



Świadectwo zgodności

Zgłaszający: Steca Elektronik GmbH
Mammostraße 1
87700 Memmingen
Germany

Produkt: Sieciowy falownik fotowoltaiczny (PV)

Model: StecaGrid 3203x, StecaGrid 3203, StecaGrid 4003x, StecaGrid 4003, StecaGrid 5003x, StecaGrid 5003, StecaGrid 6003x, StecaGrid 6003

Zastosowanie zgodnie z przepisami:

Automatyczne urządzenie wyłączające, monitorujące sieć trójfazową w systemach fotowoltaicznych z obwodem równoległym trójfazowym poprzez przetwornicę w publicznej sieci zasilania. Automatyczne urządzenie wyłączające stanowi część wyżej wymienionej przetwornicy.

Zastosowane przepisy i normy:

EN 50438:2013, PN-EN 50438:2014

Wymagania dla instalacji mikrogeneracyjnych przeznaczonych do równoległego przyłączania do publicznych sieci dystrybucyjnych niskiego napięcia

DIN V VDE V 0126-1-1:2006-02 (bezpieczeństwo funkcjonalne)

Automatyczne urządzenie odłączające między generatorem a publiczną siecią niskiego napięcia

W momencie wydania niniejszego certyfikatu pojęcie zabezpieczenia interfejsu wyżej wymienionego, reprezentatywnego produktu spełnia wymagania bezpieczeństwa obowiązujące dla określonego zastosowania zgodnie z przepisami.

Numer raportu: 13TH0511-EN50438-2013_0
Numer świadectwa: U18-0553
Data wydania: 2018-09-25



Holger Schaffer

Institut certyfikacji Bureau Veritas Consumer Products Services Germany GmbH
Akredytowane zgodnie z normą DIN EN ISO/IEC 17065



Appendix E Type Verification Test Report

Extract from test report according to EN 50438

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Type Approval and declaration of compliance with the requirements of EN 50438.

Manufacturer / applicant:	Steca Elektronik GmbH Mammostraße 1 87700 Memmingen Germany			
Micro-generator Type	Grid-tied photovoltaic inverter			
Rated values	StecaGrid 3203x	StecaGrid 3203	StecaGrid 4003x	StecaGrid 4003
Maximum rated capacity	3200W		4000W	
Rated voltage	230V / 400 V			
Rated values	StecaGrid 5003x	StecaGrid 5003	StecaGrid 6003x	StecaGrid 6003
Maximum rated capacity	5000W		6000W	
Rated voltage	230V / 400 V			
Firmware version	ENS_PAR V23.07			
* The tests were performed with Firmwareversion V23.07. Changes in the Firmwareversion on position 23.xx has no effect on the required electrical properties. x = could be any number or sign				
Measurement period:	2018-05-02 to 2018-05-29			

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Description of the structure of the power generation unit (Figure 1):

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on two series-connected relays in line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

