Certificate of compliance

Applicant:	**AISWEI Technology(Shanghai) Co., Ltd.** Room 905B, 757 Mengzi Road, Huangpu District, 200023 Shanghai, **P.R.China**
Product:	**Photovoltaic (PV) inverter**
Model:	**ASW12K-LT-G2 Pro** **ASW13K-LT-G2 Pro** **ASW15K-LT-G2 Pro** **ASW17K-LT-G2 Pro** **ASW20K-LT-G2 Pro**

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

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number:	**PVGB2203WDG0348-2**	**Certification program:**	**NSOP-0032-DEU-ZE-V01**
Certificate number:	**U22-0694_1**	**Date of issue:**	**2022-12-06**

Certification body

Alf Assenkamp

Certification body Bureau Veritas Consumer Products Services Germany GmbH accredited according to DIN EN ISO/IEC 17065

Testing laboratory accredited according to DIN EN ISO/IEC 17025

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

Extract from test report according to the Engineering Recommendation G99 **Nr. PVGB2203WDG0348-2**

Type Approval and declaration of compliance with the requirements of Engineering Recommendation G99.				
PGM Technology:	Photovoltaic (PV) inverter			
Manufacturer / applicant:	AISWEI Technology(Shanghai) Co., Ltd.			
Address:	Room 905B, 757 Mengzi Road, Huangpu District, 200023 Shanghai, P.R.China			
Tel	-	**Fax:**	-	
Email:	-	**Website:**	-	
Rated values	ASW12K-LT-G2 Pro	ASW13K-LT-G2 Pro	ASW15K-LT-G2 Pro	ASW17K-LT-G2 Pro
Max. input DC voltage [V]	1100			
Input DC voltage range [V]	150-1100			
Max. Input DC current [A]	32,0 / 20,0			32,0 / 32,0
Output AC voltage [V]	3L/N/PE, 230/400V, 50Hz			
Max.Output AC current [A]	19,1	20,7	24,0	27,1
Nominal Output power [kW]	12,0	13,0	15,0	17,0
Max. Output power [kVA]	12,0	13,0	15,0	17,0
	ASW20K-LT-G2 Pro	-	-	-
Max. input DC voltage [V]	1100	-	-	-
Input DC voltage range [V]	150-1100	-	-	-
Max. Input DC current [A]	32,0 / 32,0	-	-	-
Output AC voltage [V]	3L/N/PE, 230/400V, 50Hz	-	-	-
Max.Output AC current [A]	31,9	-	-	-
Nominal Output power [kW]	20,0	-	-	-
Max. Output power [kVA]	20,0	-	-	-
Firmware version	Main DSP Software version: V610-03043-05 Slave DSP Software version: V610-60015-00 Safety package (Flash) version: V610-11009-02			

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 ASW12K-LT-G2 Pro, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro, ASW17K-LT-G2 Pro and ASW20K-LT-G2 Pro are identical in hardware and software, and the output power derated by software.

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 **Nr. PVGB2203WDG0348-2**

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	Voltage = 100% of nominal (230 V) Frequency = 50,0 Hz 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. PVGB2203WDG0348-2**

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	183,8	2,52	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	262,9	1,010	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	274,6	0,510	269,7V 0,95s	No trip
					277,7V 0,45s	No trip
Note. For Voltage tests the Voltage required to trip is the setting ±3,45V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ±4V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.						

Protection. 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	183,6	2,52	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	262,8	1,018	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	274,4	0,598	269,7V 0,95s	No trip
					277,7V 0,45s	No trip

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

Extract from test report according to the Engineering Recommendation G99 — **Nr. PVGB2203WDG0348-2**

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	183,8	2,51	188V / 5,0s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	264,1	1,002	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	274,5	0,514	269,7V 0,95s	No trip
					277,7V 0,45s	No trip

Note. For Voltage tests the Voltage required to trip is the setting ±3,45V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ±4V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Protection. 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	20,05	47,7Hz / 30s	No trip
U/F stage 2	47	0,5	46,99	0,574	47,2Hz / 19,5s	No trip
					46,8Hz / 0,45s	No trip
O/F stage 2	52	0,5	52,01	0,517	51,8Hz / 120s	No trip
					52,2Hz / 0,45s	No trip

Note. For Frequency Trip tests the Frequency required to trip is the setting ±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 ±0,2Hz and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

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

Extract from test report according to the Engineering Recommendation G99 **Nr. PVGB2203WDG0348-2**

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]	181	215	208	190	193	227
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 (258,2 V)	
Time delay setting	**Measured delay**
20s	34,4s
Under Voltage (188,0 V)	
Time delay setting	**Measured delay**
20s	34,8s
Over Frequency (51,9 Hz)	
Time delay setting	**Measured delay**
20s	32,0s
Under Frequency (47,6 Hz)	
Time delay setting	**Measured delay**
20s	35,6s

	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

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

Extract from test report according to the Engineering Recommendation G99 — **Nr. PVGB2203WDG0348-2**

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	50,7	51,15	50,7	50,45	50,00
$P_{expected}$ [kW]:	N/A	19,80	18,80	17,00	18,80	19,80	N/A
$P_{measured}$ [kW]:	20,14	19,87	18,85	17,03	18,85	19,88	20,14
2. Measurement a) to g): Active power output 40% and 60% Pn							
Frequency [Hz]:	50,00	50,45	50,7	51,15	50,7	50,45	50,00
$P_{expected}$ [kW]:	N/A	9,80	8,80	7,00	8,80	9,80	N/A
$P_{measured}$ [kW]:	10,00	9,82	8,83	7,05	8,83	9,81	20,10

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]:	20,144	20,143	20,145	20,143	20,142	20,129
ΔP/Pmax [%]:		-0,005	0,005	-0,005	-0,01	-0,075

Note.

For a CHP the test point a) at 50,00Hz is taken as Registered capacity (P_{max}) due to limited discrete operating points of the CHP's thermal process.

Electronic inverter no power reduction take place.

