,009	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	273,7	0,504	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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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	184,7	2,501	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	262,0	1,014	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	273,4	0,512	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.						

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	47,50	20,01	47,7Hz / 30s	No trip
U/F stage 2	47	0,5	47,00	0,513	47,2Hz / 19,5s	No trip
					46,8Hz / 0,45s	No trip
O/F stage 2	52	0,5	52,00	0,502	51,8Hz / 120s	No trip
					52,2Hz / 0,45s	No trip
Note. For Frequency Trip tests the Frequency required to trip is the setting $\pm 0,1Hz$. 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 $\pm 0,2Hz$ 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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Protection. Loss of Mains.

Inverters tested according to BS EN 62116.

Balancing load on islanded network	33% of -5% Q Test 22	66% of -5% Q Test 12	100% of -5% P Test 5	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time [ms]	72	66	116	77	86	162

Note. Trip time limit is 0,5s.

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		
60s		66,4s		
Under Voltage				
Time delay setting		Measured delay		
60s		66,4s		
Over Frequency				
Time delay setting		Measured delay		
60s		66,4s		
Under Frequency				
Time delay setting		Measured delay		
60s		66,3s		
	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

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

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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% P_n							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P _{expected} [kW]:	N/A	119,79	113,74	102,85	113,74	119,79	N/A
P _{measured} [kW]:	121,41	120,17	113,23	100,67	113,21	120,19	121,52
2. Measurement a) to g): Active power output 40% and 60% P_n							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P _{expected} [kW]:	N/A	59,29	53,24	42,35	53,24	59,29	N/A
P _{measured} [kW]:	60,80	59,37	52,56	40,06	51,23	59,28	121,38
Note. The LFSM-O is tested on the model ASW110K-LT. The Registered Capacity of the model ASW110K-LT is 121kVA.							

Output Power with falling Frequency						
Frequency setpoint [Hz]:	50,00	49,50	49,00	48,00	47,60	47,10
Frequency [Hz]:	50,00	49,50	49,00	48,00	47,60	47,10
Active power [kW]:	120,79	120,78	120,78	120,79	120,76	120,76
ΔP/P _{max} [%]:		-0,008	-0,008	0,000	-0,025	-0,025
Note. For a CHP the test point a) at 50,00Hz is taken as rated output (P _{max}) due to limited discrete operating points of the CHP's thermal process. No power reduction takes place in electronic inverter.						

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Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.						
Test: ASW75K-LT						
Phase 1						
Generating Unit rating per phase (rpp)			25,00 kW			
	At 45-55% of Registered Capacity 37,91 kW		100% of Registered Capacity 74,70 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,042	0,039	0,071	0,065	8,00	8,00
3rd	0,372	0,342	0,621	0,572	21,60	N/A
4th	0,442	0,407	0,498	0,458	4,00	4,00
5th	0,249	0,229	0,230	0,212	10,70	10,70
6th	0,177	0,162	0,297	0,273	2,67	2,67
7th	0,120	0,111	0,113	0,104	7,20	7,20
8th	0,262	0,241	0,200	0,184	2,00	2,00
9th	0,132	0,121	0,160	0,148	3,80	N/A
10th	0,163	0,150	0,122	0,112	1,60	1,60
11th	0,156	0,144	0,158	0,145	3,10	3,10
12th	0,187	0,172	0,182	0,167	1,33	1,33
13th	0,045	0,042	0,065	0,060	2,00	2,00
14th	0,292	0,269	0,229	0,211	N/A	N/A
15th	0,100	0,092	0,302	0,278	N/A	N/A
16th	0,213	0,196	0,127	0,117	N/A	N/A
17th	0,942	0,866	0,916	0,843	N/A	N/A
18th	0,131	0,121	0,230	0,211	N/A	N/A
19th	0,885	0,814	0,735	0,676	N/A	N/A
20th	0,254	0,234	0,292	0,269	N/A	N/A
21th	0,108	0,099	0,207	0,191	N/A	N/A
22th	0,269	0,248	0,255	0,235	N/A	N/A
23th	0,397	0,366	0,590	0,543	N/A	N/A
24th	0,208	0,191	0,124	0,114	N/A	N/A
25th	0,923	0,849	1,082	0,996	N/A	N/A
26th	0,067	0,062	0,140	0,129	N/A	N/A
27th	0,053	0,048	0,160	0,147	N/A	N/A
28th	0,148	0,137	0,214	0,197	N/A	N/A
29th	0,142	0,131	0,137	0,126	N/A	N/A
30th	0,262	0,241	0,284	0,262	N/A	N/A
31th	0,420	0,387	0,767	0,705	N/A	N/A
32th	0,143	0,132	0,153	0,141	N/A	N/A
33th	0,109	0,100	0,090	0,083	N/A	N/A
34th	0,045	0,041	0,107	0,099	N/A	N/A
35th	0,199	0,183	0,307	0,282	N/A	N/A
36th	0,137	0,126	0,238	0,219	N/A	N/A
37th	0,164	0,151	0,297	0,273	N/A	N/A
38th	0,139	0,128	0,131	0,121	N/A	N/A
39th	0,057	0,052	0,123	0,114	N/A	N/A
40th	0,077	0,071	0,102	0,094	N/A	N/A
THD_50[%]	--	1,888	--	2,167	23	13
PWHD [%]	--	8,002	--	9,423	23	22

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Annex to the G99/1 certificate of compliance No. 2388AP040084003

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.