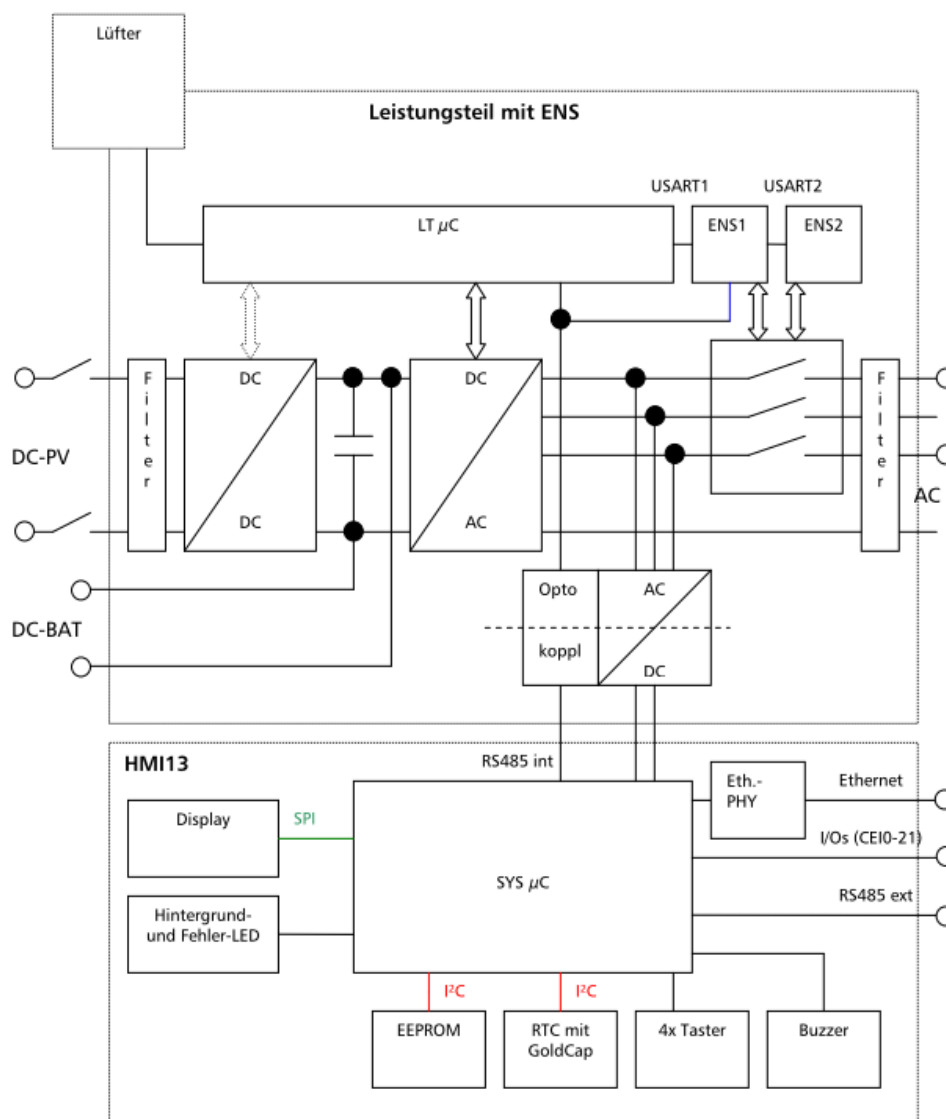


Figure 1 – Schematic structure of the power generation unit

The above stated micro-generators are tested according to the requirements in the EN 50438. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the EN 50438.

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Type testing of the interface protection

Over-/under-voltage tests

Phase1						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]
Over-voltage stage 1	253,0	600*	253,0	600*	253,0	529*
Over-voltage stage 2	264,5	0,2	264,5	0,2	262,3	0,190
Under-voltage stage 1	195,5	1,5	195,5	1,5	197,7	1,48
Phase2						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]
Over-voltage stage 1	253,0	600*	253,0	600*	253,0	529*
Over-voltage stage 2	264,5	0,2	264,5	0,2	262,5	0,192
Under-voltage stage 1	195,5	1,5	195,5	1,5	197,7	1,49
Phase3						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]
Over-voltage stage 1	253,0	600*	253,0	600*	253,0	529*
Over-voltage stage 2	264,5	0,2	264,5	0,2	262,4	0,190
Under-voltage stage 1	195,5	1,5	195,5	1,5	197,6	1,48

Note.

Minimum operation time according to default interface protection:

Over-voltage stage 1 600s

Over-voltage stage 2 0,1s

Under-voltage 1,2s

* The over-voltage-stage 1 is a 10-min-mean-value according to EN 50160. The disconnection after detection of an overvoltage at the 10-min-mean-value takes place within 200ms.

