zeversolar

Jiangsu Zeversolar New Energy CO., LTD.

Certificate UK-G59 issue 3

This Type Test sheet shall be used to record the results of the type testing of Generating unit between 16A per phase and 17kW per phase maximum output at 230V(17kW limit single phase, 34kW limit split phase, 50kW limit 3 phase)

It include the Generating Units supplier declaration of compliance with the requirements of Engineering Recommendation G59/3

Type Tested reference number	*Zeverlution Pro 33K*		
Generating Unit technology	*Photovoltaic Inverter*		
System Supplier name	*Jiangsu Zeversolar New Energy CO., LTD.*		
Address	*No. 198 Xiangyang Road, Suzhou, 215011 China*		
Tel	*+86 512 6937 0998*	*Fax*	*+86 512 6937 0630*
E:mail	*service.china@zeversolar.com*	Web site	*www.zeversolar.com*

Maximum export capacity	Connection Option	
	N/A	kW single phase, single, split or three phase system
	33.0	kW three phase
	N/A	kW two phases in three phase system
	N/A	kW two phases split phase system

System supplier declaration.

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

Signed		On behalf of	*Jiangsu Zeversolar New Energy CO., LTD.*

The result of the G59/3 tests are summarized in this certificate.

Zeversolar declares that the units installed in UK market and set for G59/3 operations are characterized by the following features:

-The internal specification and parameters are set to be compliant with: Engineering Recommendation G59 issue 3, September 2013

- These parameters can't be changed by user, an installer or by any person other than Zeversolar (password protected)

POWER QUALITY

Harmonic current emissions as per BS EN 61000-3-2

These tests should be carried out as specified in BS EN61000-3-2. The test should be undertaken with a fixed source of energy at two power level a) between 45 and 55% and b) at 100% of maximum export capacity. The result need to comply with the limits of table 1 of BS EN 61000-3-2.
The Generating Units meeting the requirement of BS EN 61000-3-2 will need no further assessment with regards to harmonics according to G59/3.

SSEG rating per phase (rpp)				3.33 KW			
Harmonic order	At 45-55% of rated output			100% of rated output			
	Measured Value (MV) in Amps			Measured Value (MV) in Amps			Limit in BS EN 61000-3-2 in Amps
	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	
2	0.1388	0.1065	0.2182	0.1741	0.1795	0.3534	1.080
3	0.0320	0.0745	0.0194	0.0528	0.1094	0.0708	2.300
4	0.0711	0.0783	0.0652	0.0935	0.1662	0.1303	0.430
5	0.1425	0.1198	0.0866	0.1257	0.1308	0.0872	1.140
6	0.0163	0.0126	0.0280	0.0413	0.0560	0.0503	0.300
7	0.0461	0.0397	0.0214	0.0515	0.0079	0.0491	0.770
8	0.0838	0.1074	0.1039	0.0968	0.1078	0.1203	0.230
9	0.0132	0.0173	0.0179	0.0119	0.0342	0.0361	0.400
10	0.0976	0.1087	0.1149	0.1151	0.1310	0.1381	0.184
11	0.0295	0.0390	0.0264	0.0328	0.0497	0.0594	0.330
12	0.0024	0.0174	0.0181	0.0065	0.0251	0.0193	0.153
13	0.0339	0.0454	0.0424	0.0434	0.0531	0.0562	0.210
14	0.0432	0.0294	0.0326	0.0495	0.0350	0.0238	0.131
15	0.0094	0.0057	0.0083	0.0093	0.0192	0.0066	0.150
16	0.0209	0.0103	0.0114	0.0156	0.0043	0.0164	0.115
17	0.0138	0.0143	0.0197	0.0430	0.0424	0.0311	0.132
18	0.0127	0.0125	0.0035	0.0043	0.0149	0.0112	0.102
19	0.0159	0.0224	0.0176	0.0379	0.0268	0.0408	0.118
20	0.0193	0.0072	0.0198	0.0088	0.0227	0.0250	0.092
21	0.0098	0.0106	0.0029	0.0049	0.0121	0.0123	0.107
22	0.0185	0.0193	0.0204	0.0253	0.0320	0.0232	0.084
23	0.0091	0.0245	0.0222	0.0310	0.0400	0.0434	0.098
24	0.0086	0.0022	0.0093	0.0081	0.0032	0.0079	0.077
25	0.0103	0.0145	0.0144	0.0382	0.0401	0.0348	0.090
26	0.0125	0.0057	0.0078	0.0051	0.0012	0.0055	0.071
27	0.0082	0.0039	0.0075	0.0020	0.0055	0.0038	0.083
28	0.0035	0.0049	0.0047	0.0031	0.0112	0.0114	0.066
29	0.0140	0.0118	0.0172	0.0213	0.0231	0.0202	0.078
30	0.0080	0.0035	0.0050	0.0043	0.0110	0.0117	0.061
31	0.0154	0.0147	0.0108	0.0274	0.0197	0.0273	0.073
32	0.0043	0.0027	0.0034	0.0071	0.0031	0.0067	0.058