Test: ASW75K-LT

Phase 2

Generating Unit rating per phase (rpp)			25,00 kW		Limit in BS EN61000-3-12	
	At 45-55% of Registered Capacity 37,91 kW	100% of Registered Capacity 74,70 kW				
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	1 phase	3 phase
2nd	0,027	0,025	0,061	0,056	8,00	8,00
3rd	0,696	0,640	0,759	0,698	21,60	N/A
4th	0,567	0,522	0,596	0,548	4,00	4,00
5th	0,239	0,219	0,211	0,194	10,70	10,70
6th	0,074	0,068	0,146	0,135	2,67	2,67
7th	0,124	0,114	0,132	0,121	7,20	7,20
8th	0,323	0,298	0,303	0,278	2,00	2,00
9th	0,092	0,084	0,068	0,062	3,80	N/A
10th	0,310	0,285	0,263	0,242	1,60	1,60
11th	0,170	0,157	0,132	0,122	3,10	3,10
12th	0,110	0,101	0,095	0,087	1,33	1,33
13th	0,051	0,047	0,067	0,062	2,00	2,00
14th	0,093	0,086	0,154	0,142	N/A	N/A
15th	0,065	0,060	0,098	0,090	N/A	N/A
16th	0,256	0,236	0,259	0,239	N/A	N/A
17th	0,963	0,886	0,977	0,899	N/A	N/A
18th	0,091	0,083	0,137	0,126	N/A	N/A
19th	0,829	0,763	0,597	0,549	N/A	N/A
20th	0,154	0,142	0,109	0,100	N/A	N/A
21th	0,082	0,076	0,134	0,123	N/A	N/A
22th	0,097	0,089	0,179	0,165	N/A	N/A
23th	0,531	0,489	0,753	0,692	N/A	N/A
24th	0,137	0,126	0,052	0,048	N/A	N/A
25th	0,986	0,908	1,060	0,976	N/A	N/A
26th	0,054	0,050	0,132	0,121	N/A	N/A
27th	0,075	0,069	0,096	0,088	N/A	N/A
28th	0,061	0,057	0,050	0,046	N/A	N/A
29th	0,059	0,054	0,221	0,204	N/A	N/A
30th	0,200	0,184	0,155	0,143	N/A	N/A
31th	0,476	0,438	0,879	0,809	N/A	N/A
32th	0,138	0,127	0,074	0,068	N/A	N/A
33th	0,088	0,081	0,162	0,149	N/A	N/A
34th	0,045	0,041	0,089	0,082	N/A	N/A
35th	0,178	0,164	0,197	0,181	N/A	N/A
36th	0,135	0,124	0,168	0,155	N/A	N/A
37th	0,169	0,156	0,388	0,357	N/A	N/A
38th	0,118	0,109	0,162	0,149	N/A	N/A
39th	0,039	0,036	0,105	0,096	N/A	N/A
40th	0,034	0,031	0,062	0,057	N/A	N/A
THD_50[%]	--	1,984	--	2,195	23	13
PWHD_[%]	--	7,986	--	9,433	23	22

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Power Quality. Harmonics.						
Test: ASW75K-LT						
Phase 3						
Generating Unit rating per phase (rpp)			25,00 kW			
	At 45-55% of Registered Capacity 37,91 kW		100% of Registered Capacity 74,70 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,049	0,045	0,070	0,065	8,00	8,00
3rd	0,306	0,281	0,217	0,199	21,60	N/A
4th	0,574	0,528	0,695	0,640	4,00	4,00
5th	0,310	0,286	0,269	0,248	10,70	10,70
6th	0,127	0,117	0,323	0,297	2,67	2,67
7th	0,151	0,139	0,143	0,132	7,20	7,20
8th	0,455	0,418	0,426	0,392	2,00	2,00
9th	0,100	0,092	0,098	0,091	3,80	N/A
10th	0,218	0,201	0,187	0,172	1,60	1,60
11th	0,194	0,179	0,163	0,150	3,10	3,10
12th	0,088	0,081	0,102	0,094	1,33	1,33
13th	0,058	0,053	0,072	0,067	2,00	2,00
14th	0,374	0,344	0,366	0,336	N/A	N/A
15th	0,081	0,075	0,220	0,202	N/A	N/A
16th	0,198	0,182	0,168	0,155	N/A	N/A
17th	0,982	0,904	0,768	0,706	N/A	N/A
18th	0,055	0,050	0,123	0,113	N/A	N/A
19th	0,892	0,820	0,769	0,707	N/A	N/A
20th	0,221	0,203	0,243	0,224	N/A	N/A
21th	0,144	0,132	0,214	0,197	N/A	N/A
22th	0,231	0,212	0,207	0,190	N/A	N/A
23th	0,509	0,468	0,526	0,484	N/A	N/A
24th	0,103	0,095	0,122	0,112	N/A	N/A
25th	1,009	0,928	1,138	1,047	N/A	N/A
26th	0,041	0,038	0,053	0,048	N/A	N/A
27th	0,044	0,041	0,235	0,216	N/A	N/A
28th	0,191	0,175	0,242	0,222	N/A	N/A
29th	0,139	0,128	0,337	0,310	N/A	N/A
30th	0,121	0,111	0,143	0,131	N/A	N/A
31th	0,508	0,467	0,932	0,857	N/A	N/A
32th	0,065	0,060	0,146	0,134	N/A	N/A
33th	0,076	0,070	0,078	0,072	N/A	N/A
34th	0,053	0,048	0,185	0,170	N/A	N/A
35th	0,151	0,139	0,123	0,113	N/A	N/A
36th	0,048	0,044	0,122	0,113	N/A	N/A
37th	0,210	0,193	0,429	0,394	N/A	N/A
38th	0,039	0,036	0,111	0,102	N/A	N/A
39th	0,048	0,044	0,138	0,127	N/A	N/A
40th	0,070	0,065	0,058	0,053	N/A	N/A
THD_50[%]	--	2,003	--	2,201	23	13
PWHD [%]	--	8,325	--	9,737	23	22

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Annex to the G99/1 certificate of compliance No. 2388AP040084003

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.

