



ENGINEERING RECOMMENDATION G59/1  
ENGINEERING RECOMMENDATION G83/1

MATERIALS & SAFETY - R&D

TR 10069

page 1 of 4

## APPENDIX 4 TYPE VERIFICATION TEST SHEET

### SSEG DETAILS

SSEG Type reference:		<i>Fronius IG Plus 35-1</i>
SSEG Technology:		<i>Photo voltaic (Annex C)</i>
Manufacturer:  <i>Fronius International GmbH</i>	Tel: <i>+43-7242-241-0</i>	Address:  <i>Guenter Fronius Str 1 4600 Wels-Thalheim, Austria</i>
	Fax: <i>+43-7242-241-224</i>	
Technical file reference No.:		
Maximum export capability (SSEG rating less parasitic load)		<i>3500 W</i>

### TEST HOUSE DETAILS

Name and address of test house	<i>Fronius R&amp;D Laboratories, Fronius International GmbH, Guenter Fronius Str 1, A-4600 Wels-Thalheim, Austria</i>
Telephone number	<i>+43-7242-241-0</i>
Facsimile number	<i>+43-7242-241-224</i>
E-mail address	<i>pv@fronius.com</i>

### Test details

Date of test	<i>26.06.2008</i>
Name of test Engineer	<i>Riedler Peter</i>
Signature of test Engineer	
Test location if different from above	



# ENGINEERING RECOMMENDATION G59/1 ENGINEERING RECOMMENDATION G83/1

## POWER QUALITY

Harmonic current emissions (A)								
Maximum permissible harmonic current as per BS EN 61000-3-2								
Harmonic	2 <sup>nd</sup>	3 <sup>rd</sup>	5 <sup>th</sup>	7 <sup>th</sup>	9 <sup>th</sup>	11 <sup>th</sup>	13 <sup>th</sup>	15 <sup>th</sup> – 39 <sup>th</sup>
Limit	1,08	2,3	1,14	0,77	0,4	0,33	0,21	0,15x(15/n)
Test value (max value of Phase1,2,3)	0,014	0,217	0,074	0,065	0,057	0,054	0,052	See TR LF 08003

Voltage fluctuations and flicker see Fronius Test report LF 08004

Power factor			
Protection Limit	+0.95 lag–0.95 at three voltage levels		
	212 V (*)	230 V	248 V
Test value	0,99	0,99	0,99

\*Indicative values are shown for minimum, medium and maximum power levels

## UNDER / OVER FREQUENCY TESTS

Parameter	Under Frequency		Over Frequency	
	Frequency (Hz)	Time (s)	Frequency (Hz)	Time (s)
G59/1 Limit	47 Hz	0,5 sec	50,5 Hz	0,5 sec
G83/1 Limit	47 Hz	0,5 (5.0) sec	50,5 Hz	0,5 (5.0) sec
Actual setting	47,01Hz	---	50,49 Hz	---
Trip value	47Hz	<0,5s	50,5Hz	<0,5s



## UNDER / OVER VOLTAGE TESTS

SSEG is configured to comply with the lower over voltage trip value.

Parameter	Under Voltage		Over Voltage	
	Voltage (V)	Time (s)	Voltage (V)	Time (s)
G59/1 Limit	207 V	0,5 sec	253 V	0,5 sec
G83/1 Limit	207 V	5,0 sec	264 V	5,0 sec
Actual setting	209 V	---	251 V	---
Trip value	208V	<0,5s	252V	<0,5s

## LOSS OF MAINS TEST

According G83/1 requirements

Method used	Frequency shift		
Output power %	10%	55%	100%
Trip setting	---	---	---
Trip value	<0,5s	<0,5s	<0,5s

\*indicative values are shown for minimum, medium and maximum power levels.

## RECONNECTION TIMES

SSEG is configured to comply with the higher reconnection trip value.

Parameter	Under/Over voltage	Under/Over Frequency	Loss of mains
G59/1 min value	60 seconds	60 seconds	---
G77/1 min value	180 seconds	180 seconds	180 seconds
Actual setting	185 seconds	185 seconds	185 seconds
Recorded value	185seconds	185seconds	185seconds



## SSEG SHORT CIRCUIT TEST

According G83/1 §C4.6 Photovoltaic SSEG's are deemed to automatically comply with clause 5.8 and no further tests are required.

## SELF MONITORING – SOLID STATE SWITCHING

According G59/1 requirements

Test	Voltage
Confirm that the AC output voltage collapses to a value below 50 volts in the event that the solid state switch fails to operate.	-----
<i>Comments: not applicable as electro-mechanical relays are used</i>	

## OVERCURRENT

Caused by the technology of solar inverters, according G59/1 the energy output is limited by the hardware itself. The supervised current can not reach out of limits, additional dc current is limited by a line protective switch.

## NEUTRAL VOLTAGE DISPLACEMENT

According G59/1, phase-neutral voltage is measured and supervised to reside between trip values. If an NVD occurs, the device detects an under / over voltage failure. Supplementary the device supports anti-islanding functions, so the risk of islanding is very low and NVD protection is not required.

## A2.4 COMMENTS

The Line\_fAC\_TripTime has been changed from 24 to 22, because when the trip time would amount 24, it would not be able to switch the inverter under 0,5s.