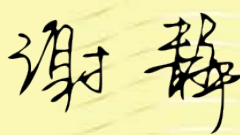


ENA Engineering Recommendation G83

Issue 2 2012

Type Verification Test Report

Type Approval and manufacturer/supplier declaration of compliance with the requirements of Engineering Recommendation G83/2.			
SSEG Type		GW4000-DT/GW5000-DT/GW6000-DT/GW4000L-DT/GW5000L-DT/ GW6000L-DT/GW8000-DT/GW9000-DT/GW10KN-DT	
System Supplier name		Jiangsu GoodWe Power Supply Technology Co.,Ltd.	
Address		NO.189 Kun Lun Shan Road, Suzhou New District, Jiangsu,china	
Tel	+86 512 6239 7998	Fax	+86 512 6239 7972
E:mail	service@goodwe.com.cn	Web site	http://www.goodwe.com.cn
Maximum rated capacity(use separate sheet if more than one connection option)		Connection Option	
		4	kW three phase
		5	kW three phase
		6	kW three phase
		8	kW three phase
		9	kW three phase
		10	kW three phase
SSEG manufacturer/supplier declaration. I certify on behalf of the company named above as a manufacturer/supplier of Small Scale Embedded Generators, that all products manufactured/supplied by the company with the above SSEG Type reference number will be manufactured and tested to ensure that they perform as stated in this Type Verification Test Report, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of G83/2.			
Signed	 Xie Jing	On behalf of	 Huang min

Power Quality. Harmonics								P
The requirement is specified in section 5.4.1, test procedure in Annex A or B 1.4.1								
SSEG rating per phase (rpp)				3.33KVA		NV=MV*3.68/rpp		
	100% of rated output KW							
	L1		L2		L3			
Harmonic	Measure d Value (MV) in Amps	Normaliz ed Value (NV) in Amps	Measure d Value (MV) in Amps	Normaliz ed Value (NV) in Amps	Measured Value (MV) in Amps	Normaliz ed Value (NV) in Amps	Limit inBS EN61000- 3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0.0958	0.1058	0.0667	0.0738	0.0431	0.0477	1.080	
3rd	0.0839	0.0927	0.0705	0.0779	0.0386	0.0427	2.300	
4th	0.1565	0.1729	0.1397	0.1544	0.1535	0.1697	0.430	
5th	0.0390	0.0431	0.0235	0.0260	0.0519	0.0574	1.140	
6th	0.0365	0.0403	0.0219	0.0242	0.0242	0.0267	0.300	
7th	0.0514	0.0568	0.0602	0.0665	0.0506	0.0559	0.770	
8th	0.0773	0.0854	0.0696	0.0769	0.0621	0.0686	0.230	
9th	0.0146	0.0161	0.0085	0.0094	0.0106	0.0117	0.400	
10th	0.0358	0.0396	0.0399	0.0441	0.0344	0.0380	0.184	
11th	0.0335	0.0370	0.0406	0.0449	0.0331	0.0366	0.330	
12th	0.0154	0.0170	0.0119	0.0131	0.0059	0.0065	0.153	
13th	0.0479	0.0530	0.0386	0.0426	0.0509	0.0563	0.210	
14th	0.0082	0.0091	0.0152	0.0168	0.0189	0.0209	0.131	
15th	0.0131	0.0145	0.0122	0.0135	0.0065	0.0072	0.150	
16th	0.0292	0.0323	0.0329	0.0364	0.0352	0.0389	0.115	
17th	0.0407	0.0450	0.0344	0.0380	0.0330	0.0364	0.132	
18th	0.0065	0.0072	0.0054	0.0059	0.0038	0.0042	0.102	
19th	0.0457	0.0505	0.0456	0.0504	0.0489	0.0540	0.118	
20th	0.0214	0.0237	0.0257	0.0284	0.0220	0.0243	0.092	
21th	0.0045	0.0050	0.0029	0.0033	0.0033	0.0037	0.107	0.160
22th	0.0139	0.0154	0.0166	0.0184	0.0128	0.0141	0.084	
23th	0.0328	0.0362	0.0340	0.0375	0.0312	0.0345	0.098	0.147
24th	0.0079	0.0087	0.0062	0.0069	0.0032	0.0035	0.077	
25th	0.0278	0.0307	0.0214	0.0236	0.0283	0.0313	0.090	0.135
26th	0.0034	0.0038	0.0080	0.0088	0.0082	0.0091	0.071	
27th	0.0089	0.0099	0.0068	0.0075	0.0033	0.0037	0.083	0.124
28th	0.0101	0.0112	0.0149	0.0165	0.0134	0.0148	0.066	
29th	0.0209	0.0231	0.0189	0.0209	0.0137	0.0151	0.078	0.117
30th	0.0049	0.0055	0.0047	0.0052	0.0019	0.0021	0.061	
31th	0.0334	0.0369	0.0295	0.0326	0.0320	0.0353	0.073	0.109
32th	0.0065	0.0072	0.0099	0.0109	0.0092	0.0102	0.058	
33th	0.0050	0.0055	0.0029	0.0032	0.0042	0.0047	0.068	0.102