Test: ASW80K-LT

Phase 1

Generating Unit rating per phase (rpp)			29,33 kW		Limit in BS EN61000-3-12	
	At 45-55% of Registered Capacity 43,80 kW	100% of Registered Capacity 87,97 kW				
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	1 phase	3 phase
2nd	0,043	0,034	0,049	0,038	8,00	8,00
3rd	0,378	0,296	0,601	0,471	21,60	N/A
4th	0,460	0,361	0,483	0,379	4,00	4,00
5th	0,246	0,193	0,238	0,186	10,70	10,70
6th	0,194	0,152	0,262	0,206	2,67	2,67
7th	0,118	0,092	0,109	0,085	7,20	7,20
8th	0,270	0,212	0,185	0,145	2,00	2,00
9th	0,123	0,096	0,189	0,148	3,80	N/A
10th	0,159	0,125	0,150	0,118	1,60	1,60
11th	0,161	0,126	0,152	0,119	3,10	3,10
12th	0,208	0,163	0,138	0,108	1,33	1,33
13th	0,044	0,035	0,071	0,055	2,00	2,00
14th	0,312	0,245	0,158	0,124	N/A	N/A
15th	0,118	0,092	0,337	0,264	N/A	N/A
16th	0,207	0,162	0,156	0,122	N/A	N/A
17th	0,953	0,747	0,944	0,740	N/A	N/A
18th	0,146	0,115	0,175	0,138	N/A	N/A
19th	0,877	0,688	0,722	0,566	N/A	N/A
20th	0,269	0,211	0,210	0,165	N/A	N/A
21th	0,107	0,084	0,217	0,170	N/A	N/A
22th	0,291	0,228	0,225	0,176	N/A	N/A
23th	0,386	0,302	0,663	0,520	N/A	N/A
24th	0,225	0,177	0,099	0,077	N/A	N/A
25th	0,916	0,718	1,118	0,877	N/A	N/A
26th	0,066	0,052	0,139	0,109	N/A	N/A
27th	0,057	0,044	0,222	0,174	N/A	N/A
28th	0,157	0,123	0,162	0,127	N/A	N/A
29th	0,145	0,114	0,174	0,137	N/A	N/A
30th	0,288	0,226	0,218	0,171	N/A	N/A
31th	0,421	0,330	0,820	0,643	N/A	N/A
32th	0,152	0,119	0,134	0,105	N/A	N/A
33th	0,121	0,095	0,073	0,057	N/A	N/A
34th	0,047	0,037	0,085	0,067	N/A	N/A
35th	0,195	0,153	0,359	0,281	N/A	N/A
36th	0,154	0,121	0,173	0,136	N/A	N/A
37th	0,162	0,127	0,300	0,235	N/A	N/A
38th	0,138	0,108	0,131	0,102	N/A	N/A
39th	0,065	0,051	0,125	0,098	N/A	N/A
40th	0,081	0,063	0,101	0,079	N/A	N/A
THD_50[%]	--	1,627	--	1,870	23	13
PWHD_[%]	--	6,877	--	8,220	23	22

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.						
Test: ASW80K-LT						
Phase 2						
Generating Unit rating per phase (rpp)			29,33 kW			
	At 45-55% of Registered Capacity 43,80 kW		100% of Registered Capacity 87,97 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,032	0,025	0,054	0,042	8,00	8,00
3rd	0,703	0,551	0,741	0,581	21,60	N/A
4th	0,581	0,455	0,591	0,463	4,00	4,00
5th	0,235	0,184	0,214	0,168	10,70	10,70
6th	0,064	0,050	0,136	0,107	2,67	2,67
7th	0,129	0,101	0,133	0,104	7,20	7,20
8th	0,307	0,241	0,340	0,266	2,00	2,00
9th	0,082	0,064	0,079	0,062	3,80	N/A
10th	0,315	0,247	0,237	0,186	1,60	1,60
11th	0,174	0,136	0,129	0,101	3,10	3,10
12th	0,109	0,085	0,112	0,088	1,33	1,33
13th	0,047	0,037	0,068	0,053	2,00	2,00
14th	0,076	0,059	0,213	0,167	N/A	N/A
15th	0,068	0,053	0,116	0,091	N/A	N/A
16th	0,254	0,199	0,233	0,183	N/A	N/A
17th	0,996	0,781	1,002	0,786	N/A	N/A
18th	0,087	0,068	0,169	0,133	N/A	N/A
19th	0,824	0,646	0,569	0,446	N/A	N/A
20th	0,166	0,131	0,055	0,043	N/A	N/A
21th	0,078	0,061	0,163	0,128	N/A	N/A
22th	0,103	0,081	0,161	0,126	N/A	N/A
23th	0,534	0,419	0,776	0,608	N/A	N/A
24th	0,133	0,105	0,085	0,067	N/A	N/A
25th	0,984	0,772	1,053	0,826	N/A	N/A
26th	0,053	0,042	0,075	0,059	N/A	N/A
27th	0,076	0,060	0,088	0,069	N/A	N/A
28th	0,052	0,041	0,079	0,062	N/A	N/A
29th	0,063	0,050	0,232	0,182	N/A	N/A
30th	0,203	0,159	0,162	0,127	N/A	N/A
31th	0,480	0,377	0,936	0,734	N/A	N/A
32th	0,145	0,114	0,093	0,073	N/A	N/A
33th	0,094	0,074	0,161	0,126	N/A	N/A
34th	0,044	0,034	0,098	0,077	N/A	N/A
35th	0,182	0,143	0,207	0,162	N/A	N/A
36th	0,137	0,108	0,182	0,143	N/A	N/A
37th	0,172	0,135	0,416	0,327	N/A	N/A
38th	0,126	0,099	0,165	0,130	N/A	N/A
39th	0,042	0,033	0,118	0,092	N/A	N/A
40th	0,034	0,027	0,073	0,058	N/A	N/A
THD_50[%]	--	1,706	--	1,898	23	13
PWHD [%]	--	6,867	--	8,251	23	22