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Over-/under-frequency tests						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Frequency [Hz]	Disconnection time [s]	Frequency [Hz]	Disconnection time [s]	Frequency [Hz]	Disconnection time [s]
Over-frequency	52,00	0,5	52,00	0,5	51,97	0,497
Under-frequency	47,50	0,5	47,50	0,5	47,54	0,497
Note. Minimum operation time according to default interface protection: Over-frequency 0,5 s Under-frequency 0,5 s						

LoM test						
Method used	EN 62116					
Balancing load on islanded network	33% of -5% Q Test 22	66% of -5% Q Test 12	100% of -5% P Test 5	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time. Phase 1 fuse removed [ms]	912	1133	993	729	1232	949
Trip time. Phase 2 fuse removed [ms]	912	1133	993	729	1232	949
Trip time. Phase 3 fuse removed [ms]	912	1133	993	729	1232	949

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Type testing of a micro-generator

Operating range

Test 1: U = 195,5 V; f = 47,5 Hz; P = 1,00 Sn; cosφ = 1

Test 2: U = 253,0 V; f = 51,5 Hz; P = 1,00 Sn; cosφ = 1

Test sequence	Voltage [V]	Frequency [Hz]	Output power [W]	Cos φ [1]
1	195,4	47,50	5983	1,00
2	253,0	51,49	6007	1,00

Active power at under-frequency

5-min mean value (each)	a) 50 ± 0,01 [Hz]	b) - 0,4 to - 0,5 [Hz]	c) - 2,4 to - 2,5 [Hz]
Frequency [Hz]:	50,00	49,60	47,60
Active power [kW]:	5952	5954	5952
ΔP/PM [%] per 1 Hz:			0,5

Power response to over-frequency

1-min mean value [Hz]:	a) 50,00	b) 50,25	c) 50,70	d) 51,14	e) 50,70	f) 50,25	g) 50,00
1. Measurement a) to g): Active power output > 80% P _n							
Frequency [Hz]:	50,00	50,25	50,70	51,14	50,70	50,25	50,00
PM [kW]:	N/A	5,88	4,79	3,73	4,79	5,88	N/A
PE60 [kW]:	5,99	5,87	4,83	3,77	4,75	5,83	5,95
ΔPE60/PM [%]:	N/A	-0,09	0,65	0,63	-0,82	-0,88	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% P _n							
Frequency [Hz]:	50,00	50,25	50,70	51,14	50,70	50,25	50,00
PM [kW]:	N/A	2,99	2,44	1,89	2,44	2,99	N/A
PE60 [kW]:	3,04	2,99	2,46	1,91	2,41	2,96	3,29
ΔPE60/PM [%]:	N/A	0,11	0,35	0,24	-0,39	-0,44	N/A
Limit ΔP/P _{1min} :	+ 10 % of P _M						

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Reactive power				
Uncontrollable reactive power				
Test Voltage	211,6V	230V	248,4V	
Output power				
25% PN	0,988	0,998	0,997	
50% PN	0,999	0,999	0,999	
75% PN	0,999	0,999	0,989	
100% PN	0,999	0,999	0,999	
Limit	>0,95	>0,95	>0,95	

Controllable reactive power				
Inductive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	400,83	-1179,09	-0,32	447,30
10% - 20%	927,56	-2532,30	-0,34	991,99
20% - 30%	1529,44	-2640,43	-0,50	1601,62
30% - 40%	2130,68	-2640,23	-0,63	2207,90
40% - 50%	2659,28	-2638,21	-0,71	2744,28
50% - 60%	3342,21	-2632,87	-0,79	3438,33
60% - 70%	3932,61	-2626,06	-0,83	4042,50
70% - 80%	4516,64	-2619,16	-0,86	4642,63
80% - 90%	5086,34	-2605,03	-0,89	5230,86
90% - 100%	5398,99	-2599,14	-0,90	5558,07

Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	341,18	930,05	0,36	384,79
10% - 20%	933,12	2471,65	0,35	992,42
20% - 30%	1529,94	2660,53	0,50	1595,53
30% - 40%	2129,74	2658,05	0,63	2201,91
40% - 50%	2727,08	2659,35	0,72	2801,48
50% - 60%	3276,90	2659,08	0,78	3353,75
60% - 70%	3927,77	2664,52	0,83	4018,81
70% - 80%	4514,92	2666,97	0,86	4614,13
80% - 90%	5090,86	2676,15	0,89	5223,28
90% - 100%	5382,83	2682,57	0,90	5523,63

