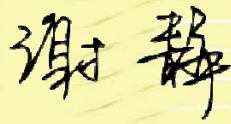



## G59/3 TYPE TEST VERIFICATION REPORT

<b>Type Tested reference number</b>		GW5048D-ES, GW4248D-ES	
<b>System supplier name</b>		Jiangsu GoodWe Power Supply Technology Co.,Ltd.	
<b>Address</b>		NO.189 Kun Lun Shan Road, Suzhou New District, Jiangsu,china	
<b>Tel</b>	+86 512 6239 7998	<b>Fax</b>	+86 512 6239 7972
<b>E:mail</b>	service@goodwe.com.cn	<b>Web site</b>	http://www.goodwe.com.cn
<b>Maximum export capacity, use separate sheet if more than one connection option.</b>	4.6	<b>kW single phase</b>	
	4.2	<b>kW single phase</b>	
<p>System supplier declaration.</p> <p>- 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.</p>			
<b>Signed</b>		<b>On behalf of</b>	

**Power Quality. Harmonics.**

Generating Unit tested to BS EN 61000-3-12

Generating Unit (rpp)		rating per phase	4.6	kVA	Harmonic % = Measured Value (Amps) x 23/rating per phase (kVA)	
Harmonic	At 45-55% of rated output		100% of rated output		Limit in BS EN 61000-3-12	
	Measured Value MV in Amps	%	Measured Value MV in Amps	%	1 phase	3 phase
2	0.010	0.05%	0.005	0.03%	8%	8%
3	0.322	1.61%	0.317	1.59%	21.6%	Not stated
4	0.010	0.05%	0.011	0.06%	4%	4%
5	0.026	0.13%	0.019	0.10%	10.7%	10.7%
6	0.003	0.02%	0.003	0.02%	2.67%	2.67%
7	0.013	0.07%	0.011	0.06%	7.2%	7.2%
8	0.008	0.04%	0.005	0.03%	2%	2%
9	0.007	0.04%	0.009	0.05%	3.8%	Not stated
10	0.008	0.04%	0.006	0.03%	1.6%	1.6%
11	0.009	0.05%	0.009	0.05%	3.1%	3.1%
12	0.005	0.03%	0.006	0.03%	1.33%	1.33%
13	0.006	0.03%	0.005	0.03%	2%	2%
THD	0.362	1.81%	0.264	1.32%	23%	13%
PWHD	0.548	2.74%	0.538	2.69%	23%	22%

**Power Quality. Voltage fluctuations and Flicker.** The tests should be carried out on a single Generating Unit. Results should be normalised 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	
	d max	d c	d(t)	d max	d c	d(t)	P st	P lt 2 hours
Measured Values at test impedance	0.52%	0.28%	0	0.76%	0.35%	0.27%	0.05	0.07
Normalised to standard impedance	0.58%	0.31%	0.00%	0.85%	0.39%	0.30%	0.06	0.09
Normalised to required maximum impedance	0.65%	0.35%	0.00%	0.95%	0.44%	0.34%	0.07	0.09
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	0.356	$\Omega$	XI	0.235	$\Omega$		
Standard Impedance	R	0.4	$\Omega$	XI	0.25	$\Omega$		
Maximum Impedance	R	0.358	$\Omega$	XI	0.246	$\Omega$		

**Power quality. DC injection.**

Test power level	10%	55%	100%
Recorded value in Amps	0.041	0.036	0.018
as % of rated AC current	0.21%	0.18%	0.09%
Limit	0.25%	0.25%	0.25%

**Power Quality. Power factor.** The tests should be carried out on a single Generating Unit. Test are to be carried out at three voltage levels and at full output. Voltage to be maintained within + or – 1.5% of the stated level during the test.

	216.2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within + or – 1.5% of the stated level during the test.
Measured value	0.998	0.999	0.999	
Limit	>0.95	>0.95	>0.95	

### 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	51.5Hz	90s	51.47 Hz	90.35 s	51.3Hz 95s	no trip
O/F stage 2	52Hz	0.5s	51.97 Hz	804 ms	51.8Hz 89.98s	no trip
					52.2Hz 0.48s	no trip
U/F stage 1	47.5Hz	20s	47.53 Hz	20.24 s	47.7Hz 25s	no trip
U/F stage 2	47Hz	0.5s	47.03 Hz	751 ms	47.2Hz 19.98s	no trip
					46.8 Hz 0.48s	no trip

**Protection. Voltage tests**

Function	Setting		Trip test		"No trip-tests" All phases at same voltage	
	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
O/V stage 1	262.2V	1.0s	261.2 V	1.42 s	258.2V 2.0 sec	no trip
O/V stage 2	273.7V	0.5s	270.7 V	754 ms	269.7V 0.98s	no trip
					277.7V 0.48s	no trip
U/V stage 1	200.1V	2.5s	202.3 V	2.84 s	204.1V 3.5s	no trip
U/V stage 2	184V	0.5s	185.6 V	835ms	188V 2.48s	no trip
					180v 0.48 sec	no trip

**Protection. Loss of Mains test and single phase test.**

Test Power and imbalance	33%	66%	100%	33%	66%	100%
	-5% Q	-5% Q	-5% P	+5% Q	+5% Q	+5% P
Trip time. Limit is 0.5s	0.416	0.399	0.425	0.437	0.468	0.429

<b>Protection. Frequency change, Stability test</b>				
	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	+0.19Hzs <sup>-1</sup>	51.5Hz	no trip
Negative Frequency drift	50.5Hz	-0.19Hzs <sup>-1</sup>	47.5Hz	no trip

<b>Protection. Re-connection timer.</b> The tests should prove that the reconnection sequence starts in no less than 20s for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1					
Test should prove that the reconnection sequence starts in no less than 20s for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1					
Time delay setting (s)	Measured delay (s)	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 10.5.7.1.			
20s	43.2s	At 266.2V	At 196.1V	At 47.4Hz	At 51.6Hz
Confirmation that the Generating Unit does not re-connect		no reconnection	no reconnection	no reconnection	no reconnection

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	18.6V	159mA
Initial Value of aperiodic current	$A$	---	100ms	15.7V	356mA
Initial symmetrical short-circuit current*	$I_k$	---	250ms	14.2V	308mA
Decaying (aperiodic) component of short circuit current*	$i_{DC}$	---	500ms	13.2V	352mA
Reactance/Resistance Ratio of source*	$X/R$	---	Time to trip	768 $\mu$ s	

Self Monitoring solid state switching	NA
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	

Additional comments
GW4248D-ES is similar to GW5048D-ES in circuit and construction except for output rating of current and power. The test result can refer to GW5048D-ES .