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

Extract from test report according to the Engineering Recommendation G99 — **Nr. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 1						
Generating Unit rating per phase (rpp)			ASW12K-LT-G2 Pro			
	At 45-55% of rated output 5,981 kW		100% of rated output 12,045 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	8,635	--	17,392	--	-	-
2nd	0,008	0,048	0,009	0,051	8	8
3rd	0,006	0,032	0,006	0,035	21,6	N/A
4th	0,007	0,040	0,009	0,051	4	4
5th	0,062	0,357	0,055	0,316	10,7	10,7
6th	0,002	0,011	0,002	0,013	2,67	2,67
7th	0,028	0,161	0,021	0,123	7,2	7,2
8th	0,004	0,024	0,003	0,020	2	2
9th	0,005	0,027	0,003	0,018	3,8	N/A
10th	0,003	0,017	0,002	0,014	1,6	1,6
11th	0,011	0,066	0,017	0,096	3,1	3,1
12th	0,001	0,008	0,002	0,010	1,33	1,33
13th	0,013	0,076	0,057	0,326	2	2
14th	0,003	0,020	0,002	0,014	N/A	N/A
15th	0,004	0,021	0,003	0,020	N/A	N/A
16th	0,004	0,020	0,002	0,013	N/A	N/A
17th	0,009	0,052	0,043	0,249	N/A	N/A
18th	0,001	0,006	0,001	0,008	N/A	N/A
19th	0,011	0,064	0,032	0,185	N/A	N/A
20th	0,003	0,015	0,002	0,014	N/A	N/A
21th	0,004	0,020	0,003	0,015	N/A	N/A
22th	0,003	0,016	0,002	0,011	N/A	N/A
23th	0,015	0,088	0,024	0,140	N/A	N/A
24th	0,001	0,007	0,001	0,007	N/A	N/A
25th	0,008	0,048	0,017	0,095	N/A	N/A
26th	0,003	0,016	0,003	0,016	N/A	N/A
27th	0,003	0,016	0,003	0,016	N/A	N/A
28th	0,002	0,013	0,002	0,013	N/A	N/A
29th	0,008	0,046	0,013	0,072	N/A	N/A
30th	0,001	0,006	0,001	0,006	N/A	N/A
31th	0,003	0,019	0,008	0,044	N/A	N/A
32th	0,003	0,017	0,003	0,016	N/A	N/A
33th	0,002	0,012	0,002	0,013	N/A	N/A
34th	0,003	0,016	0,002	0,014	N/A	N/A
35th	0,009	0,049	0,007	0,041	N/A	N/A
36th	0,001	0,005	0,001	0,006	N/A	N/A
37th	0,008	0,044	0,003	0,020	N/A	N/A
38th	0,003	0,017	0,003	0,015	N/A	N/A
39th	0,001	0,008	0,002	0,013	N/A	N/A
40th	0,003	0,015	0,002	0,014	N/A	N/A
THD_{40} [%]	--	0,445	--	0,613	23	13
PWHD [%]	--	0,831	--	1,660	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 2

Generating Unit rating per phase (rpp)			ASW12K-LT-G2 Pro			
	At 45-55% of rated output 5,981 kW		100% of rated output 12,045 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	8,657	--	17,417	--	-	-
2nd	0,026	0,147	0,031	0,177	8	8
3rd	0,008	0,048	0,008	0,044	21,6	N/A
4th	0,009	0,054	0,009	0,052	4	4
5th	0,061	0,351	0,054	0,308	10,7	10,7
6th	0,002	0,009	0,002	0,012	2,67	2,67
7th	0,028	0,163	0,023	0,132	7,2	7,2
8th	0,003	0,016	0,002	0,014	2	2
9th	0,009	0,053	0,005	0,031	3,8	N/A
10th	0,004	0,021	0,003	0,019	1,6	1,6
11th	0,012	0,066	0,017	0,098	3,1	3,1
12th	0,002	0,010	0,002	0,009	1,33	1,33
13th	0,007	0,043	0,058	0,333	2	2
14th	0,003	0,020	0,002	0,009	N/A	N/A
15th	0,006	0,036	0,005	0,027	N/A	N/A
16th	0,003	0,018	0,003	0,017	N/A	N/A
17th	0,012	0,072	0,041	0,234	N/A	N/A
18th	0,001	0,007	0,001	0,008	N/A	N/A
19th	0,016	0,090	0,032	0,183	N/A	N/A
20th	0,003	0,018	0,002	0,010	N/A	N/A
21th	0,005	0,030	0,004	0,024	N/A	N/A
22th	0,003	0,015	0,003	0,015	N/A	N/A
23th	0,014	0,079	0,021	0,121	N/A	N/A
24th	0,001	0,007	0,001	0,007	N/A	N/A
25th	0,011	0,061	0,016	0,089	N/A	N/A
26th	0,002	0,012	0,002	0,012	N/A	N/A
27th	0,005	0,031	0,005	0,026	N/A	N/A
28th	0,002	0,014	0,003	0,016	N/A	N/A
29th	0,006	0,036	0,009	0,054	N/A	N/A
30th	0,001	0,007	0,001	0,007	N/A	N/A
31th	0,006	0,036	0,007	0,040	N/A	N/A
32th	0,002	0,012	0,002	0,012	N/A	N/A
33th	0,004	0,020	0,004	0,026	N/A	N/A
34th	0,003	0,017	0,003	0,016	N/A	N/A
35th	0,008	0,047	0,006	0,034	N/A	N/A
36th	0,001	0,005	0,001	0,006	N/A	N/A
37th	0,008	0,046	0,006	0,033	N/A	N/A
38th	0,003	0,016	0,002	0,014	N/A	N/A
39th	0,001	0,007	0,004	0,021	N/A	N/A
40th	0,003	0,015	0,002	0,014	N/A	N/A
THD_{40} [%]	--	0,472	--	0,627	23	13
PWHD [%]	--	0,926	--	1,566	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 3

Generating Unit rating per phase (rpp)			ASW12K-LT-G2 Pro			
	At 45-55% of rated output 5,981 kW		100% of rated output 12,045 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	8,719	--	17,526	--	-	-
2nd	0,020	0,117	0,027	0,154	8	8
3rd	0,006	0,032	0,004	0,020	21,6	N/A
4th	0,009	0,055	0,009	0,050	4	4
5th	0,060	0,346	0,053	0,303	10,7	10,7
6th	0,002	0,013	0,003	0,015	2,67	2,67
7th	0,028	0,159	0,022	0,125	7,2	7,2
8th	0,005	0,029	0,003	0,018	2	2
9th	0,005	0,028	0,002	0,013	3,8	N/A
10th	0,004	0,024	0,003	0,016	1,6	1,6
11th	0,012	0,072	0,017	0,095	3,1	3,1
12th	0,002	0,011	0,002	0,012	1,33	1,33
13th	0,013	0,074	0,062	0,355	2	2
14th	0,004	0,025	0,002	0,013	N/A	N/A
15th	0,003	0,017	0,002	0,014	N/A	N/A
16th	0,003	0,018	0,002	0,013	N/A	N/A
17th	0,008	0,046	0,040	0,229	N/A	N/A
18th	0,001	0,006	0,002	0,009	N/A	N/A
19th	0,015	0,085	0,035	0,203	N/A	N/A
20th	0,002	0,014	0,002	0,014	N/A	N/A
21th	0,003	0,014	0,001	0,008	N/A	N/A
22th	0,002	0,013	0,003	0,015	N/A	N/A
23th	0,011	0,062	0,021	0,123	N/A	N/A
24th	0,001	0,008	0,002	0,009	N/A	N/A
25th	0,013	0,076	0,020	0,114	N/A	N/A
26th	0,002	0,010	0,003	0,016	N/A	N/A
27th	0,002	0,012	0,002	0,010	N/A	N/A
28th	0,002	0,013	0,003	0,015	N/A	N/A
29th	0,004	0,023	0,010	0,058	N/A	N/A
30th	0,001	0,007	0,001	0,008	N/A	N/A
31th	0,007	0,039	0,010	0,059	N/A	N/A
32th	0,003	0,016	0,003	0,016	N/A	N/A
33th	0,001	0,008	0,001	0,008	N/A	N/A
34th	0,003	0,017	0,003	0,018	N/A	N/A
35th	0,006	0,037	0,004	0,023	N/A	N/A
36th	0,001	0,006	0,001	0,007	N/A	N/A
37th	0,009	0,053	0,007	0,038	N/A	N/A
38th	0,003	0,015	0,003	0,016	N/A	N/A
39th	0,001	0,007	0,001	0,008	N/A	N/A
40th	0,003	0,016	0,003	0,017	N/A	N/A
THD_{40} [%]	--	0,452	--	0,635	23	13
PWHD [%]	--	0,840	--	1,647	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 1