33	0.0035	0.0070	0.0023	0.0031	0.0153	0.0094	0.068
34	0.0062	0.0018	0.0051	0.0041	0.0072	0.0082	0.054
35	0.0095	0.0101	0.0132	0.0191	0.0156	0.0263	0.064
36	0.0068	0.0051	0.0026	0.0113	0.0071	0.0037	0.051
37	0.0091	0.0107	0.0101	0.0159	0.0214	0.0174	0.061
38	0.0026	0.0024	0.0046	0.0039	0.0057	0.0086	0.048
39	0.0026	0.0021	0.0030	0.0006	0.0016	0.0047	0.058
40	0.0006	0.0034	0.0036	0.0038	0.0078	0.0047	0.046

Voltage Fluctuations and Flicker as per BS EN 61000-3-11

The tests should be carried out on a single Generating Unit. Results should be normalized to a standard source impedance or if this results in figures above the limits set in BS EN 61000-3-11 to a suitable Maximum Impedance.

	Starting			Stopping			Running	
	dmax	dc	d(t)	dmax	dc	d(t)	Pst	Plt 2
Measured Values at test impedance	3.846%	0.405%	0.000%	3.041%	2.878%	0.000%	0.320	0.189
Normalised to standard impedance	6.15%	0.65%	0.001%	4.87%	4.60%	0.001%	0.512	0.302
Normalised to required maximum impendance	3.99%	0.42%	0.001%	3.16%	2.99%	0.001%	0.332	0.196
Limits set under BS EN 61000-3-11	4%	3.3%	3.3%	4%	3.3%	3.3%	1.0	0.65

Test Impedance	R	0.15	Ω	XI	0.15	Ω
Standard Impedance	R	0.24*/0.4ˆ	Ω	XI	0.15*/0.25ˆ	Ω
Maximum Impedance	R	0.231	Ω	XI	0.231	Ω

*Applies to three phase and split single phase Generating Units.

ˆApplies to single phase Generating Units and Generating Units using two phase on a three phase system.

For voltage change and flicker measurements the following formula is to be used to convert the measured values to the normalised values where the power factor of the generation output is 0.98 or above.

Normalised value = Measured value*reference source resistance/measured source resistance at test point.

Single phase units reference source resistance is 0.4Ω

Two phase units in a three phase system reference source resistance is 0.4Ω

Two phase units in a split phase system reference source resistance is 0.24Ω

Three phase units reference source resistance is 0.24Ω

Where the power factor of the output is under 0.98 then the XI to R ration of the test impedance should be close to that of the standard impedance.

The stopping test should be a trip from full load operation.

The duration of these tests need to comply with the particular requirements set out in the testing notes for the technology under test. Dates and location of the test need to be noted below.

Test start date	2015-2-3	Test end date	2015-2-3
Test location	Audix Technology (WuJiang)Co.,Ltd. EMC Dept.		

	DC injection			Power factor *		
Test level	10%	55%	100%	216.2 V	230 V	253 V
Recorded value in Amps	0.092	0.084	0.074	0.9994	0.9995	0.9995
as % of rated AC current	0.19%	0.18%	0.15%	-	-	-
Limit	0.25%	0.25%	0.25%	>0.95	>0.95	>0.95

* Measured at three voltage levels and at full output. The voltage was maintained within ±1.5% of the stated level during the test.

PROTECTION

Frequency tests						
Function	Setting		Trip test		"No trip tests"	
	Frequency	Time delay	Frequency	Time delay	Frequency/time	Confirm no trip
O/F Stage 1	51.5 Hz	90.0s	51.51Hz	90.10s	51.3Hz/95s	No trip
O/F Stage 2	52.0 Hz	0.5s	52.01Hz	0.611s	51.8Hz/89.98s	No trip
					52.2Hz/0.48s	No trip
U/F Stage 1	47.5Hz	20s	47.50Hz	20.10s	47.7Hz/25s	No trip
U/F Stage 2	47.0Hz	0.5s	46.95Hz	0.62s	47.2Hz/19.98s	No trip
					46.8Hz/0.48s	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.						