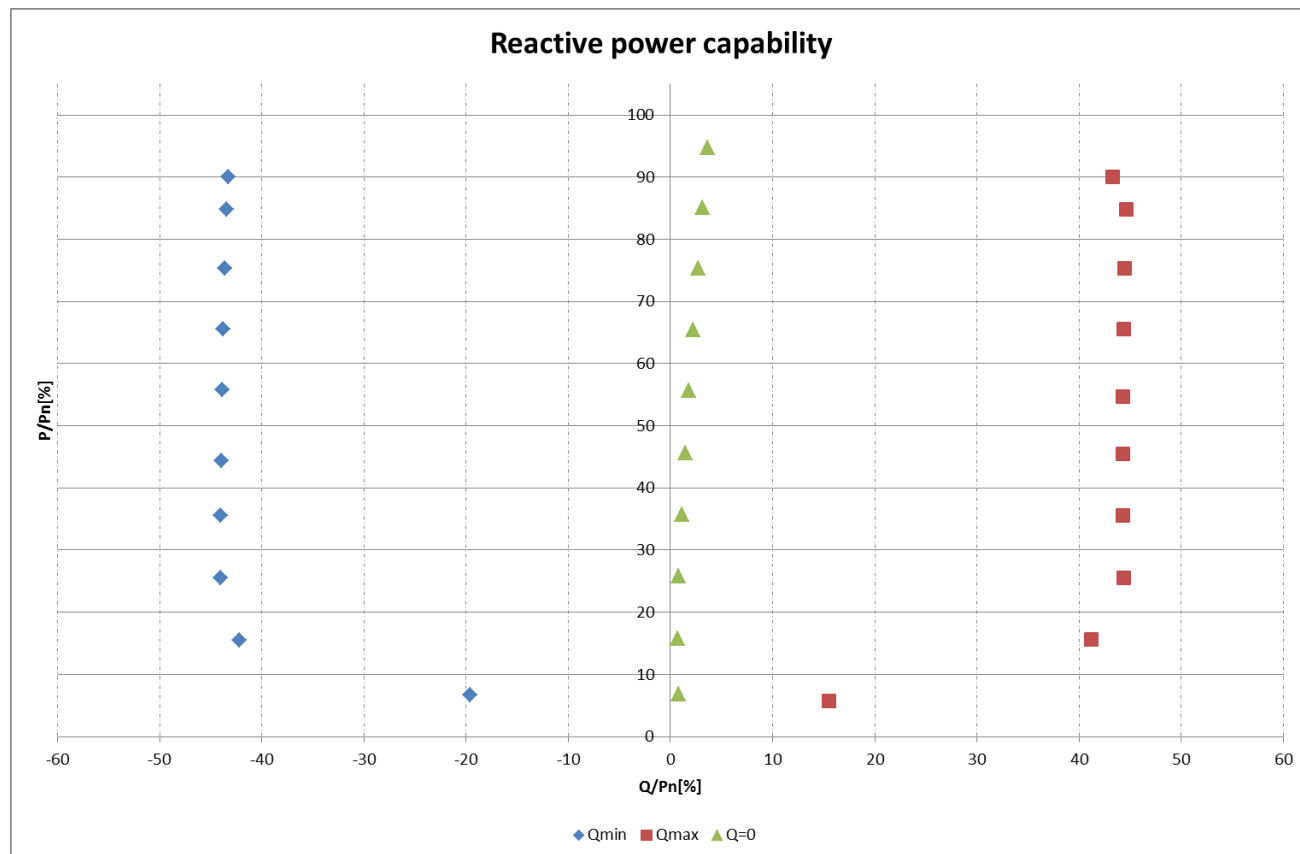
Reactive power supply with set point Q=0				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	406,34	49,80	0,99	449,14
10% - 20%	946,17	41,91	1,00	993,57
20% - 30%	1544,20	48,98	1,00	1598,30
30% - 40%	2143,40	66,87	1,00	2202,75
40% - 50%	2735,55	88,27	1,00	2803,45
50% - 60%	3337,26	108,58	1,00	3416,80
60% - 70%	3927,70	134,17	1,00	4020,22
70% - 80%	4521,05	161,45	1,00	4629,59
80% - 90%	5104,01	189,76	1,00	5230,14
90% - 100%	5686,33	220,94	1,00	5834,37