Generating Unit rating per phase (rpp)			ASW13K-LT-G2 Pro			
	At 45-55% of rated output 6,497 kW		100% of rated output 13,050 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	9,379	--	18,841	--	-	-
2nd	0,008	0,041	0,009	0,049	8	8
3rd	0,006	0,030	0,006	0,034	21,6	N/A
4th	0,007	0,038	0,009	0,049	4	4
5th	0,061	0,323	0,055	0,294	10,7	10,7
6th	0,002	0,009	0,002	0,013	2,67	2,67
7th	0,028	0,147	0,020	0,104	7,2	7,2
8th	0,004	0,021	0,003	0,017	2	2
9th	0,004	0,024	0,003	0,017	3,8	N/A
10th	0,003	0,014	0,003	0,014	1,6	1,6
11th	0,014	0,072	0,017	0,092	3,1	3,1
12th	0,001	0,007	0,002	0,010	1,33	1,33
13th	0,024	0,126	0,059	0,314	2	2
14th	0,004	0,020	0,002	0,012	N/A	N/A
15th	0,003	0,016	0,004	0,019	N/A	N/A
16th	0,004	0,019	0,002	0,011	N/A	N/A
17th	0,002	0,011	0,045	0,238	N/A	N/A
18th	0,001	0,006	0,001	0,008	N/A	N/A
19th	0,005	0,027	0,035	0,186	N/A	N/A
20th	0,003	0,015	0,003	0,014	N/A	N/A
21th	0,003	0,017	0,003	0,015	N/A	N/A
22th	0,003	0,017	0,002	0,010	N/A	N/A
23th	0,011	0,059	0,027	0,141	N/A	N/A
24th	0,001	0,006	0,001	0,007	N/A	N/A
25th	0,008	0,041	0,020	0,104	N/A	N/A
26th	0,003	0,015	0,003	0,015	N/A	N/A
27th	0,003	0,014	0,003	0,014	N/A	N/A
28th	0,002	0,013	0,002	0,012	N/A	N/A
29th	0,008	0,043	0,016	0,082	N/A	N/A
30th	0,001	0,006	0,001	0,006	N/A	N/A
31th	0,003	0,015	0,010	0,054	N/A	N/A
32th	0,003	0,015	0,003	0,014	N/A	N/A
33th	0,002	0,012	0,002	0,013	N/A	N/A
34th	0,002	0,012	0,002	0,012	N/A	N/A
35th	0,005	0,029	0,009	0,049	N/A	N/A
36th	0,001	0,006	0,001	0,006	N/A	N/A
37th	0,005	0,028	0,005	0,025	N/A	N/A
38th	0,003	0,015	0,003	0,014	N/A	N/A
39th	0,002	0,010	0,002	0,012	N/A	N/A
40th	0,003	0,013	0,002	0,012	N/A	N/A
THD_{40} [%]	---	0,407	--	0,591	23	13
PWHD [%]	--	0,586	--	1,678	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 2

Generating Unit rating per phase (rpp)			ASW13K-LT-G2 Pro			
	At 45-55% of rated output 6,497 kW		100% of rated output 13,050 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	9,405	--	18,866	--	-	-
2nd	0,026	0,138	0,031	0,162	8	8
3rd	0,007	0,038	0,008	0,044	21,6	N/A
4th	0,010	0,051	0,009	0,048	4	4
5th	0,060	0,317	0,054	0,286	10,7	10,7
6th	0,002	0,009	0,002	0,011	2,67	2,67
7th	0,029	0,151	0,022	0,114	7,2	7,2
8th	0,003	0,015	0,002	0,012	2	2
9th	0,009	0,047	0,006	0,029	3,8	N/A
10th	0,004	0,021	0,003	0,018	1,6	1,6
11th	0,014	0,072	0,018	0,095	3,1	3,1
12th	0,002	0,008	0,002	0,009	1,33	1,33
13th	0,020	0,109	0,061	0,321	2	2
14th	0,003	0,016	0,002	0,008	N/A	N/A
15th	0,006	0,030	0,004	0,024	N/A	N/A
16th	0,003	0,018	0,003	0,015	N/A	N/A
17th	0,004	0,020	0,042	0,224	N/A	N/A
18th	0,001	0,006	0,001	0,007	N/A	N/A
19th	0,008	0,044	0,035	0,186	N/A	N/A
20th	0,003	0,017	0,002	0,009	N/A	N/A
21th	0,004	0,023	0,004	0,020	N/A	N/A
22th	0,003	0,016	0,003	0,013	N/A	N/A
23th	0,012	0,061	0,024	0,128	N/A	N/A
24th	0,001	0,006	0,001	0,007	N/A	N/A
25th	0,010	0,055	0,019	0,101	N/A	N/A
26th	0,003	0,015	0,002	0,009	N/A	N/A
27th	0,004	0,023	0,005	0,025	N/A	N/A
28th	0,002	0,013	0,003	0,014	N/A	N/A
29th	0,006	0,032	0,012	0,066	N/A	N/A
30th	0,001	0,006	0,001	0,006	N/A	N/A
31th	0,005	0,024	0,009	0,050	N/A	N/A
32th	0,002	0,011	0,002	0,010	N/A	N/A
33th	0,004	0,024	0,004	0,023	N/A	N/A
34th	0,003	0,014	0,003	0,014	N/A	N/A
35th	0,006	0,034	0,007	0,037	N/A	N/A
36th	0,001	0,005	0,001	0,006	N/A	N/A
37th	0,008	0,042	0,006	0,032	N/A	N/A
38th	0,002	0,012	0,002	0,011	N/A	N/A
39th	0,003	0,015	0,004	0,021	N/A	N/A
40th	0,003	0,015	0,002	0,013	N/A	N/A
THD_{40} [%]	---	0,430	--	0,604	23	13
PWHD [%]	--	0,697	--	1,596	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 3

