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:	**ASW3000-S-G2** **ASW3680-S-G2**

Use in accordance with regulations:

Automatic disconnection device with single-phase mains surveillance in accordance with Engineering Recommendation G98/1 for photovoltaic systems with a single-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 G98/1-7:2022
Requirements for the connection of Fully Type Tested Micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks

DIN V VDE V 0126-1-1:2006 (4.1 Functional safety)
Automatic disconnection device between a generator and the public low-voltage grid

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:	**PVGB2210WDG0136-2**	**Certification program:**	**NSOP-0032-DEU-ZE-V01**
Certificate number:	**U22-0701**	**Date of issue:**	**2022-12-14**

Certification body

Alf Assenkamp

DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-00

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

A partial representation of the certificate requires the written approval of Bureau Veritas Consumer Products Services Germany GmbH

Appendix C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

Type Approval and declaration of compliance with the requirements of Engineering Recommendation G98/1.				
PGM Technology	Photovoltaic inverter			
Manufacturer	AISWEI Technology(Shanghai) Co., Ltd.			
Address	Room 905B, 757 Mengzi Road, Huangpu District, 200023 Shanghai, P.R.China			
Tel	-	**Fax**	-	
Email	-	**Website**	-	
Rated values	ASW3000-S-G2	ASW3680-S-G2	-	-
Max. Input DC voltage [V]	600		-	-
Input DC voltage range [V]	60-600		-	-
Max. Input DC current [A]	2*16	2*16	-	-
Output AC voltage [V]	L/N/PE, 230V, 50Hz		-	-
Max Output AC current [A]	15,0	16,0	-	-
Nominal Output power [W]	3000	3680	-	-
Max. Output power [VA]	3000	3680	-	-
Firmware version	Main DSP Software version: V610-01055-03 Slave DSP Software version: V610-01056-03 Safety package (Flash) version: V610-10010-03			

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 (each) 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 ASW3000-S-G2 and ASW3680-S-G2 are almost identical in hardware and software, expected the components are description as below table and the output power derated by software.

Model / Item	ASW3000-S-G2	ASW3680-S-G2
Fan	No	Yes

The above stated Generating Units are tested according the requirements in the Engineering Recommendation G98/1. 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 G98/1.

Appendix C Type Test Verification Report	
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Operating Range.	
Test 1	Voltage = 85% of nominal (195,5 V) Frequency = 47,5 Hz Power Factor = 1 Period of test 20 seconds
Connection:	Always connected
Limit:	Always connected
Test 2	Voltage = 85% of nominal (195,5 V) Frequency = 47,5 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 3	Voltage = 110% of nominal (253 V) Frequency = 51,5 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	Always connected
Test 4	Voltage = 110% of nominal (253 V) Frequency = 52,0 Hz 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 Micro-Generating Plant 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 500 ms.
Connection:	Always connected
Limit:	Always connected

Appendix C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

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	184,39	2,53	188V / 5s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	263,97	1,02	258,2V 5,0s	No trip
O/V stage 2	273,7	0,5	275,34	0,52	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.

Appendix C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

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	47,41	20,02	47,7Hz / 30s	No trip
U/F stage 2	47	0,5	47,00	0,53	47,2Hz / 19,5s	No trip
					46,8Hz / 0,45s	No trip
O/F stage 2	52	0,5	52,08	0,54	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 C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

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. Ph1 fuse removed [ms]	135	120	178	136	122	184
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 2.	
Over Voltage	
Time delay setting	**Measured delay**
20s	66,6s
Under Voltage	
Time delay setting	**Measured delay**
20s	66,4s
Over Frequency	
Time delay setting	**Measured delay**
20s	66,2s
Under Frequency	
Time delay setting	**Measured delay**
20s	66,2s

	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 266,2V	At 180,0V	At 47,4Hz	At 52,1Hz
Confirmation that the Generating Unit does not re-connect.	No reconnection	No reconnection	No reconnection	No reconnection

Appendix C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

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

Limited Frequency Sensitive Mode – Over Frequency							
1-min mean value [Hz]:	**a) 50,00**	**b) 50,45**	**c) 50,70**	**d) 51,15**	**e) 50,70**	**f) 50,45**	**g) 50,00**
1. Measurement a) to g): Active power output > 80% Pn							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
$P_{expected}$ [W]:	3680	3643	3459	3128	3459	3643	3680
$P_{measured}$ [W]:	3611	3511	3361	3091	3360	3515	3613
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
$P_{expected}$ [W]:	1840	1803	1619	1288	1619	1803	3680
$P_{measured}$ [W]:	1831	1799	1646	1375	1632	1781	3627