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Diagram of inductive reactive power absorption



Q adjustment

	Reactive power set point Q [%]	Measured reactive power Q [%]	Measured cos φ	Deviation compared to setpoint $\Delta Q / P_N$ [%]
- Qmin	-48,43	-48,32	0,875	0,08
0	0,00	0,08	0,999	0,08
+ Qmax	48,43	48,54	0,872	0,10

Qmin reactive power in accordance to standard characteristic curve $Q = f(V)$

Vac [V] Set point	Vac [V] measured	Q [Var] measured	Q [Var] expected	ΔQ [%]
0,99Vn	98,9	2642,5	43,6%	1,01
1,02Vn	102,0	237,9	$\approx 0 (< \pm 2.5\% P_n)$	0,05
1,05Vn	105,0	217,7	$\approx 0 (< \pm 2.5\% P_n)$	0,04
1,08Vn	108,1	-2551,6	-43,6%	2,46

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Connection and starting to generate electrical power		
Test according EN 50438 with standard setting	Min. voltage for connection to grid:	195,5V
	Max. voltage for connection to grid:	253V
	Min. frequency for connection to grid:	47,4Hz
	Max. frequency for connection to grid:	50,05Hz
	Observation time ($\geq 60s$)	60s
Test		
	Voltage conditions	
a) Start up for voltage range	$<84\% U_n$ for twice of observation time	$>111\% U_n$ for twice of observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
b) In voltage range at start-up	$\geq 84\% U_n$ within twice setting observation time	$\leq 111\% U_n$ within twice setting observation time
Reconnection time [s]	69	69
Limit:	Connected after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: $10\%P_n/\text{min}$.	
c) In voltage range after voltage failure	$\geq 84\% U_n$ for twice of setting observation time	$\leq 111\% U_n$ for twice of setting observation time
Reconnection time [s]	102	139
Limit:	Reconnection after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: $10\%P_n/\text{min}$.	
	Frequency conditions	
d) Start up for frequency range	$<47,45 \text{ Hz}$ for twice of setting observation time	$>50,15 \text{ Hz}$ for twice of setting observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
e) In frequency range at start-up	$\geq 47,45 \text{ Hz}$ within twice of setting observation time	$\leq 51,15 \text{ Hz}$ within twice of setting observation time
Reconnection time [s]	100	107
Limit:	Connected after setting delay time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: $10\%P_n/\text{min}$.	

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f) In frequency range after frequency failure	$\geq 47,45$ Hz for twice of setting observation time	$\leq 51,15$ Hz for twice of setting observation time
Reconnection time [s]	75	74
Limit:	Reconnection after setting observation time (≥ 60 s)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%Pn/min.	

Short-circuit current contribution					
Short-circuit current parameters					
For a directly coupled micro-generator			For a Inverter micro-generator		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	I_p	N/A	20ms	29,87	1,68
Initial Value of aperiodic current	A	N/A	100ms	29,53	1,00
Initial symmetrical short-circuit current*	I_k	N/A	250ms	29,46	0,86
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	29,48	0,81
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	0,001	In seconds