Generating Unit rating per phase (rpp)			ASW13K-LT-G2 Pro			
	At 45-55% of rated output 6,497 kW		100% of rated output 13,050 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	9,465	--	18,984	--	-	-
2nd	0,021	0,112	0,027	0,145	8	8
3rd	0,005	0,027	0,004	0,022	21,6	N/A
4th	0,009	0,049	0,009	0,046	4	4
5th	0,059	0,313	0,053	0,284	10,7	10,7
6th	0,002	0,013	0,002	0,013	2,67	2,67
7th	0,027	0,144	0,020	0,106	7,2	7,2
8th	0,005	0,025	0,003	0,016	2	2
9th	0,005	0,027	0,002	0,013	3,8	N/A
10th	0,004	0,022	0,003	0,015	1,6	1,6
11th	0,014	0,075	0,017	0,091	3,1	3,1
12th	0,002	0,010	0,002	0,009	1,33	1,33
13th	0,026	0,139	0,064	0,338	2	2
14th	0,004	0,024	0,002	0,012	N/A	N/A
15th	0,003	0,015	0,002	0,013	N/A	N/A
16th	0,003	0,018	0,002	0,011	N/A	N/A
17th	0,005	0,028	0,041	0,219	N/A	N/A
18th	0,001	0,006	0,002	0,009	N/A	N/A
19th	0,005	0,029	0,039	0,205	N/A	N/A
20th	0,003	0,017	0,002	0,012	N/A	N/A
21th	0,002	0,012	0,001	0,007	N/A	N/A
22th	0,003	0,015	0,002	0,012	N/A	N/A
23th	0,008	0,043	0,024	0,127	N/A	N/A
24th	0,001	0,006	0,002	0,009	N/A	N/A
25th	0,012	0,061	0,023	0,121	N/A	N/A
26th	0,002	0,011	0,003	0,014	N/A	N/A
27th	0,002	0,010	0,002	0,009	N/A	N/A
28th	0,002	0,011	0,003	0,014	N/A	N/A
29th	0,005	0,026	0,013	0,069	N/A	N/A
30th	0,001	0,007	0,001	0,007	N/A	N/A
31th	0,006	0,032	0,013	0,068	N/A	N/A
32th	0,002	0,011	0,003	0,014	N/A	N/A
33th	0,002	0,009	0,001	0,007	N/A	N/A
34th	0,002	0,013	0,003	0,015	N/A	N/A
35th	0,003	0,017	0,006	0,032	N/A	N/A
36th	0,001	0,006	0,001	0,007	N/A	N/A
37th	0,007	0,038	0,008	0,041	N/A	N/A
38th	0,003	0,014	0,003	0,014	N/A	N/A
39th	0,001	0,006	0,001	0,007	N/A	N/A
40th	0,003	0,014	0,003	0,014	N/A	N/A
THD_{40} [%]	---	0,419	--	0,612	23	13
PWHD [%]	--	0,596	--	1,673	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 1

Generating Unit rating per phase (rpp)			ASW15K-LT-G2 Pro			
	At 45-55% of rated output 7,510 kW		100% of rated output 15,078 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	10,843	--	21,767	--	-	-
2nd	0,008	0,036	0,010	0,047	8	8
3rd	0,005	0,024	0,007	0,034	21,6	N/A
4th	0,008	0,037	0,010	0,048	4	4
5th	0,059	0,272	0,057	0,261	10,7	10,7
6th	0,002	0,009	0,003	0,012	2,67	2,67
7th	0,027	0,122	0,017	0,076	7,2	7,2
8th	0,003	0,015	0,003	0,015	2	2
9th	0,004	0,019	0,003	0,015	3,8	N/A
10th	0,003	0,013	0,003	0,012	1,6	1,6
11th	0,016	0,073	0,018	0,085	3,1	3,1
12th	0,002	0,007	0,002	0,010	1,33	1,33
13th	0,039	0,179	0,064	0,296	2	2
14th	0,003	0,015	0,003	0,012	N/A	N/A
15th	0,003	0,013	0,004	0,017	N/A	N/A
16th	0,003	0,015	0,002	0,010	N/A	N/A
17th	0,018	0,082	0,045	0,208	N/A	N/A
18th	0,001	0,005	0,002	0,007	N/A	N/A
19th	0,008	0,038	0,037	0,168	N/A	N/A
20th	0,003	0,014	0,003	0,012	N/A	N/A
21th	0,002	0,011	0,003	0,014	N/A	N/A
22th	0,003	0,014	0,002	0,010	N/A	N/A
23th	0,002	0,010	0,031	0,141	N/A	N/A
24th	0,001	0,005	0,002	0,007	N/A	N/A
25th	0,004	0,017	0,023	0,105	N/A	N/A
26th	0,003	0,013	0,003	0,012	N/A	N/A
27th	0,002	0,011	0,002	0,011	N/A	N/A
28th	0,003	0,014	0,002	0,009	N/A	N/A
29th	0,008	0,035	0,020	0,090	N/A	N/A
30th	0,001	0,005	0,001	0,006	N/A	N/A
31th	0,005	0,025	0,014	0,065	N/A	N/A
32th	0,003	0,013	0,003	0,013	N/A	N/A
33th	0,002	0,009	0,002	0,011	N/A	N/A
34th	0,003	0,012	0,002	0,011	N/A	N/A
35th	0,005	0,023	0,012	0,056	N/A	N/A
36th	0,001	0,005	0,001	0,005	N/A	N/A
37th	0,003	0,014	0,008	0,036	N/A	N/A
38th	0,003	0,012	0,003	0,012	N/A	N/A
39th	0,002	0,008	0,002	0,009	N/A	N/A
40th	0,002	0,010	0,002	0,010	N/A	N/A
THD_{40} [%]	--	0,380	--	0,545	23	13
PWHD [%]	--	0,540	--	1,610	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 2