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.						
Test: ASW80K-LT						
Phase 3						
Generating Unit rating per phase (rpp)			29,33 kW			
	At 45-55% of Registered Capacity 43,80 kW		100% of Registered Capacity 87,97 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,049	0,038	0,077	0,060	8,00	8,00
3rd	0,311	0,244	0,192	0,151	21,60	N/A
4th	0,597	0,468	0,660	0,518	4,00	4,00
5th	0,307	0,241	0,273	0,214	10,70	10,70
6th	0,164	0,128	0,199	0,156	2,67	2,67
7th	0,149	0,117	0,138	0,108	7,20	7,20
8th	0,464	0,364	0,377	0,295	2,00	2,00
9th	0,091	0,072	0,111	0,087	3,80	N/A
10th	0,224	0,175	0,159	0,125	1,60	1,60
11th	0,200	0,157	0,162	0,127	3,10	3,10
12th	0,111	0,087	0,050	0,039	1,33	1,33
13th	0,063	0,049	0,078	0,061	2,00	2,00
14th	0,377	0,295	0,312	0,245	N/A	N/A
15th	0,107	0,084	0,235	0,184	N/A	N/A
16th	0,196	0,154	0,131	0,103	N/A	N/A
17th	0,990	0,776	0,773	0,606	N/A	N/A
18th	0,071	0,056	0,067	0,053	N/A	N/A
19th	0,884	0,693	0,780	0,612	N/A	N/A
20th	0,229	0,179	0,206	0,162	N/A	N/A
21th	0,135	0,106	0,229	0,179	N/A	N/A
22th	0,234	0,184	0,188	0,147	N/A	N/A
23th	0,511	0,401	0,531	0,417	N/A	N/A
24th	0,122	0,096	0,107	0,084	N/A	N/A
25th	1,019	0,799	1,159	0,908	N/A	N/A
26th	0,035	0,028	0,078	0,061	N/A	N/A
27th	0,042	0,033	0,285	0,224	N/A	N/A
28th	0,193	0,151	0,227	0,178	N/A	N/A
29th	0,146	0,115	0,374	0,293	N/A	N/A
30th	0,147	0,115	0,072	0,056	N/A	N/A
31th	0,521	0,409	0,980	0,768	N/A	N/A
32th	0,072	0,056	0,158	0,124	N/A	N/A
33th	0,081	0,064	0,113	0,089	N/A	N/A
34th	0,051	0,040	0,165	0,130	N/A	N/A
35th	0,146	0,115	0,156	0,122	N/A	N/A
36th	0,058	0,046	0,060	0,047	N/A	N/A
37th	0,218	0,171	0,422	0,331	N/A	N/A
38th	0,036	0,028	0,126	0,099	N/A	N/A
39th	0,054	0,043	0,180	0,141	N/A	N/A
40th	0,076	0,060	0,063	0,050	N/A	N/A
THD_50[%]	--	1,729	--	1,870	23	13
PWHD [%]	--	7,170	--	8,475	23	22



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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.

Test: ASW100K-LT

Phase 1

Generating Unit rating per phase (rpp)			36,67 kW			
	At 45-55% of Registered Capacity 54,38 kW		100% of Registered Capacity 110,09 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,048	0,030	0,058	0,037	8,00	8,00
3rd	0,556	0,349	0,777	0,487	21,60	N/A
4th	0,484	0,304	0,612	0,384	4,00	4,00
5th	0,209	0,131	0,251	0,158	10,70	10,70
6th	0,253	0,158	0,438	0,275	2,67	2,67
7th	0,112	0,071	0,072	0,045	7,20	7,20
8th	0,279	0,175	0,235	0,148	2,00	2,00
9th	0,100	0,063	0,375	0,235	3,80	N/A
10th	0,108	0,068	0,183	0,115	1,60	1,60
11th	0,182	0,114	0,133	0,084	3,10	3,10
12th	0,257	0,161	0,132	0,082	1,33	1,33
13th	0,072	0,045	0,046	0,029	2,00	2,00
14th	0,342	0,215	0,241	0,151	N/A	N/A
15th	0,194	0,121	0,414	0,260	N/A	N/A
16th	0,155	0,098	0,156	0,098	N/A	N/A
17th	0,887	0,556	0,963	0,604	N/A	N/A
18th	0,242	0,152	0,289	0,182	N/A	N/A
19th	0,744	0,466	0,634	0,398	N/A	N/A
20th	0,360	0,226	0,399	0,250	N/A	N/A
21th	0,136	0,086	0,280	0,176	N/A	N/A
22th	0,305	0,191	0,305	0,191	N/A	N/A
23th	0,460	0,289	0,791	0,496	N/A	N/A
24th	0,186	0,117	0,110	0,069	N/A	N/A
25th	0,923	0,579	1,015	0,637	N/A	N/A
26th	0,107	0,067	0,153	0,096	N/A	N/A
27th	0,048	0,030	0,276	0,173	N/A	N/A
28th	0,229	0,144	0,298	0,187	N/A	N/A
29th	0,116	0,073	0,150	0,094	N/A	N/A
30th	0,357	0,224	0,422	0,265	N/A	N/A
31th	0,523	0,328	0,753	0,472	N/A	N/A
32th	0,143	0,089	0,256	0,161	N/A	N/A
33th	0,145	0,091	0,147	0,092	N/A	N/A
34th	0,097	0,061	0,140	0,088	N/A	N/A
35th	0,176	0,110	0,386	0,242	N/A	N/A
36th	0,229	0,143	0,345	0,216	N/A	N/A
37th	0,215	0,135	0,243	0,152	N/A	N/A
38th	0,108	0,068	0,160	0,101	N/A	N/A
39th	0,103	0,065	0,187	0,117	N/A	N/A
40th	0,078	0,049	0,125	0,079	N/A	N/A
THD_50[%]	--	1,349	--	1,638	23	13
PWHD [%]	--	5,664	--	6,951	23	22

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.