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Power Quality. Harmonic current emission				
micro-generator		StecaGrid 6003		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	8,597	100,000	Phase 1	-
2nd	0,041	0,189	Phase 1	1,080
3rd	0,034	0,305	Phase 1	2,300
4th	0,024	0,177	Phase 1	0,430
5th	0,085	0,614	Phase 1	1,140
6th	0,016	0,083	Phase 1	0,300
7th	0,076	0,451	Phase 1	0,770
8th	0,014	0,066	Phase 1	0,230
9th	0,014	0,034	Phase 1	0,400
10th	0,013	0,057	Phase 1	0,184
11th	0,016	0,177	Phase 1	0,330
12th	0,011	0,048	Phase 1	0,153
13th	0,021	0,148	Phase 1	0,210
14th	0,010	0,044	Phase 1	0,131
15th	0,010	0,028	Phase 1	0,150
16th	0,010	0,038	Phase 1	0,115
17th	0,009	0,069	Phase 1	0,132
18th	0,009	0,032	Phase 1	0,102
19th	0,010	0,054	Phase 1	0,118
20th	0,009	0,034	Phase 1	0,092
21th	0,008	0,018	Phase 1	0,107
22th	0,008	0,029	Phase 1	0,084
23th	0,007	0,029	Phase 1	0,098
24th	0,008	0,024	Phase 1	0,077
25th	0,008	0,026	Phase 1	0,090
26th	0,008	0,027	Phase 1	0,071
27th	0,007	0,017	Phase 1	0,083
28th	0,008	0,023	Phase 1	0,066
29th	0,006	0,017	Phase 1	0,078
30th	0,007	0,019	Phase 1	0,061
31th	0,005	0,017	Phase 1	0,073
32th	0,006	0,023	Phase 1	0,058
33th	0,006	0,015	Phase 1	0,068
34th	0,007	0,020	Phase 1	0,054
35th	0,005	0,024	Phase 1	0,064
36th	0,006	0,016	Phase 1	0,051
37th	0,005	0,035	Phase 1	0,061
38th	0,005	0,019	Phase 1	0,048
39th	0,004	0,014	Phase 1	0,058
40th	0,005	0,017	Phase 1	0,046

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Power Quality. Harmonic current emission				
micro-generator		StecaGrid 6003		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	8,606	100,000	Phase 2	-
2nd	0,040	0,161	Phase 2	1,080
3rd	0,031	0,292	Phase 2	2,300
4th	0,025	0,137	Phase 2	0,430
5th	0,098	0,876	Phase 2	1,140
6th	0,016	0,084	Phase 2	0,300
7th	0,073	0,483	Phase 2	0,770
8th	0,015	0,073	Phase 2	0,230
9th	0,014	0,165	Phase 2	0,400
10th	0,013	0,069	Phase 2	0,184
11th	0,022	0,324	Phase 2	0,330
12th	0,012	0,040	Phase 2	0,153
13th	0,025	0,233	Phase 2	0,210
14th	0,011	0,048	Phase 2	0,131
15th	0,009	0,102	Phase 2	0,150
16th	0,010	0,046	Phase 2	0,115
17th	0,010	0,119	Phase 2	0,132
18th	0,009	0,029	Phase 2	0,102
19th	0,013	0,086	Phase 2	0,118
20th	0,008	0,034	Phase 2	0,092
21th	0,007	0,035	Phase 2	0,107
22th	0,008	0,033	Phase 2	0,084
23th	0,007	0,024	Phase 2	0,098
24th	0,007	0,023	Phase 2	0,077
25th	0,008	0,028	Phase 2	0,090
26th	0,007	0,025	Phase 2	0,071
27th	0,006	0,023	Phase 2	0,083
28th	0,007	0,027	Phase 2	0,066
29th	0,006	0,036	Phase 2	0,078
30th	0,007	0,019	Phase 2	0,061
31th	0,005	0,032	Phase 2	0,073
32th	0,006	0,020	Phase 2	0,058
33th	0,005	0,028	Phase 2	0,068
34th	0,006	0,022	Phase 2	0,054
35th	0,005	0,045	Phase 2	0,064
36th	0,006	0,016	Phase 2	0,051
37th	0,004	0,031	Phase 2	0,061
38th	0,005	0,017	Phase 2	0,048
39th	0,004	0,017	Phase 2	0,058
40th	0,005	0,020	Phase 2	0,046