Generating Unit rating per phase (rpp)			ASW15K-LT-G2 Pro			
	At 45-55% of rated output 7,510 kW		100% of rated output 15,078 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	10,870	--	21,797	--	-	-
2nd	0,026	0,122	0,032	0,149	8	8
3rd	0,006	0,026	0,010	0,046	21,6	N/A
4th	0,009	0,043	0,010	0,044	4	4
5th	0,058	0,266	0,055	0,253	10,7	10,7
6th	0,002	0,010	0,002	0,010	2,67	2,67
7th	0,028	0,127	0,018	0,084	7,2	7,2
8th	0,003	0,013	0,002	0,010	2	2
9th	0,007	0,034	0,005	0,023	3,8	N/A
10th	0,004	0,018	0,004	0,016	1,6	1,6
11th	0,015	0,071	0,019	0,085	3,1	3,1
12th	0,002	0,007	0,002	0,007	1,33	1,33
13th	0,038	0,175	0,066	0,306	2	2
14th	0,002	0,010	0,002	0,007	N/A	N/A
15th	0,006	0,027	0,004	0,017	N/A	N/A
16th	0,003	0,016	0,003	0,012	N/A	N/A
17th	0,013	0,060	0,043	0,198	N/A	N/A
18th	0,001	0,005	0,001	0,006	N/A	N/A
19th	0,005	0,023	0,037	0,172	N/A	N/A
20th	0,003	0,012	0,002	0,007	N/A	N/A
21th	0,004	0,019	0,004	0,020	N/A	N/A
22th	0,003	0,014	0,003	0,012	N/A	N/A
23th	0,003	0,016	0,029	0,133	N/A	N/A
24th	0,001	0,005	0,001	0,006	N/A	N/A
25th	0,006	0,028	0,023	0,106	N/A	N/A
26th	0,003	0,014	0,002	0,007	N/A	N/A
27th	0,003	0,012	0,004	0,019	N/A	N/A
28th	0,003	0,013	0,003	0,012	N/A	N/A
29th	0,007	0,032	0,017	0,079	N/A	N/A
30th	0,001	0,005	0,001	0,006	N/A	N/A
31th	0,006	0,029	0,014	0,065	N/A	N/A
32th	0,003	0,013	0,002	0,009	N/A	N/A
33th	0,003	0,012	0,004	0,019	N/A	N/A
34th	0,003	0,012	0,003	0,012	N/A	N/A
35th	0,003	0,012	0,010	0,046	N/A	N/A
36th	0,001	0,005	0,001	0,005	N/A	N/A
37th	0,001	0,007	0,008	0,039	N/A	N/A
38th	0,002	0,010	0,002	0,009	N/A	N/A
39th	0,003	0,015	0,004	0,018	N/A	N/A
40th	0,002	0,011	0,003	0,012	N/A	N/A
THD_{40} [%]	--	0,391	--	0,560	23	13
PWHD [%]	--	0,492	--	1,558	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 3

Generating Unit rating per phase (rpp)			ASW15K-LT-G2 Pro			
	At 45-55% of rated output 7,510 kW		100% of rated output 15,078 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	10,935	--	21,920	--	-	-
2nd	0,021	0,097	0,028	0,130	8	8
3rd	0,004	0,018	0,005	0,025	21,6	N/A
4th	0,009	0,043	0,009	0,042	4	4
5th	0,057	0,263	0,055	0,252	10,7	10,7
6th	0,003	0,013	0,003	0,013	2,67	2,67
7th	0,026	0,119	0,017	0,078	7,2	7,2
8th	0,004	0,018	0,003	0,014	2	2
9th	0,005	0,023	0,003	0,013	3,8	N/A
10th	0,004	0,017	0,003	0,012	1,6	1,6
11th	0,016	0,073	0,018	0,082	3,1	3,1
12th	0,002	0,010	0,002	0,009	1,33	1,33
13th	0,043	0,198	0,069	0,316	2	2
14th	0,004	0,017	0,002	0,010	N/A	N/A
15th	0,003	0,012	0,002	0,011	N/A	N/A
16th	0,004	0,017	0,002	0,009	N/A	N/A
17th	0,016	0,074	0,042	0,195	N/A	N/A
18th	0,001	0,006	0,002	0,010	N/A	N/A
19th	0,009	0,040	0,041	0,188	N/A	N/A
20th	0,003	0,015	0,002	0,010	N/A	N/A
21th	0,002	0,008	0,002	0,007	N/A	N/A
22th	0,003	0,015	0,002	0,010	N/A	N/A
23th	0,002	0,009	0,028	0,127	N/A	N/A
24th	0,001	0,005	0,002	0,007	N/A	N/A
25th	0,005	0,024	0,026	0,119	N/A	N/A
26th	0,003	0,014	0,002	0,011	N/A	N/A
27th	0,002	0,008	0,001	0,006	N/A	N/A
28th	0,003	0,014	0,002	0,011	N/A	N/A
29th	0,005	0,025	0,017	0,077	N/A	N/A
30th	0,001	0,005	0,001	0,007	N/A	N/A
31th	0,008	0,036	0,017	0,079	N/A	N/A
32th	0,002	0,011	0,003	0,012	N/A	N/A
33th	0,001	0,007	0,002	0,007	N/A	N/A
34th	0,002	0,011	0,003	0,012	N/A	N/A
35th	0,004	0,018	0,009	0,043	N/A	N/A
36th	0,001	0,006	0,001	0,007	N/A	N/A
37th	0,003	0,015	0,011	0,049	N/A	N/A
38th	0,002	0,009	0,003	0,012	N/A	N/A
39th	0,002	0,007	0,001	0,006	N/A	N/A
40th	0,002	0,010	0,003	0,013	N/A	N/A
THD_{40} [%]	--	0,392	--	0,565	23	13
PWHD [%]	--	0,520	--	1,617	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 1

Generating Unit rating per phase (rpp)			ASW17K-LT-G2 Pro			
	At 45-55% of rated output 8,522 kW		100% of rated output 17,100 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	12,309	--	24,700	--	-	-
2nd	0,008	0,032	0,010	0,040	8	8
3rd	0,005	0,021	0,009	0,037	21,6	N/A
4th	0,008	0,033	0,011	0,044	4	4
5th	0,058	0,235	0,063	0,255	10,7	10,7
6th	0,002	0,009	0,003	0,014	2,67	2,67
7th	0,026	0,105	0,013	0,054	7,2	7,2
8th	0,003	0,014	0,003	0,013	2	2
9th	0,004	0,016	0,003	0,014	3,8	N/A
10th	0,002	0,010	0,003	0,012	1,6	1,6
11th	0,016	0,065	0,018	0,074	3,1	3,1
12th	0,002	0,008	0,003	0,010	1,33	1,33
13th	0,048	0,194	0,068	0,277	2	2
14th	0,003	0,014	0,003	0,010	N/A	N/A
15th	0,003	0,010	0,003	0,013	N/A	N/A
16th	0,002	0,009	0,002	0,010	N/A	N/A
17th	0,028	0,113	0,045	0,184	N/A	N/A
18th	0,001	0,006	0,002	0,007	N/A	N/A
19th	0,016	0,066	0,037	0,151	N/A	N/A
20th	0,003	0,013	0,002	0,009	N/A	N/A
21th	0,002	0,009	0,003	0,012	N/A	N/A
22th	0,003	0,011	0,002	0,010	N/A	N/A
23th	0,008	0,033	0,032	0,131	N/A	N/A
24th	0,001	0,004	0,002	0,007	N/A	N/A
25th	0,003	0,010	0,026	0,105	N/A	N/A
26th	0,003	0,012	0,003	0,011	N/A	N/A
27th	0,002	0,007	0,002	0,010	N/A	N/A
28th	0,003	0,012	0,002	0,009	N/A	N/A
29th	0,005	0,019	0,021	0,087	N/A	N/A
30th	0,001	0,004	0,001	0,006	N/A	N/A
31th	0,004	0,017	0,017	0,067	N/A	N/A
32th	0,003	0,012	0,003	0,011	N/A	N/A
33th	0,002	0,007	0,002	0,009	N/A	N/A
34th	0,003	0,012	0,003	0,010	N/A	N/A
35th	0,007	0,030	0,015	0,060	N/A	N/A
36th	0,001	0,004	0,002	0,006	N/A	N/A
37th	0,006	0,024	0,010	0,042	N/A	N/A
38th	0,003	0,010	0,003	0,011	N/A	N/A
39th	0,002	0,006	0,002	0,008	N/A	N/A
40th	0,003	0,010	0,002	0,010	N/A	N/A
THD_{40} [%]	--	0,365	--	0,510	23	13
PWHD [%]	--	0,667	--	1,508	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 2

