APPENDIX 2 Type Test Certification Test Result Sheet

Micro-generator details

MICRO-GENERATOR Type reference: *Fronius Symo 4.5-3-S*		
Maximum continuous rating: 4500W		
Manufacturer: *Fronius International GmbH*	Tel: *+43-7242-241-0* Fax: *+43-7242-241-224*	Address: *Guenter Fronius Str 1* *4600 Wels-Thalheim, Austria*
Technical file reference No.:		

Test house details

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

POWER QUALITY

Harmonic current emissions (A) Maximum permissible harmonic current as per BS EN 61000-3-2								
Harmonic	2nd	3rd	5th	7th	9th	11th	13th	15th – 39th
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)	*0.051*	*0.079*	*0.101*	*0.044*	*0.058*	*0.043*	*0.046*	*See TR LF 13030*

Voltage Fluctuations and Flicker				
	Starting	Stopping	Running	
Limit*	4%	4%	P_{st} = 1.0	P_{lt} = 0.65
Test value	0 **	0 **	0,137 **	0.135 **

*Maximum permissible voltage fluctuation (expressed as a percentage of nominal voltage at 100% power) and flicker. As per BS EN 61000-3-11.

** The EUT itself does not produce flicker relevant variations of the line current, startup is made using a ramp function and does therefore not create relevant d_{MAX} values.
Solar power variations naturally lead to variations of the electric power fed into the grid, however these variations are not significant for P_{ST} and P_{LT}.

	Power factor		
Protection Limit	+0.95 lag–0,95 at three voltage levels		
	210 V	230 V	250 V
Test value	1,00	1,00	1,00

Under / Over frequency tests

	Under Frequency		Over Frequency	
Parameter	Frequency (Hz)	Time (s)	Frequency (Hz)	Time (s)
Protection limit	48 Hz	0,5 sec	50,5 Hz	0,5 sec
Actual setting	48,02 Hz	0,48 sec	50,48 Hz	0,48 sec
Trip value	48,015 Hz	0,492 sec	50,493 Hz	0,498 sec

Under / Over voltage tests (single stage protection)

	Under Voltage		Over Voltage	
Parameter	Voltage (V)	Time (s)	Voltage (V)	Time (s)
Protection limit	207 V	0,5 sec	253 V	0,5 sec
Actual setting	209,00 V	0,48 sec	250,40 V	0,48 sec
Trip value	207,98 V	0,498 sec	252,62 V	0,498 sec

LoM test

Method used	Frequency shift		
Output power level*	10%	55%	100%
Trip setting clearance time	0,5 sec	0,5 sec	0,5 sec
Trip value clearance time	0,390 sec	0,443 sec	0,442 sec

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

Fault level contribution

Micro-generator short-circuit parameters					
For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	i_p	--	20ms	142V	11,5A
Initial Value of aperiodic current	A	--	100ms	70,9V	7,51A
Initial symmetrical short-circuit current*	I_k	--	250ms	46V	6,72A
Decaying (aperiodic) component of short circuit current*	i_{DC}	--	500ms	33,1V	6,43A
Reactance/Resistance Ratio of source*	X/R	--	Time to trip	14ms	In milliseconds

COMMENTS