Output Power with falling Frequency			
5-min mean value (each)	**a) 50 ± 0,01 Hz**	**b) - 0,4 to - 0,5 Hz**	**c) - 2,4 to - 2,5 Hz**
Frequency [Hz]:	50,00	49,50	47,50
Active power [W]:	3687	3685	3687
ΔP/Pmax [%]:			0,00

Note.
No power reduction takes place in the electronic inverter.

Appendix C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

Power Quality. Harmonics.

ASW3000-S-G2

Phase 1

SSEG rating per phase (rpp)			3,00 kW			
	At 45-55% of rated ouput 1,470kW		100% of rated output 2,973 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0,022	0,167	0,014	0,104	1,080	
3rd	0,071	0,542	0,075	0,574	2,300	
4th	0,018	0,137	0,016	0,121	0,430	
5th	0,007	0,054	0,002	0,015	1,140	
6th	0,026	0,201	0,039	0,303	0,300	
7th	0,014	0,104	0,020	0,151	0,770	
8th	0,003	0,020	0,001	0,010	0,230	
9th	0,152	1,165	0,032	0,248	0,400	
10th	0,021	0,158	0,029	0,220	0,184	
11th	0,188	1,441	0,035	0,272	0,330	
12th	0,023	0,175	0,048	0,366	0,153	
13th	0,139	1,066	0,053	0,408	0,210	
14th	0,023	0,177	0,019	0,147	0,131	
15th	0,078	0,596	0,025	0,194	0,150	
16th	0,017	0,129	0,010	0,078	0,115	
17th	0,051	0,393	0,025	0,192	0,132	
18th	0,010	0,080	0,012	0,094	0,102	
19th	0,049	0,372	0,019	0,144	0,118	
20th	0,009	0,072	0,002	0,013	0,092	
21th	0,048	0,368	0,018	0,140	0,107	0,160
22th	0,006	0,049	0,003	0,021	0,084	
23th	0,044	0,334	0,013	0,102	0,098	0,147
24th	0,007	0,054	0,004	0,032	0,077	
25th	0,035	0,265	0,015	0,112	0,090	0,135
26th	0,008	0,059	0,003	0,024	0,071	
27th	0,026	0,203	0,016	0,124	0,083	0,124
28th	0,008	0,064	0,005	0,042	0,066	
29th	0,022	0,165	0,018	0,137	0,078	0,117
30th	0,006	0,045	0,003	0,021	0,061	
31th	0,018	0,141	0,009	0,071	0,073	0,109
32th	0,003	0,023	0,003	0,022	0,058	
33th	0,015	0,119	0,009	0,068	0,068	0,102
34th	0,002	0,012	0,002	0,018	0,054	
35th	0,013	0,100	0,011	0,088	0,064	0,096
36th	0,002	0,015	0,001	0,011	0,051	
37th	0,011	0,086	0,011	0,082	0,061	0,091
38th	0,003	0,022	0,002	0,016	0,048	
39th	0,011	0,082	0,009	0,066	0,058	0,087
40th	0,004	0,028	0,002	0,016	0,046	

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

Appendix C Type Test Verification Report

Extract from test report according to the Engineering Recommendation G98/1	Nr. PVGB2210WDG0136-2

Power Quality. Harmonics.