Generating Unit rating per phase (rpp)			ASW17K-LT-G2 Pro			
	At 45-55% of rated ouput 8,522 kW		100% of rated output 17,100 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	12,331	--	24,715	--	-	-
2nd	0,028	0,112	0,034	0,136	8	8
3rd	0,005	0,019	0,011	0,046	21,6	N/A
4th	0,009	0,038	0,010	0,042	4	4
5th	0,056	0,229	0,061	0,247	10,7	10,7
6th	0,002	0,008	0,002	0,009	2,67	2,67
7th	0,027	0,110	0,015	0,062	7,2	7,2
8th	0,003	0,010	0,002	0,009	2	2
9th	0,006	0,024	0,004	0,016	3,8	N/A
10th	0,004	0,015	0,004	0,015	1,6	1,6
11th	0,016	0,063	0,018	0,073	3,1	3,1
12th	0,001	0,006	0,002	0,007	1,33	1,33
13th	0,048	0,196	0,070	0,283	2	2
14th	0,002	0,008	0,002	0,007	N/A	N/A
15th	0,005	0,018	0,003	0,014	N/A	N/A
16th	0,003	0,013	0,003	0,011	N/A	N/A
17th	0,024	0,097	0,045	0,182	N/A	N/A
18th	0,001	0,005	0,001	0,006	N/A	N/A
19th	0,015	0,059	0,038	0,154	N/A	N/A
20th	0,003	0,010	0,002	0,006	N/A	N/A
21th	0,004	0,017	0,004	0,015	N/A	N/A
22th	0,003	0,012	0,003	0,012	N/A	N/A
23th	0,005	0,020	0,031	0,124	N/A	N/A
24th	0,001	0,005	0,001	0,005	N/A	N/A
25th	0,002	0,009	0,026	0,107	N/A	N/A
26th	0,003	0,012	0,002	0,006	N/A	N/A
27th	0,003	0,012	0,003	0,012	N/A	N/A
28th	0,003	0,012	0,003	0,011	N/A	N/A
29th	0,005	0,020	0,020	0,081	N/A	N/A
30th	0,001	0,004	0,001	0,005	N/A	N/A
31th	0,006	0,024	0,017	0,069	N/A	N/A
32th	0,003	0,012	0,002	0,007	N/A	N/A
33th	0,002	0,007	0,004	0,015	N/A	N/A
34th	0,003	0,011	0,003	0,012	N/A	N/A
35th	0,007	0,027	0,013	0,053	N/A	N/A
36th	0,001	0,004	0,001	0,005	N/A	N/A
37th	0,006	0,024	0,011	0,044	N/A	N/A
38th	0,003	0,011	0,002	0,009	N/A	N/A
39th	0,002	0,007	0,003	0,013	N/A	N/A
40th	0,002	0,010	0,003	0,011	N/A	N/A
THD_{40} [%]	--	0,374	--	0,524	23	13
PWHD [%]	--	0,606	--	1,487	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 3

Generating Unit rating per phase (rpp)			ASW17K-LT-G2 Pro			
	At 45-55% of rated ouput 8,522 kW		100% of rated output 17,100 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	12,400	--	24,830	--	-	-
2nd	0,022	0,091	0,030	0,122	8	8
3rd	0,003	0,013	0,007	0,027	21,6	N/A
4th	0,009	0,036	0,009	0,038	4	4
5th	0,056	0,226	0,061	0,249	10,7	10,7
6th	0,002	0,010	0,002	0,009	2,67	2,67
7th	0,026	0,104	0,015	0,059	7,2	7,2
8th	0,004	0,015	0,003	0,012	2	2
9th	0,004	0,016	0,003	0,011	3,8	N/A
10th	0,003	0,013	0,003	0,010	1,6	1,6
11th	0,016	0,064	0,018	0,072	3,1	3,1
12th	0,002	0,009	0,002	0,008	1,33	1,33
13th	0,053	0,214	0,072	0,294	2	2
14th	0,003	0,013	0,002	0,009	N/A	N/A
15th	0,002	0,008	0,002	0,006	N/A	N/A
16th	0,003	0,013	0,002	0,008	N/A	N/A
17th	0,025	0,102	0,043	0,175	N/A	N/A
18th	0,002	0,007	0,002	0,007	N/A	N/A
19th	0,019	0,076	0,041	0,164	N/A	N/A
20th	0,003	0,014	0,002	0,009	N/A	N/A
21th	0,002	0,007	0,002	0,007	N/A	N/A
22th	0,003	0,013	0,002	0,008	N/A	N/A
23th	0,007	0,028	0,029	0,119	N/A	N/A
24th	0,001	0,005	0,002	0,006	N/A	N/A
25th	0,004	0,016	0,029	0,116	N/A	N/A
26th	0,003	0,014	0,002	0,010	N/A	N/A
27th	0,001	0,006	0,001	0,005	N/A	N/A
28th	0,003	0,013	0,002	0,009	N/A	N/A
29th	0,003	0,011	0,019	0,078	N/A	N/A
30th	0,001	0,004	0,002	0,007	N/A	N/A
31th	0,006	0,024	0,019	0,078	N/A	N/A
32th	0,003	0,012	0,003	0,011	N/A	N/A
33th	0,001	0,005	0,001	0,006	N/A	N/A
34th	0,003	0,012	0,003	0,011	N/A	N/A
35th	0,006	0,025	0,012	0,049	N/A	N/A
36th	0,001	0,004	0,002	0,007	N/A	N/A
37th	0,007	0,029	0,013	0,052	N/A	N/A
38th	0,002	0,010	0,003	0,011	N/A	N/A
39th	0,001	0,005	0,001	0,006	N/A	N/A
40th	0,002	0,010	0,003	0,011	N/A	N/A
THD_{40} [%]	--	0,379	--	0,528	23	13
PWHD [%]	--	0,656	--	1,511	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 1

