



66 Treffers Road, Christchurch, 8042, New Zealand  
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## Certificate G59/2

### TYPE VERIFICATION TEST SHEET

#### GENERATING PLANT DETAILS

Generating Plant Type Reference:		<b>EnaSolar 4kWGT-UK</b>	
Generating Plant Technology (as per Annex):		Photovoltaic	
Manufacturer:	Address:	Telephone:	Fax:
EnaSolar Ltd	66 Treffers Road Christchurch 8042 New Zealand	0064 3 366 4550	0064 3 366 0884
Maximum Export Capability) (Generating Plant Rating Less Parasitic Load)		4000W	

#### TEST HOUSE DETAILS

Name and Address of Test House	EnaSolar Ltd 66 Treffers Road Christchurch 8042 New Zealand
Telephone Number	+64 3 366 4550
Facsimile Number	+64 3 366 0884
Email Address	support@enasolar.net

#### TEST DETAILS

Date of Test	December 2013
Name of Tester	Jesse Gao
Signature of Tester	
Test Location if Different from Above	Same as above

# Test Results

## POWER QUALITY

Harmonic Current Emissions								
Minimal Short Circuit Ratio $R_{scc}$ :							33	
Value of Short Circuit Power $S_{sc}$ corresponding to $R_{scc}$ :							396kVA	
Equipment Phases:							Single Phase	
Description	Harmonic Current % = $100I_n/I_1$						Harmonic Current Distortion Factors (%)	
Harmonic	3rd	5th	7th	9th	11th	13th	THD	PWHD
Limit*	21.6	10.7	7.2	3.8	3.1	2	23	23
Actual Values:	0.87	1.57	1.71	1.64	1.51	1.13	3.87	5.22

\*Maximum permissible harmonic current As per BS EN 61000-3-12 Table 2

Voltage Fluctuation and Flicker					
Equipment meets BSEN 61000-3-3?					No
If equipment does not meet BSEN 61000-3-3:					
i) Does equipment require a supply rated $\geq 100A$ ?					No
ii) If answer to i) is no, specify the value of $Z_{ref}$ :					$(0.4+j25)\#$
Voltage Disturbance					
	$P_{st}$	$P_{lt}$	$d(t)>3.3\%$	$d_c\%$	$d_{max}\%$
Limit at $Z_{ref}$ *	1.0	0.65	0.5	3.3	4.0
Actual Values #:	0.05	0.05	0	0.05	0.21

\*Detailed requirements are specified in BS EN 61000-3-3 and BS EN 61000-3-11

#Per Austest report "0803ENA\_4.0&5.0kWGT 61000-3-11.12"

	DC injection			Power Factor		
G59/2 Limit	20mA, tested at three power levels			0.95 lag-0.95 lead at three voltage levels		
Test Level	10%	55%	100%	212V	230V	248V
Actual Values:	8mA	13mA	10mA	0.999	0.999	0.999

\*Measured values are below 0.25% of the rated current

## UNDER/OVER FREQUENCY TESTS

	G59/2 Limit		Setting		Test Results	
	Frequency	Max Time	Frequency	Time	Frequency	Time
Under frequency Stage 1	47.5Hz	20s	47.5Hz	19.9s	47.45Hz	19.7s
Under frequency Stage 2	47Hz	0.5s	47Hz	0.4s	46.95Hz	0.42s
Over frequency Stage 1	51.5Hz	90s	51.5Hz	89s	51.55Hz	89.1s
Over frequency Stage 2	52Hz	0.5s	52Hz	0.4s	52.05Hz	0.42s

## UNDER/OVER VOLTAGE TESTS

	G59/2 Limit		Setting		Test Results	
	Voltage	Max Time	Voltage	Time	Voltage	Time
Under voltage Stage 1	208.8V	2.5s	208.8V	2.4s	208.3V	2.4s
Under voltage Stage 2	192V	0.5s	192V	0.4s	191.0	0.41s
Over voltage Stage 1	264V	1.0s	264V	0.9s	265V	0.95s
Over voltage Stage 2	276V	0.5s	276V	0.4s	277.5V	0.41s

## LOSS OF MAINS TEST

Method Used	Reactive current injection		
Output Power Level	400W (10%)	2200W (55%)	4000W (100%)
G59/2 Limit (max)	2.5s	2.5s	2.5s
Trip Setting	NA	NA	NA
Actual Values:	0.14s	0.36s	0.59s

## RECONNECTION TIMES

Reconnection Time	Under/Over Voltage	Under/Over Frequency	Loss of Mains
Minimum Value	180 seconds	180 seconds	180 seconds
Actual Setting	180 seconds	180 seconds	180 seconds
Recorded Value	180 seconds	183 seconds	180 seconds

## FAULT LEVEL CONTRIBUTION

As Photovoltaic Generating Plants are inverter connected, they are deemed to comply with regulations and no further tests are required.

## SELF MONITORING – SOLID STATE SWITCHING

Not applicable as electro-mechanical relays are used.

## COMMENTS

These tests have been carried out with the specifications and parameters set to meet the requirements of G59/2. It is hereby declared by the manufacturer that all units shipped to the UK will have identical parameter settings and that these parameters cannot be changed by a user, installer or any other person without the use of password protected software.