Test: ASW100K-LT

Phase 2						
Generating Unit rating per phase (rpp)			36,67 kW			
	At 45-55% of Registered Capacity 54,38 kW		100% of Registered Capacity 110,09 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,046	0,029	0,089	0,056	8,00	8,00
3rd	0,781	0,490	0,828	0,519	21,60	N/A
4th	0,586	0,368	0,617	0,387	4,00	4,00
5th	0,240	0,150	0,202	0,127	10,70	10,70
6th	0,167	0,105	0,248	0,155	2,67	2,67
7th	0,138	0,086	0,110	0,069	7,20	7,20
8th	0,257	0,161	0,285	0,179	2,00	2,00
9th	0,057	0,036	0,206	0,129	3,80	N/A
10th	0,309	0,194	0,265	0,166	1,60	1,60
11th	0,170	0,106	0,110	0,069	3,10	3,10
12th	0,132	0,083	0,080	0,050	1,33	1,33
13th	0,059	0,037	0,051	0,032	2,00	2,00
14th	0,073	0,046	0,206	0,129	N/A	N/A
15th	0,083	0,052	0,102	0,064	N/A	N/A
16th	0,262	0,165	0,324	0,203	N/A	N/A
17th	0,955	0,599	1,111	0,697	N/A	N/A
18th	0,080	0,050	0,115	0,072	N/A	N/A
19th	0,678	0,425	0,580	0,364	N/A	N/A
20th	0,225	0,141	0,151	0,095	N/A	N/A
21th	0,107	0,067	0,139	0,087	N/A	N/A
22th	0,124	0,078	0,258	0,162	N/A	N/A
23th	0,647	0,406	0,965	0,605	N/A	N/A
24th	0,066	0,042	0,073	0,046	N/A	N/A
25th	0,987	0,619	0,969	0,608	N/A	N/A
26th	0,114	0,071	0,195	0,123	N/A	N/A
27th	0,101	0,063	0,106	0,067	N/A	N/A
28th	0,038	0,024	0,067	0,042	N/A	N/A
29th	0,106	0,066	0,436	0,274	N/A	N/A
30th	0,189	0,118	0,222	0,139	N/A	N/A
31th	0,598	0,375	0,980	0,615	N/A	N/A
32th	0,118	0,074	0,091	0,057	N/A	N/A
33th	0,115	0,072	0,262	0,164	N/A	N/A
34th	0,040	0,025	0,124	0,078	N/A	N/A
35th	0,162	0,101	0,209	0,131	N/A	N/A
36th	0,153	0,096	0,205	0,128	N/A	N/A
37th	0,243	0,153	0,411	0,258	N/A	N/A
38th	0,149	0,093	0,179	0,112	N/A	N/A
39th	0,066	0,042	0,171	0,107	N/A	N/A
40th	0,044	0,028	0,074	0,047	N/A	N/A
THD_50[%]	--	1,387	--	1,651	23	13
PWHD [%]	--	5,623	--	7,166	23	22

Power Quality. Harmonics.



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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Test: ASW100K-LT

Phase 3

Generating Unit rating per phase (rpp)			36,67 kW			
	At 45-55% of Registered Capacity 54,38 kW		100% of Registered Capacity 110,09 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,049	0,031	0,092	0,058	8,00	8,00
3rd	0,279	0,175	0,089	0,056	21,60	N/A
4th	0,659	0,414	0,845	0,530	4,00	4,00
5th	0,281	0,176	0,257	0,161	10,70	10,70
6th	0,316	0,198	0,543	0,341	2,67	2,67
7th	0,131	0,082	0,111	0,070	7,20	7,20
8th	0,458	0,287	0,512	0,321	2,00	2,00
9th	0,082	0,051	0,182	0,114	3,80	N/A
10th	0,237	0,149	0,196	0,123	1,60	1,60
11th	0,205	0,128	0,152	0,095	3,10	3,10
12th	0,145	0,091	0,159	0,100	1,33	1,33
13th	0,088	0,055	0,064	0,040	2,00	2,00
14th	0,401	0,251	0,440	0,276	N/A	N/A
15th	0,140	0,088	0,312	0,196	N/A	N/A
16th	0,184	0,115	0,189	0,119	N/A	N/A
17th	0,875	0,549	0,763	0,478	N/A	N/A
18th	0,172	0,108	0,182	0,114	N/A	N/A
19th	0,741	0,465	0,812	0,509	N/A	N/A
20th	0,300	0,188	0,348	0,218	N/A	N/A
21th	0,164	0,103	0,262	0,164	N/A	N/A
22th	0,221	0,139	0,322	0,202	N/A	N/A
23th	0,544	0,341	0,586	0,367	N/A	N/A
24th	0,133	0,084	0,161	0,101	N/A	N/A
25th	1,029	0,645	1,056	0,663	N/A	N/A
26th	0,074	0,046	0,119	0,075	N/A	N/A
27th	0,064	0,040	0,382	0,240	N/A	N/A
28th	0,237	0,149	0,273	0,171	N/A	N/A
29th	0,201	0,126	0,516	0,324	N/A	N/A
30th	0,214	0,134	0,193	0,121	N/A	N/A
31th	0,667	0,418	0,992	0,622	N/A	N/A
32th	0,091	0,057	0,223	0,140	N/A	N/A
33th	0,084	0,053	0,124	0,077	N/A	N/A
34th	0,112	0,070	0,247	0,155	N/A	N/A
35th	0,111	0,070	0,212	0,133	N/A	N/A
36th	0,136	0,086	0,225	0,141	N/A	N/A
37th	0,303	0,190	0,470	0,295	N/A	N/A
38th	0,049	0,031	0,134	0,084	N/A	N/A
39th	0,078	0,049	0,178	0,112	N/A	N/A
40th	0,063	0,040	0,084	0,053	N/A	N/A
THD_50[%]	--	1,404	--	1,668	23	13
PWHD [%]	--	5,892	--	7,261	23	22

BUREAU
VERITAS

Annex to the G99/1 certificate of compliance No. 2388AP040084003

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.