34th	0.0074	0.0082	0.0103	0.0113	0.0092	0.0102	0.054	
35th	0.0243	0.0268	0.0249	0.0275	0.0213	0.0236	0.064	0.096
36th	0.0052	0.0058	0.0044	0.0049	0.0027	0.0030	0.051	
37th	0.0133	0.0147	0.0089	0.0098	0.0118	0.0130	0.061	0.091
38th	0.0028	0.0031	0.0067	0.0074	0.0062	0.0069	0.048	
39th	0.0060	0.0066	0.0037	0.0041	0.0035	0.0039	0.058	0.087
40th	0.0057	0.0063	0.0035	0.0038	0.0078	0.0086	0.046	
At 45-55% of rated output kW								
	L1		L2		L3			
Harmonic	Measure d Value (MV) in Amps	Normaliz ed Value (NV) in Amps	Measure d Value (MV) in Amps	Normaliz ed Value (NV) in Amps	Measured Value (MV) in Amps	Normaliz ed Value (NV) in Amps	Limit in BS EN61000- 3-2 in Amps	Higher limit for odd harmonics 21 and above
2nd	0.0987	0.1090	0.0759	0.0839	0.0943	0.1042	1.080	
3rd	0.0893	0.0987	0.0839	0.0927	0.0440	0.0487	2.300	
4th	0.1407	0.1555	0.1243	0.1374	0.1379	0.1524	0.430	
5th	0.0810	0.0895	0.0378	0.0417	0.0750	0.0829	1.140	
6th	0.0431	0.0476	0.0285	0.0315	0.0229	0.0253	0.300	
7th	0.1043	0.1153	0.1205	0.1332	0.1082	0.1196	0.770	
8th	0.1098	0.1213	0.0991	0.1095	0.0884	0.0977	0.230	
9th	0.0215	0.0237	0.0167	0.0185	0.0119	0.0131	0.400	
10th	0.0624	0.0689	0.0667	0.0737	0.0583	0.0644	0.184	
11th	0.0665	0.0735	0.0764	0.0844	0.0658	0.0727	0.330	
12th	0.0156	0.0173	0.0154	0.0170	0.0060	0.0066	0.153	
13th	0.0791	0.0874	0.0678	0.0749	0.0881	0.0974	0.210	
14th	0.0144	0.0159	0.0215	0.0238	0.0228	0.0252	0.131	
15th	0.0170	0.0188	0.0172	0.0190	0.0080	0.0088	0.150	
16th	0.0393	0.0434	0.0432	0.0477	0.0481	0.0531	0.115	
17th	0.0645	0.0713	0.0555	0.0614	0.0553	0.0611	0.132	
18th	0.0088	0.0098	0.0091	0.0101	0.0038	0.0042	0.102	
19th	0.0623	0.0688	0.0635	0.0701	0.0702	0.0776	0.118	
20th	0.0311	0.0344	0.0305	0.0337	0.0246	0.0272	0.092	
21th	0.0074	0.0082	0.0078	0.0086	0.0080	0.0089	0.107	0.160
22th	0.0157	0.0174	0.0194	0.0214	0.0184	0.0204	0.084	
23th	0.0434	0.0480	0.0484	0.0535	0.0441	0.0487	0.098	0.147
24th	0.0078	0.0087	0.0070	0.0077	0.0034	0.0037	0.077	
25th	0.0415	0.0459	0.0307	0.0340	0.0411	0.0454	0.090	0.135
26th	0.0153	0.0169	0.0210	0.0232	0.0135	0.0149	0.071	
27th	0.0070	0.0077	0.0095	0.0105	0.0071	0.0078	0.083	0.124
28th	0.0187	0.0206	0.0156	0.0172	0.0219	0.0242	0.066	
29th	0.0261	0.0288	0.0280	0.0309	0.0268	0.0296	0.078	0.117

30th	0.0087	0.0096	0.0049	0.0054	0.0055	0.0060	0.061	
31th	0.0484	0.0535	0.0453	0.0501	0.0528	0.0584	0.073	0.109
32th	0.0145	0.0161	0.0172	0.0190	0.0136	0.0151	0.058	
33th	0.0061	0.0068	0.0095	0.0105	0.0114	0.0126	0.068	0.102
34th	0.0264	0.0292	0.0232	0.0256	0.0231	0.0255	0.054	
35th	0.0330	0.0365	0.0611	0.0675	0.0468	0.0517	0.064	0.096
36th	0.0099	0.0109	0.0122	0.0135	0.0138	0.0153	0.051	
37th	0.0454	0.0502	0.0391	0.0432	0.0519	0.0573	0.061	0.091
38th	0.0168	0.0186	0.0161	0.0178	0.0210	0.0232	0.048	
39th	0.0131	0.0145	0.0122	0.0134	0.0180	0.0199	0.058	0.087
40th	0.0131	0.0145	0.0077	0.0085	0.0153	0.0170	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.