ASW3680-S-G2

Phase 1

SSEG rating per phase (rpp)			3,68 kW			
	At 45-55% of rated output 1,832 kW		100% of rated output 3,695 kW			
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0,015	0,092	0,012	0,074	1,080	
3rd	0,074	0,465	0,078	0,486	2,300	
4th	0,017	0,104	0,012	0,074	0,430	
5th	0,004	0,023	0,003	0,021	1,140	
6th	0,030	0,188	0,042	0,260	0,300	
7th	0,012	0,074	0,018	0,113	0,770	
8th	0,005	0,029	0,006	0,037	0,230	
9th	0,053	0,328	0,049	0,306	0,400	
10th	0,029	0,179	0,027	0,167	0,184	
11th	0,078	0,485	0,052	0,324	0,330	
12th	0,029	0,180	0,047	0,292	0,153	
13th	0,078	0,490	0,040	0,250	0,210	
14th	0,015	0,097	0,013	0,079	0,131	
15th	0,061	0,384	0,046	0,289	0,150	
16th	0,012	0,075	0,021	0,130	0,115	
17th	0,044	0,274	0,021	0,130	0,132	
18th	0,005	0,033	0,013	0,081	0,102	
19th	0,027	0,170	0,019	0,122	0,118	
20th	0,006	0,041	0,007	0,042	0,092	
21th	0,018	0,110	0,017	0,106	0,107	0,160
22th	0,004	0,028	0,007	0,043	0,084	
23th	0,014	0,086	0,011	0,069	0,098	0,147
24th	0,003	0,019	0,007	0,044	0,077	
25th	0,012	0,073	0,010	0,065	0,090	0,135
26th	0,005	0,030	0,008	0,048	0,071	
27th	0,011	0,070	0,013	0,080	0,083	0,124
28th	0,005	0,029	0,007	0,046	0,066	
29th	0,010	0,062	0,011	0,067	0,078	0,117
30th	0,002	0,015	0,005	0,031	0,061	
31th	0,009	0,055	0,009	0,058	0,073	0,109
32th	0,002	0,015	0,003	0,020	0,058	
33th	0,007	0,047	0,008	0,052	0,068	0,102
34th	0,002	0,014	0,003	0,016	0,054	
35th	0,007	0,041	0,008	0,052	0,064	0,096
36th	0,002	0,013	0,002	0,009	0,051	
37th	0,006	0,036	0,008	0,051	0,061	0,091
38th	0,002	0,012	0,001	0,009	0,048	
39th	0,005	0,031	0,007	0,042	0,058	0,087
40th	0,002	0,010	0,002	0,010	0,046	

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

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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%	0,990	0,986	0,976	
50%	0,999	0,999	0,997	
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	0,267	0,191	0,000	0,470	0,432	0,000	0,072	0,072
Normalised to standard impedance	0,267	0,191	0,000	0,470	0,432	0,000	0,072	0,072
Normalised to required to required maximum impedance	4,00%	3,30%	3,3% 500ms	4,00%	3,30%	3,3% 500ms	1,00	0,650
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	0,4	Ω	Xl	0,25	Ω
	Z	0,472	Ω			
Standard impedance	R	0,4	Ω	Xl	0,25	Ω
	Z	0,472	Ω			
Maximum impedance	R	0,4	Ω	Xl	0,25	Ω
	Zmax	0,472	Ω			

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Power Quality. DC injection.			
ASW3000-S-G2			
Test level power [%]	10	55	100
Recorded value [mA]	25	29	30
Recorded value [%]	0,192	0,222	0,230
Limit [%]	0,25	0,25	0,25

Power Quality. DC injection.			
ASW3680-S-G2			
Test level power [%]	10	55	100
Recorded value [mA]	29	34	38
Recorded value [%]	0,181	0,213	0,238
Limit [%]	0,25	0,25	0,25

Appendix C Type Test Verification Report	
Extract from test report according to the Engineering Recommendation G98/1	**Nr. PVGB2210WDG0136-2**

Fault level Contribution.					
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	0 V	0 A
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]**	0,003 s	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.					
The tests had been performed on the ASW3680-S-G2 are valid for the ASW3000-S-G2 since it is almost same as in hardware and just power derated by software.					

Self Monitoring – Solid state switching.	**P**
It has been verified that in the event of the solid state switching device failing to disconnect the Generating Unit, 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 (Functional safety of the internal automatic disconnection device according to VDE 0126-1-1).	

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.	

Logic Interface (input port) Required by paragraph 9.4.4	**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 9.4.4 such as AC or DC signal	Yes
The logic interface is implemented by the external device (Model: Ai-Logger 1000). The COM1, 2 or 3 of the external device shall connected to the COM1 of the Power Generating Module (Figure 3). The pin 1 and pin 10 of the DI port for the external device are connected to a switch or contactor. When the switch is closed the Power Generating Module can operate normally. When the switch is opened, the logic interface will have a 5V DC voltage, and the generator module will reduce its active power to zero within 5 s.	

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Additional comments