Test: ASW110K-LT

Phase 1

Generating Unit rating per phase (rpp)			40,33 kW		Limit in BS EN61000-3-12	
	At 45-55% of Registered Capacity 60,26 kW		100% of Registered Capacity 120,49 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	1 phase	3 phase
2nd	0,051	0,029	0,069	0,040	8,00	8,00
3rd	0,549	0,313	1,150	0,656	21,60	N/A
4th	0,496	0,283	0,756	0,431	4,00	4,00
5th	0,225	0,128	0,354	0,202	10,70	10,70
6th	0,233	0,133	0,611	0,348	2,67	2,67
7th	0,115	0,066	0,046	0,026	7,20	7,20
8th	0,260	0,148	0,449	0,256	2,00	2,00
9th	0,099	0,056	0,512	0,292	3,80	N/A
10th	0,130	0,074	0,305	0,174	1,60	1,60
11th	0,172	0,098	0,187	0,107	3,10	3,10
12th	0,202	0,115	0,433	0,247	1,33	1,33
13th	0,076	0,043	0,064	0,037	2,00	2,00
14th	0,278	0,159	0,570	0,325	N/A	N/A
15th	0,215	0,122	0,425	0,242	N/A	N/A
16th	0,153	0,087	0,670	0,382	N/A	N/A
17th	0,908	0,518	0,535	0,305	N/A	N/A
18th	0,209	0,119	0,662	0,377	N/A	N/A
19th	0,772	0,440	0,881	0,502	N/A	N/A
20th	0,304	0,173	0,671	0,383	N/A	N/A
21th	0,157	0,090	0,396	0,226	N/A	N/A
22th	0,273	0,156	0,063	0,036	N/A	N/A
23th	0,533	0,304	0,404	0,230	N/A	N/A
24th	0,151	0,086	0,470	0,268	N/A	N/A
25th	0,958	0,546	0,497	0,284	N/A	N/A
26th	0,107	0,061	0,532	0,303	N/A	N/A
27th	0,057	0,033	0,384	0,219	N/A	N/A
28th	0,208	0,118	0,230	0,131	N/A	N/A
29th	0,132	0,075	0,391	0,223	N/A	N/A
30th	0,315	0,180	0,256	0,146	N/A	N/A
31th	0,571	0,325	0,264	0,151	N/A	N/A
32th	0,143	0,081	0,069	0,039	N/A	N/A
33th	0,111	0,063	0,141	0,081	N/A	N/A
34th	0,096	0,055	0,287	0,164	N/A	N/A
35th	0,221	0,126	0,264	0,150	N/A	N/A
36th	0,204	0,117	0,232	0,132	N/A	N/A
37th	0,221	0,126	0,220	0,125	N/A	N/A
38th	0,120	0,068	0,093	0,053	N/A	N/A
39th	0,080	0,045	0,194	0,111	N/A	N/A
40th	0,078	0,045	0,158	0,090	N/A	N/A
THD_50[%]	--	1,238	--	1,639	23	13
PWHD_[%]	--	5,253	--	5,801	23	22

Power Quality. Harmonics.

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Test: ASW110K-LT

Phase 2

Generating Unit rating per phase (rpp)			40,33 kW			
	At 45-55% of Registered Capacity 60,26 kW		100% of Registered Capacity 120,49 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,048	0,027	0,084	0,048	8,00	8,00
3rd	0,775	0,442	1,074	0,612	21,60	N/A
4th	0,574	0,327	0,998	0,569	4,00	4,00
5th	0,236	0,134	0,242	0,138	10,70	10,70
6th	0,142	0,081	0,193	0,110	2,67	2,67
7th	0,136	0,077	0,067	0,038	7,20	7,20
8th	0,270	0,154	0,300	0,171	2,00	2,00
9th	0,069	0,039	0,182	0,104	3,80	N/A
10th	0,289	0,165	0,502	0,286	1,60	1,60
11th	0,167	0,095	0,183	0,104	3,10	3,10
12th	0,129	0,073	0,113	0,064	1,33	1,33
13th	0,065	0,037	0,051	0,029	2,00	2,00
14th	0,088	0,050	0,227	0,129	N/A	N/A
15th	0,079	0,045	0,107	0,061	N/A	N/A
16th	0,248	0,141	0,283	0,161	N/A	N/A
17th	0,958	0,547	1,036	0,591	N/A	N/A
18th	0,102	0,058	0,384	0,219	N/A	N/A
19th	0,665	0,379	1,378	0,786	N/A	N/A
20th	0,145	0,083	0,074	0,042	N/A	N/A
21th	0,123	0,070	0,313	0,178	N/A	N/A
22th	0,124	0,071	0,309	0,176	N/A	N/A
23th	0,691	0,394	0,518	0,295	N/A	N/A
24th	0,053	0,030	0,137	0,078	N/A	N/A
25th	0,988	0,563	0,288	0,164	N/A	N/A
26th	0,100	0,057	0,407	0,232	N/A	N/A
27th	0,088	0,050	0,313	0,179	N/A	N/A
28th	0,047	0,027	0,144	0,082	N/A	N/A
29th	0,134	0,076	0,475	0,271	N/A	N/A
30th	0,189	0,108	0,367	0,209	N/A	N/A
31th	0,650	0,370	0,301	0,172	N/A	N/A
32th	0,105	0,060	0,274	0,156	N/A	N/A
33th	0,119	0,068	0,332	0,189	N/A	N/A
34th	0,052	0,030	0,055	0,032	N/A	N/A
35th	0,162	0,093	0,056	0,032	N/A	N/A
36th	0,159	0,091	0,147	0,084	N/A	N/A
37th	0,260	0,148	0,305	0,174	N/A	N/A
38th	0,142	0,081	0,191	0,109	N/A	N/A
39th	0,066	0,038	0,231	0,132	N/A	N/A
40th	0,046	0,026	0,177	0,101	N/A	N/A
THD_50[%]	--	1,268	--	1,608	23	13
PWHD [%]	--	5,207	--	5,931	23	22

