CERTIFICATE G83/2

Product Model: Growatt SPH3000/ Growatt SPH3600

Nominal AC Power: 3000W/3680W
MAX. AC Power: 3000W/3680W

Manufacturer: Growatt New Energy Technology Co., Ltd.

Address: 1st East & 3rd Floor, Jiayu Industrial Zone, Xibianling, Shangwu Village,Shiyan, Baoan District, Shenzhen, P.R. China

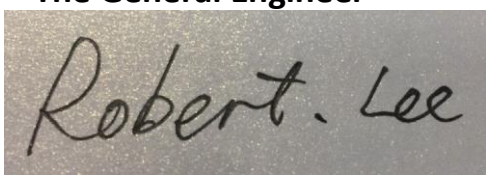
Test Lab: Growatt R&D Test Lab

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.

Test Details:
- Under / Over voltage switch off
- Under / Over frequency switch off
- Loss of mains test
- Power quality: Harmonic current emissions as per BS EN 61000-3-2
- Power quality: Power factor
- Power quality: Voltage fluctuations and flicker as per BS EN 61000-3-3
- Power quality: DC injection

Growatt New Energy Technology CO., LTD

The General Engineer



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TEST I: UNDER/OVER VOLTAGE TEST						
Function	**Setting**		**Trip test**		**"No trip tests"**	
	Voltage	**Time delay**	**Voltage**	**Time delay**	**Voltage /time**	**Confirm no trip**
U/V stage 1	200.1V	2.5s	199.1V	2.56s	204.1V 3.5s	No Trip
U/V stage 2	184V	0.5s	183.5V	0.548s	188V 2.48s	No Trip
					180V 0.48s	No Trip
O/V stage 1	262.2V	1.0s	262.8V	1.04s	258.2V 2.0s	No Trip
O/V stage 2	273.7V	0.5s	274.9V	0.554s	269.7V 0.98s	No Trip
					277.7V 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.						

TEST II: UNDER/OVER FREQUENCY TEST						
Function	**Setting**		**Trip test**		**"No trip tests"**	
	Frequency	**Time delay**	**Frequency**	**Time delay**	**Frequency /time**	**Confirm no trip**
U/F stage 1	47.5Hz	20s	47.48Hz	20.06s	47.7Hz 25s	No Trip
U/F stage 2	47Hz	0.5s	46.98Hz	0.50s	47.2Hz 19.98s	No Trip
					46.8Hz 0.48s	No Trip
O/F stage 1	51.5Hz	90s	51.52Hz	93.19s	51.3Hz 95s	No Trip
O/F stage 2	52Hz	0.5s	52.00Hz	0.548s	51.8Hz 89.98s	No Trip
					52.2Hz 0.48s	No Trip

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TEST III: LOSS OF MAINS PROTECTION				
Parameter	**10% of power**	**55% of power**	**100% of power**	**Note**
G59/3 Limit	0.5s	0.5s	0.5s	
Trip setting,sec	-	-	-	
Trip value,sec	0.308S	0.331S	0.331S	

TEST IV: POWER QUALITY TEST-HARMONICS								
Parameter	**2nd**	**3rd**	**5th**	**7th**	**9th**	**11th**	**13th**	**15th....39th**
G59/3 Limit(A)	1.08	2.3	1.14	0.77	0.4	0.33	0.21	0.15x(15/n)
Test value	0.047	0.088	0.053	0.030	0.050	0.008	0.016	<limit BS EN 61000-3-2

TEST V: POWER QUALITY TEST-POWER FACTOR				
Parameter	**212V**	**230V**	**250V**	**Note**
G59/3 Limit	0.95lag-0.95lead	0.95lag-0.95lead	0.95lag-0.95lead	
Measured	0.995	0.995	0.994	@full load

TEST VI: POWER QUALITY TEST- VOLTAGE FLICKER					
Parameter	**Starting**	**Stopping**	**Running**		**Note**
G59/3 Limit	4%	4%	P_{st} =1.0	P_{it} = 0.65	
Test Value	<1.08%	<1.08	0.27	0.17	

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TEST VII: POWER QUALITY TEST- DC INJECTION				
Test level	**10% power**	**55% power**	**100% power**	**Note**
Recorded value	38.6mA	35.5mA	33.6mA	
as % of rated AC current	0.241%	0.221%	0.21%	
Limit	0.25%	0.25%	0.25%	

TEST VIII: RECONNECTION TIMES					
Time delay setting	**Measured delay**	**Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1**			
20s	34.2s	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**

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