Voltage tests						
Function	Setting		Trip test		"No trip tests"	
	Voltage	Time delay	Voltage	Time delay	Voltage/time	Confirm no trip
O/V Stage 1 L1	262.2V	1.0s	264.1V	1.10s	258.2V/2.0s	No trip
O/V Stage 1 L2	262.2V	1.0s	263.2V	1.11s	258.2V/2.0s	No trip
O/V Stage 1 L3	262.2V	1.0s	263.7V	1.10s	258.2V/2.0s	No trip
O/V Stage 2 L1	273.7V	0.5s	275.1V	0.606s	269.7V/0.98s	No trip
O/V Stage 2 L2	273.7V	0.5s	274.5V	0.601s	269.7V/0.98s	No trip
O/V Stage 2 L3	273.7V	0.5s	274.4V	0.612s	269.7V/0.98s	No trip
L1					277.7V/0.48s	No trip
L2					277.7V/0.48s	No trip

L3					277.7V/0.48s	No trip
U/V Stage 1 L1	200.1V	2.5s	201.4V	2.62s	204.1V/3.5s	No trip
U/V Stage 1 L2	200.1V	2.5s	199.5V	2.61s	204.1V/3.5s	No trip
U/V Stage 1 L3	200.1V	2.5s	200.6V	2.61s	204.1V/3.5s	No trip
U/V Stage 2 L1	184.0V	0.5s	184.9V	0.598s	188V/2.48s	No trip
U/V Stage 2 L2	184.0V	0.5s	183.6.3V	0.607s	188V/2.48s	No trip
U/V Stage 2 L3	184.0V	0.5s	185.7V	0.600s	188V/2.48s	No trip
L1					180V/0.48s	No trip
L2					180V/0.48s	No trip
L3					180V/0.48s	No trip

Note. For Voltage tests the Voltage required to trip is the setting ±3.45V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ±4V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Loss of Mains test

Note as an alternative, inverters can be tested to BS EN 62116. The following sub set of tests should be recorded in the following table.

Test Power	33%	66%	100%	33%	66%	100%
Balancing load on islanded network	33% -5% Q Test 22	66% -5% Q Test 12	100% -5% P Test 5	33% +5% Q Test 31	66% +5% Q Test 21	100% +5% P Test 10
Trip time. Limit is 0.5 seconds	0.070s	0.072s	0.168s	0.115s	0.081s	0.109s

Single phase test for multi phase Generating units. Confirm that when generating in parallel with a network operating at around 50Hz with no network disturbance, that the removal of a single phase connection to the Generating Unit, with the remaining phases connected causes a disconnection of the generating unit within a maximum of 1s.

	Confirm Trip		Confirm Trip		Confirm Trip
Ph1 removed	0.11s	Ph2 removed	0.06s	Ph3 removed	0.06s

Frequency change, Stability test

	Start Frequency	Change	End Frequency	Confirm no trip
Positive Vector Shift	49.5Hz	+9 degrees		No trip
Negative Vector Shift	50.5Hz	- 9 degrees		No trip
Positive Frequency drift	49.5Hz	+0.19Hz/sec	51.5Hz	No trip
Negative Frequency drift	50.5Hz	-0.19Hz/sec	47.5Hz	No trip

Re-connection timer					
Test should prove that the reconnection sequence starts after a minimum delay of 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1.					
Time delay setting	Measured delay	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 10.5.7.1.			
30s	30s	At 266.2V	At 196.1V	At 47.4Hz	At 51.6Hz
Confirmation that the SSEG does not reconnect.		No reconnect	No reconnect	No reconnect	No reconnect

FAULT LEVEL CONTRIBUTION

For machines with electro-magnetic output			For Inverter output		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	-	20ms	24.41	48.6
Initial Value of aperiodic current	A	-	100ms	23.92	48.5
Initial symmetrical short-circuit current*	I_k	-	250ms	23.79	48.3
Decaying (aperiodic) component of short circuit current*	i_{DC}	-	500ms	23.82	48.2
Reactance/Resistance Ratio of source*	X/R	-	Time to trip	0.605	In seconds
For rotating machines and linear piston machines the test should produce a 0s – 2s plot of the short circuit current as seen at the Generating Unit terminals. *Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot.					

SELF-MONITORING SOLID STATE SWITCHING

Not applicable as electro-mechanical relays are used.