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Harmonics.						
Test: ASW110K-LT						
Phase 3						
Generating Unit rating per phase (rpp)			40,33 kW			
	At 45-55% of Registered Capacity 60,26 kW		100% of Registered Capacity 120,49 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (%) in [A]	Measured Value (MV) in [A]	Measured Value (%) in [A]	Limit in BS EN61000-3-12	
					1 phase	3 phase
2nd	0,053	0,030	0,110	0,063	8,00	8,00
3rd	0,281	0,160	0,568	0,324	21,60	N/A
4th	0,640	0,365	1,006	0,573	4,00	4,00
5th	0,288	0,164	0,316	0,180	10,70	10,70
6th	0,253	0,144	0,631	0,360	2,67	2,67
7th	0,130	0,074	0,025	0,014	7,20	7,20
8th	0,427	0,244	0,724	0,413	2,00	2,00
9th	0,088	0,050	0,394	0,225	3,80	N/A
10th	0,202	0,115	0,253	0,144	1,60	1,60
11th	0,196	0,112	0,196	0,112	3,10	3,10
12th	0,090	0,051	0,448	0,255	1,33	1,33
13th	0,091	0,052	0,046	0,026	2,00	2,00
14th	0,357	0,204	0,522	0,298	N/A	N/A
15th	0,161	0,092	0,511	0,291	N/A	N/A
16th	0,166	0,095	0,543	0,310	N/A	N/A
17th	0,849	0,484	0,833	0,475	N/A	N/A
18th	0,121	0,069	0,440	0,251	N/A	N/A
19th	0,773	0,441	1,382	0,788	N/A	N/A
20th	0,252	0,144	0,618	0,352	N/A	N/A
21th	0,180	0,103	0,127	0,072	N/A	N/A
22th	0,210	0,119	0,339	0,193	N/A	N/A
23th	0,565	0,322	0,132	0,075	N/A	N/A
24th	0,114	0,065	0,436	0,249	N/A	N/A
25th	1,041	0,594	0,696	0,397	N/A	N/A
26th	0,045	0,026	0,183	0,105	N/A	N/A
27th	0,100	0,057	0,433	0,247	N/A	N/A
28th	0,235	0,134	0,347	0,198	N/A	N/A
29th	0,243	0,139	0,312	0,178	N/A	N/A
30th	0,160	0,091	0,162	0,092	N/A	N/A
31th	0,714	0,407	0,084	0,048	N/A	N/A
32th	0,111	0,063	0,278	0,158	N/A	N/A
33th	0,080	0,045	0,244	0,139	N/A	N/A
34th	0,124	0,070	0,279	0,159	N/A	N/A
35th	0,114	0,065	0,277	0,158	N/A	N/A
36th	0,108	0,062	0,166	0,095	N/A	N/A
37th	0,304	0,174	0,101	0,058	N/A	N/A
38th	0,050	0,029	0,121	0,069	N/A	N/A
39th	0,088	0,050	0,158	0,090	N/A	N/A
40th	0,056	0,032	0,132	0,075	N/A	N/A
THD_50[%]	--	1,266	--	1,700	23	13
PWHD [%]	--	5,418	--	6,197	23	22



BUREAU
VERITAS

Annex to the G99/1 certificate of compliance No. 2388AP040084003

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Power factor.				
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%	0,999	0,999	0,999	
50%	0,999	0,999	0,999	
75%	0,999	0,999	0,999	
100%	0,999	0,999	0,999	
Limit	>0,95	>0,95	>0,95	

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. Voltage fluctuation and Flicker.

		Starting			Stopping			Running	
		dmax	dc	d(t)	dmax	dc	d(t)	Pst	Plt 2 hours
Measured values at test impedance	Phase 1	0,108	0,028	0,00	0,078	0,027	0,00	0,342	0,310
	Phase 2	0,024	0,034	0,00	0,086	0,019	0,00	0,257	0,254
	Phase 3	0,209	0,051	0,00	0,156	0,054	0,00	0,252	0,251
Normalised to standard impedance		0,209	0,051	0,00	0,156	0,054	0,00	0,342	0,310
Normalised to required maximum impedance		0,209	0,051	0,00	0,156	0,054	0,00	0,342	0,310
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	0,150	Ω		
		Z	0,283	Ω					
Standard impedance		R	0,240	Ω	XI	0,150	Ω		
		Z	0,283	Ω					
Maximum impedance		R	0,240	Ω	XI	0,150	Ω		
		Zmax	0,283	Ω					