Generating Unit rating per phase (rpp)			ASW20K-LT-G2 Pro			
	At 45-55% of rated ouput 10,033 kW		100% of rated output 20,136 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	14,612	--	29,054	--	-	-
2nd	0,020	0,067	0,033	0,115	8	8
3rd	0,004	0,014	0,008	0,027	21,6	N/A
4th	0,010	0,033	0,018	0,062	4	4
5th	0,051	0,177	0,133	0,459	10,7	10,7
6th	0,002	0,007	0,006	0,021	2,67	2,67
7th	0,026	0,090	0,036	0,122	7,2	7,2
8th	0,003	0,010	0,010	0,034	2	2
9th	0,002	0,008	0,006	0,022	3,8	N/A
10th	0,002	0,008	0,006	0,022	1,6	1,6
11th	0,016	0,056	0,026	0,088	3,1	3,1
12th	0,002	0,006	0,006	0,020	1,33	1,33
13th	0,060	0,205	0,060	0,206	2	2
14th	0,003	0,010	0,008	0,026	N/A	N/A
15th	0,003	0,009	0,006	0,022	N/A	N/A
16th	0,003	0,010	0,008	0,026	N/A	N/A
17th	0,033	0,114	0,059	0,203	N/A	N/A
18th	0,001	0,005	0,006	0,020	N/A	N/A
19th	0,029	0,100	0,102	0,351	N/A	N/A
20th	0,003	0,010	0,011	0,037	N/A	N/A
21th	0,002	0,007	0,008	0,027	N/A	N/A
22th	0,003	0,010	0,012	0,041	N/A	N/A
23th	0,013	0,044	0,047	0,163	N/A	N/A
24th	0,001	0,005	0,006	0,019	N/A	N/A
25th	0,011	0,037	0,036	0,124	N/A	N/A
26th	0,003	0,010	0,008	0,027	N/A	N/A
27th	0,002	0,007	0,006	0,022	N/A	N/A
28th	0,003	0,011	0,009	0,030	N/A	N/A
29th	0,004	0,013	0,058	0,201	N/A	N/A
30th	0,001	0,005	0,006	0,021	N/A	N/A
31th	0,008	0,026	0,025	0,087	N/A	N/A
32th	0,003	0,011	0,008	0,028	N/A	N/A
33th	0,002	0,006	0,006	0,022	N/A	N/A
34th	0,004	0,012	0,011	0,038	N/A	N/A
35th	0,008	0,029	0,035	0,121	N/A	N/A
36th	0,001	0,005	0,006	0,020	N/A	N/A
37th	0,012	0,041	0,033	0,115	N/A	N/A
38th	0,003	0,011	0,015	0,051	N/A	N/A
39th	0,002	0,006	0,006	0,021	N/A	N/A
40th	0,003	0,012	0,012	0,041	N/A	N/A
THD_{40} [%]	--	0,349	--	0,772	23	13
PWHD [%]	--	0,805	--	2,633	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 2

Generating Unit rating per phase (rpp)			ASW20K-LT-G2 Pro			
	At 45-55% of rated ouput 10,033 kW		100% of rated output 20,136 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	14,521	--	29,075	--	-	-
2nd	0,017	0,059	0,011	0,037	8	8
3rd	0,005	0,017	0,012	0,041	21,6	N/A
4th	0,009	0,030	0,018	0,061	4	4
5th	0,052	0,181	0,127	0,440	10,7	10,7
6th	0,002	0,006	0,006	0,020	2,67	2,67
7th	0,027	0,095	0,036	0,125	7,2	7,2
8th	0,003	0,011	0,009	0,031	2	2
9th	0,007	0,025	0,009	0,032	3,8	N/A
10th	0,003	0,010	0,006	0,022	1,6	1,6
11th	0,016	0,055	0,024	0,082	3,1	3,1
12th	0,002	0,006	0,006	0,019	1,33	1,33
13th	0,056	0,193	0,068	0,235	2	2
14th	0,004	0,012	0,007	0,025	N/A	N/A
15th	0,005	0,017	0,006	0,022	N/A	N/A
16th	0,003	0,011	0,007	0,023	N/A	N/A
17th	0,033	0,114	0,068	0,234	N/A	N/A
18th	0,001	0,005	0,006	0,021	N/A	N/A
19th	0,024	0,081	0,099	0,342	N/A	N/A
20th	0,003	0,012	0,009	0,031	N/A	N/A
21th	0,005	0,019	0,008	0,026	N/A	N/A
22th	0,003	0,011	0,012	0,041	N/A	N/A
23th	0,012	0,040	0,044	0,151	N/A	N/A
24th	0,001	0,005	0,005	0,018	N/A	N/A
25th	0,007	0,024	0,038	0,132	N/A	N/A
26th	0,004	0,013	0,010	0,034	N/A	N/A
27th	0,005	0,016	0,010	0,034	N/A	N/A
28th	0,003	0,011	0,008	0,027	N/A	N/A
29th	0,006	0,021	0,061	0,211	N/A	N/A
30th	0,001	0,005	0,006	0,022	N/A	N/A
31th	0,007	0,024	0,023	0,079	N/A	N/A
32th	0,004	0,014	0,007	0,024	N/A	N/A
33th	0,004	0,013	0,006	0,022	N/A	N/A
34th	0,004	0,012	0,011	0,038	N/A	N/A
35th	0,011	0,037	0,031	0,107	N/A	N/A
36th	0,001	0,004	0,006	0,020	N/A	N/A
37th	0,011	0,039	0,035	0,121	N/A	N/A
38th	0,004	0,012	0,014	0,048	N/A	N/A
39th	0,002	0,008	0,008	0,027	N/A	N/A
40th	0,003	0,012	0,010	0,042	N/A	N/A
THD_{40} [%]	--	0,340	--	0,766	23	13
PWHD [%]	--	0,776	--	2,646	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. PVGB2203WDG0348-2**

Power Quality. Harmonics.