Flicker								P
The requirement is specified in section 5.4.2, test procedure in Annex A or B 1.4.3								
	Starting			Stopping			Running	
	d_{max}	d_c	$d_{(t)}$	d_{max}	d_c	$d_{(t)}$	P_{st}	P_{lt} 2 hours
Measured values	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Normalised to standard impedance and 3.68kW for multiple units	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Limits set under BS EN 61000-3-2	4%	3.3%	3.3% 500ms	4%	3.3%	3.3% 500ms	1.0	0,65
Test start date	2015.12.30 10:20			Test end date			2015.12.30 12:20	

Power quality. DC injection			P
The requirement is specified in section 5.5, test procedure in Annex A or B 1.4.4			
Test level power	10%	55%	100%
Recorded value	L1: 7.96mA L2: 6.18mA L3: 11.25mA	L1: 8.15mA L2: 4.76mA L3: 13.82mA	L1: 2.20mA L2: 7.08mA L3: 5.59mA
As % of ratedAC current	L1: 0.05% L2: 0.04% L3: 0.09%	L1: 0.07% L2: 0.01% L3: 0.09%	L1: 0.001% L2: 0.040% L3: 0.037%
Limit	0.25%	0.25%	0.25%

Power Quality. Power factor					P
The requirement is specified in section 5.6, test procedure in Annex A or B 1.4.2					
	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.	
Measured value	0.999	0.999	0.999		
Limit	>0.95	>0.95	>0.95		

Protection. Frequency test						P
The requirement is specified in section 5.3.1, test procedure in Annex A or B 1.3.3						
Function	Setting		Trip test		No trip test	
	Frequency	Time delay	Frequency	Time delay	Frequency / time	Confirm no trip
U/F stage 1	47.5Hz	20s	47.48 Hz	20.20s	47.7Hz 25s	no trip
U/F stage 2	47Hz	0.5s	46.98 Hz	794.5ms	47.2Hz 19.98s	no trip
					46.8 Hz 0.48s	no trip
O/F stage 1	51.5Hz	90s	51.52 Hz	90.21s	51.3Hz 95s	no trip
O/F stage 2	52Hz	0.5s	52.02Hz	869.6ms	51.8Hz 89.98s	no trip
					52.2Hz 0.48s	no trip

Protection. Voltage test						P
The requirement is specified in section 5.3.1, test procedure in Annex A or B 1.3.2						
Function	Setting		Trip test		No trip test	
	Voltage	Time delay	Voltage	Time delay	Voltage / time	Confirm no trip
U/V stage 1	200.1V	2.5s	199.1 V	2.91s	204.1V 3.5s	no trip
U/V stage 2	184V	0.5s	183 V	909.4ms	188V 2.48s	no trip
					180v 0.48 sec	no trip
O/V stage 1	262.2V	1.0s	263.2 V	1.42s	261.9V 1.41sec	no trip
O/V stage 2	273.7V	0.5s	274.7 V	944.7ms	269.7V 0.922s	no trip
					277.7V 0.48s	no trip

Protection. Loss of Mains test

Inverters can be tested to BS EN 62116.

Test Power and imbalance	33% -5% Q	66% -5% Q	100% -5% P	33% +5% Q	66% +5% Q	100% +5% P
Trip time. Limit is 0.5s	0.358	0.416	0.385	0.376	0.394	0.426

Protection. Frequency change, Stability test

The requirement is specified in section 5.3.3, test procedure in Annex A or B 1.3.6

P

	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

Protection. Re-connection time

The requirement is specified in section 5.3.4 Automatic Reconnection, test procedure in Annex A or B 1.3.5

P

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 1.

Voltage				
Time delay setting		Measured delay time(s)		
20s		51.1 s		
Frequency				
Time delay setting		Measured delay time(s)		
20s		51.8 s		
	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 266.2V	At 196.1V	At 47.4Hz	At 51.6Hz
Confirmation that the SSEG does not re-connect.	no reconnection	no reconnection	no reconnection	no reconnection

Short circuit Current Contribution					P
The requirement is specified in section 5.7, test procedure in Annex A or B 1.4.6					
For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	-	-	20ms	9.6V	308mA
Initial Value of aperiodic current	-	-	100ms	9.6V	161mA
Initial symmetrical short-circuit current*	-	-	250ms	9.3V	116mA
Decaying (aperiodic) component of short circuit current*	-	-	500ms	9.1V	113mA
Reactance/Resistance Ratio of source*	-	-	Time to trip	720μs	In seconds

Self-Monitoring Solid state Disconnection	N/A
The requirement is specified in section 5.3.1, No specified test requirements.	
Not applicable since electro-mechanical relays are used.	

Additional comments
GW4000-DT/GW5000-DT/GW6000-DT/GW4000L-DT/GW5000L-DT/GW6000L-DT/GW8000-DT/GW9000-DT is similar to GW10KN-DT in circuit and construction except for output rating of current and power. The test result can refer to GW10KN-DT.