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. DC injection.			
Test: ASW75K-LT			
Phase 1			
Test level power [%]	10	55	100
Recorded value [mA]	22,7	112,4	245,0
Recorded value [%]	0,021	0,103	0,225
Limit [%]	0,25	0,25	0,25
Phase 2			
Test level power [%]	10	55	100
Recorded value [mA]	20,7	79,0	190,4
Recorded value [%]	0,019	0,073	0,175
Limit [%]	0,25	0,25	0,25
Phase 3			
Test level power [%]	10	55	100
Recorded value [mA]	25,4	99,0	197,5
Recorded value [%]	0,023	0,091	0,182
Limit [%]	0,25	0,25	0,25
Note. Informative measurement of DC-injection of each phase of the inverter and a limit of 0,25% per phase of the rated current per phase as pass criteria.			
Sum of all Phases Tests are carried out at three defined power levels $\pm 5\%$. At 230 V a 75 kW three phase Inverter has a current output of 326,09 A so DC limit is 815 mA. These tests is undertaken in accordance with Annex A.7.1.4.4. The % DC injection ("as % of rated AC current" below) is calculated as follows: % DC injection = Recorded DC value in Amps / Base current where the base current is the Registered Capacity (W) / V phase. The % DC injection should not be greater than 0,25%.			
Sum of all Phases			
Test level power [%]	10	55	100
Recorded value [mA]	68,8	290,4	632,9
Recorded value [%]	0,021	0,089	0,194
Limit [%]	0,25	0,25	0,25

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Power Quality. DC injection.
Test: ASW110K-LT
Phase 1

Test level power [%]	10	55	100
Recorded value [mA]	194,8	279,3	222,8
Recorded value [%]	0,111	0,159	0,127
Limit [%]	0,25	0,25	0,25

Phase 2

Test level power [%]	10	55	100
Recorded value [mA]	148,1	201,7	252,6
Recorded value [%]	0,084	0,115	0,144
Limit [%]	0,25	0,25	0,25

Phase 3

Test level power [%]	10	55	100
Recorded value [mA]	308,4	342,7	316,4
Recorded value [%]	0,176	0,195	0,180
Limit [%]	0,25	0,25	0,25

Note. Informative measurement of DC-injection of each phase of the inverter and a limit of 0,25% per phase of the rated current per phase as pass criteria.

Sum of all Phases

Tests are carried out at three defined power levels $\pm 5\%$. At 230 V a 121 kW three phase Inverter has a current output of 526,09A so DC limit is 1315 mA. These tests is undertaken in accordance with Annex A.7.1.4.4.

The % DC injection ("as % of rated AC current" below) is calculated as follows:

% DC injection = Recorded DC value in Amps / Base current where the base current is the Registered Capacity (W) / V phase.
The % DC injection should not be greater than 0,25%.

Sum of all Phases

Test level power [%]	10	55	100
Recorded value [mA]	651,3	823,7	791,8
Recorded value [%]	0,124	0,157	0,151
Limit [%]	0,25	0,25	0,25

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Fault level Contribution.					
For a directly coupled SSEG			For a Inverter SSEG		
Phase 1					
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I _p	N/A	20ms	6,60	-2,10
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
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
Phase 2					
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I _p	N/A	20ms	4,84	0,57
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
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
Phase 3					
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [A]
Peak Short Circuit current	I _p	N/A	20ms	10,07	0,57
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
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]	0,001	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.					

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

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 Power Park Module, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0,5 seconds.	N/A
Note. 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 0124-100).	

Cyber security	P
Confirm that the Manufacturer or Installer of the Micro-generator has provided a statement describing how the Micro-generator has been designed to comply with cyber security requirements, as detailed in 9.7.	Yes
Note. Different levels of access, all are password protected, only certain parameters can be changed on maintenance level. Manufacturer information provided, see test report.	

Wiring functional tests if required by para. 15.2.1	N/A
Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning).	N/A
Note. Type test of components wired correct together on site is part of the commissioning test. The inverter was tested in a test laboratory. The correct wiring functional test in the field has to be done by the responsible person for the installation of the plant.	

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

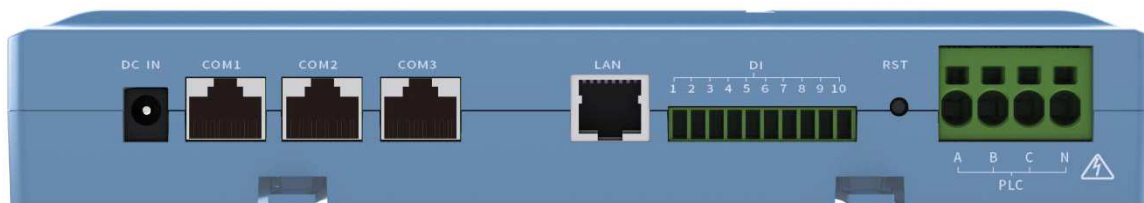
Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3

Logic Interface (input port) Required by paragraph 11.1.3.1	P
Confirm that an input port is provided and can be used to reduce the Active Power output to zero	Yes
Note. Manufacturer information provided. A Modbus signal can be used to cease Active Power output within 5 s. See test report.	
Provide high level description of logic interface, e.g. details in 11.1.3.1 such as AC or DC signal	Yes
Logical interfaces are implemented by external devices (model: Ai-Logger 1000). COM1 or 2 or 3 of the external device is connected to COM1 or 2 of the power generation module (Figure 4). Pins 1 and 10 of the DI port of the external device are connected to the switch or contactor. When the switch is closed, the generating module can work normally. When the switch is opened, the logical port has a DC voltage of 5V, and the power module reduces the active power to zero within 5 seconds.	



Ai-Logger 1000



Ai-Logger 1000 communication interface

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

Extract from test report according to the Engineering Recommendation G99

Nr. PVGB2211WDG0067-1-R3



Figure 4

Additional comments