Phase 3

Generating Unit rating per phase (rpp)			ASW20K-LT-G2 Pro			
	At 45-55% of rated ouput 10,033 kW		100% of rated output 20,136 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-12	
					1 phase	3 phase
1st	14,491	--	29,253	--	-	-
2nd	0,036	0,124	0,029	0,100	8	8
3rd	0,005	0,016	0,013	0,045	21,6	N/A
4th	0,010	0,034	0,017	0,058	4	4
5th	0,053	0,182	0,130	0,450	10,7	10,7
6th	0,002	0,006	0,006	0,020	2,67	2,67
7th	0,026	0,091	0,037	0,128	7,2	7,2
8th	0,003	0,010	0,010	0,035	2	2
9th	0,004	0,014	0,008	0,029	3,8	N/A
10th	0,003	0,011	0,007	0,025	1,6	1,6
11th	0,017	0,057	0,025	0,087	3,1	3,1
12th	0,001	0,005	0,006	0,020	1,33	1,33
13th	0,054	0,186	0,064	0,220	2	2
14th	0,003	0,009	0,009	0,031	N/A	N/A
15th	0,003	0,010	0,008	0,029	N/A	N/A
16th	0,003	0,012	0,007	0,024	N/A	N/A
17th	0,037	0,128	0,061	0,210	N/A	N/A
18th	0,001	0,004	0,006	0,021	N/A	N/A
19th	0,025	0,086	0,102	0,351	N/A	N/A
20th	0,003	0,010	0,010	0,033	N/A	N/A
21th	0,003	0,009	0,007	0,025	N/A	N/A
22th	0,003	0,012	0,014	0,049	N/A	N/A
23th	0,016	0,054	0,047	0,163	N/A	N/A
24th	0,001	0,004	0,006	0,020	N/A	N/A
25th	0,008	0,027	0,038	0,130	N/A	N/A
26th	0,003	0,012	0,009	0,031	N/A	N/A
27th	0,003	0,009	0,008	0,028	N/A	N/A
28th	0,004	0,012	0,009	0,030	N/A	N/A
29th	0,007	0,025	0,054	0,186	N/A	N/A
30th	0,001	0,004	0,007	0,022	N/A	N/A
31th	0,004	0,014	0,019	0,064	N/A	N/A
32th	0,004	0,014	0,008	0,027	N/A	N/A
33th	0,003	0,009	0,007	0,023	N/A	N/A
34th	0,004	0,013	0,011	0,039	N/A	N/A
35th	0,010	0,036	0,035	0,122	N/A	N/A
36th	0,001	0,004	0,006	0,020	N/A	N/A
37th	0,009	0,033	0,035	0,121	N/A	N/A
38th	0,004	0,013	0,016	0,055	N/A	N/A
39th	0,002	0,008	0,007	0,023	N/A	N/A
40th	0,004	0,012	0,012	0,042	N/A	N/A
THD_{40} [%]	--	0,359	--	0,769	23	13
PWHD [%]	--	0,815	--	2,616	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. PVGB2203WDG0348-2**

Power Quality. Power factor.				
Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within ±1,5% of the stated level during the test.
20%	0,998	0,999	0,997	
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	

Power Quality. Voltage fluctuation and Flicker.								
	Starting			**Stopping**			**Running**	
	d_{max}	**d_c**	**$d_{(t)}$**	**d_{max}**	**d_c**	**$d_{(t)}$**	**P_{st}**	**P_{lt} 2 hours**
Measured values at test impedance (L1)	0,141	0,043	0,000	0,397	0,003	0,000	0,193	0,194
Normalised to standard impedance (L1)	0,141	0,043	0,000	0,397	0,003	0,000	0,193	0,194
Measured values at test impedance (L2)	0,210	0,039	0,000	0,298	0,029	0,000	0,193	0,192
Normalised to standard impedance (L2)	0,210	0,039	0,000	0,298	0,029	0,000	0,193	0,192
Measured values at test impedance (L3)	0,167	0,003	0,000	0,453	0,017	0,000	0,187	0,187
Normalised to standard impedance (L3)	0,167	0,003	0,000	0,453	0,017	0,000	0,187	0,187
Values for maximum impedance	4,00%	3,30%	3,3% 500ms	4,00%	3,30%	3,3% 500ms	1,0	0,65
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	Xl	0,150	Ω
	Z	0,283	Ω			
Standard impedance	R	0,240	Ω	Xl	0,150	Ω
	Z	0,283	Ω			
Maximum impedance	R	0,240	Ω	Xl	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. PVGB2203WDG0348-2**

Power Quality. DC injection.			
Phase 1			
ASW12K-LT-G2 Pro			
Test level power [%]	10	55	100
Recorded value [mA]	25,3	33,5	29,6
Recorded value [%]	0,145	0,193	0,170
Limit [%]	0,25	0,25	0,25
Phase 2			
Test level power [%]	10	55	100
Recorded value [mA]	30,0	39,9	26,7
Recorded value [%]	0,173	0,229	0,154
Limit [%]	0,25	0,25	0,25
Phase 3			
Test level power [%]	10	55	100
Recorded value [mA]	32,7	30,7	34,2
Recorded value [%]	0,188	0,177	0,209
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 ±5%. At 230 V a 12 kW three phase Inverter has a current output of 17,39 A so DC limit is 43 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]	23,4	25,8	23,7
Recorded value [%]	0,135	0,148	0,136
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. PVGB2203WDG0348-2**

Power Quality. DC injection.			
Phase 1			
ASW20K-LT-G2 Pro			
Test level power [%]	10	55	100
Recorded value [mA]	35,7	35,0	60,0
Recorded value [%]	0,123	0,121	0,207
Limit [%]	0,25	0,25	0,25
Phase 2			
Test level power [%]	10	55	100
Recorded value [mA]	34,8	35,4	71,5
Recorded value [%]	0,120	0,122	0,247
Limit [%]	0,25	0,25	0,25
Phase 3			
Test level power [%]	10	55	100
Recorded value [mA]	31,1	33,6	63,6
Recorded value [%]	0,107	0,116	0,219
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 ±5%. At 230 V a 20 kW three phase Inverter has a current output of 28,99 A so DC limit is 72 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%.

The tests had been performed on the ASW12K-LT-G2 Pro and ASW20K-LT-G2 Pro are valid for the, ASW13K-LT-G2 Pro, ASW15K-LT-G2 Pro and ASW17K-LT-G2 Pro since it is almost same as in hardware and just power derated by software.

Sum of all Phases			
Test level power [%]	10	55	100
Recorded value [mA]	23,5	22,9	34,3
Recorded value [%]	0,081	0,079	0,118
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. PVGB2203WDG0348-2**

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	4,85Vac	22,00
Initial Value of aperiodic current	A	N/A	100ms	9,76Vac	26,54
Initial symmetrical short-circuit current*	I_k	N/A	250ms	10,94Vac	19,11
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	3,69Vac	0,14
Reactance/Resistance Ratio of source*	X/R	N/A	**Time to Trip [s]**	0,395	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	24,10Vac	16,00
Initial Value of aperiodic current	A	N/A	100ms	26,44Vac	40,53
Initial symmetrical short-circuit current*	I_k	N/A	250ms	27,73Vac	44,02
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	25,97Vac	0,09
Reactance/Resistance Ratio of source*	X/R	N/A	**Time to Trip [s]**	0,395	In seconds

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	29,05Vac	38,64
Initial Value of aperiodic current	A	N/A	100ms	15,91Vac	14,68
Initial symmetrical short-circuit current*	I_k	N/A	250ms	17,51Vac	24,33
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	22,48Vac	0,45
Reactance/Resistance Ratio of source*	X/R	N/A	**Time to Trip [s]**	0,395	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. PVGB2203WDG0348-2**

Self Monitoring – Solid state switching.	**P**
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.	Yes
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 (5.5.2.1 Functional safety 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. 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.	

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.	
Provide high level description of logic interface, e.g. details in 11.1.3.1 such as AC or DC signal	Yes
Note. Manufacturer information provided.	

Additional comments