



# ENGINEERING RECOMMENDATION G59/1 ENGINEERING RECOMMENDATION G83/1

MATERIALS & SAFETY - R&D

TR 10076

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## APPENDIX 4 TYPE VERIFICATION TEST SHEET

### SSEG DETAILS

SSEG Type reference:		<i>Fronius IG Plus 150-3</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)		12000 W

### 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	26.06.2008
Name of test Engineer	Riedler Peter
Signature of test Engineer	
Test location if different from above	



## POWER QUALITY

<b>Harmonic current emissions (A)</b> 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)	0,030	0,250	0,064	0,055	0,053	0,055	0,048	See TR LF 08017

<b>Harmonic current emissions (A)</b> Maximum permissible harmonic current as per BS EN 61000-3-12								
Harmonic	2 <sup>nd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	7 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	13 <sup>th</sup>	15 <sup>th</sup> – 39 <sup>th</sup>
Limit	1,4	0,70	7,01	4,38	0,28	2,63	1,75	0,15x(15/n)
Test value (max value of Phase1,2,3)	0,059	0,019	0,080	0,065	0,008	0,059	0,053	See TR LF 08017

Voltage fluctuations and flicker see Fronius Test report LF 08019

<b>Power factor</b>			
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.