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Power Quality. Harmonic current emission				
micro-generator		StecaGrid 6003		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	8,573	100,000	Phase 3	-
2nd	0,038	0,273	Phase 3	1,080
3rd	0,025	0,220	Phase 3	2,300
4th	0,021	0,137	Phase 3	0,430
5th	0,066	0,714	Phase 3	1,140
6th	0,017	0,101	Phase 3	0,300
7th	0,056	0,273	Phase 3	0,770
8th	0,016	0,082	Phase 3	0,230
9th	0,012	0,157	Phase 3	0,400
10th	0,014	0,063	Phase 3	0,184
11th	0,026	0,241	Phase 3	0,330
12th	0,013	0,035	Phase 3	0,153
13th	0,026	0,111	Phase 3	0,210
14th	0,012	0,052	Phase 3	0,131
15th	0,009	0,117	Phase 3	0,150
16th	0,012	0,042	Phase 3	0,115
17th	0,009	0,085	Phase 3	0,132
18th	0,011	0,022	Phase 3	0,102
19th	0,012	0,052	Phase 3	0,118
20th	0,012	0,038	Phase 3	0,092
21th	0,007	0,038	Phase 3	0,107
22th	0,011	0,030	Phase 3	0,084
23th	0,007	0,032	Phase 3	0,098
24th	0,011	0,021	Phase 3	0,077
25th	0,009	0,042	Phase 3	0,090
26th	0,011	0,031	Phase 3	0,071
27th	0,007	0,021	Phase 3	0,083
28th	0,010	0,024	Phase 3	0,066
29th	0,006	0,039	Phase 3	0,078
30th	0,009	0,017	Phase 3	0,061
31th	0,006	0,027	Phase 3	0,073
32th	0,009	0,025	Phase 3	0,058
33th	0,006	0,030	Phase 3	0,068
34th	0,008	0,020	Phase 3	0,054
35th	0,006	0,042	Phase 3	0,064
36th	0,008	0,015	Phase 3	0,051
37th	0,005	0,021	Phase 3	0,061
38th	0,007	0,020	Phase 3	0,048
39th	0,005	0,020	Phase 3	0,058
40th	0,006	0,018	Phase 3	0,046

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Power Quality. Harmonic current emission				
micro-generator		StecaGrid 3203		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	4,365	100,000	Phase 1	-
2nd	0,012	0,337	Phase 1	1,080
3rd	0,047	0,055	Phase 1	2,300
4th	0,010	0,031	Phase 1	0,430
5th	0,040	0,560	Phase 1	1,140
6th	0,005	0,033	Phase 1	0,300
7th	0,051	0,403	Phase 1	0,770
8th	0,005	0,040	Phase 1	0,230
9th	0,007	0,056	Phase 1	0,400
10th	0,005	0,043	Phase 1	0,184
11th	0,010	0,298	Phase 1	0,330
12th	0,004	0,028	Phase 1	0,153
13th	0,008	0,308	Phase 1	0,210
14th	0,005	0,047	Phase 1	0,131
15th	0,005	0,039	Phase 1	0,150
16th	0,005	0,024	Phase 1	0,115
17th	0,010	0,316	Phase 1	0,132
18th	0,004	0,025	Phase 1	0,102
19th	0,007	0,273	Phase 1	0,118
20th	0,005	0,028	Phase 1	0,092
21th	0,004	0,035	Phase 1	0,107
22th	0,005	0,038	Phase 1	0,084
23th	0,006	0,300	Phase 1	0,098
24th	0,005	0,026	Phase 1	0,077
25th	0,005	0,286	Phase 1	0,090
26th	0,005	0,032	Phase 1	0,071
27th	0,004	0,031	Phase 1	0,083
28th	0,005	0,035	Phase 1	0,066
29th	0,004	0,309	Phase 1	0,078
30th	0,005	0,029	Phase 1	0,061
31th	0,003	0,255	Phase 1	0,073
32th	0,004	0,029	Phase 1	0,058
33th	0,003	0,046	Phase 1	0,068
34th	0,005	0,032	Phase 1	0,054
35th	0,003	0,249	Phase 1	0,064
36th	0,005	0,027	Phase 1	0,051
37th	0,003	0,217	Phase 1	0,061
38th	0,004	0,026	Phase 1	0,048
39th	0,003	0,028	Phase 1	0,058
40th	0,004	0,025	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. 13TH0511-EN50438-2013_0

Power Quality. Harmonic current emission				
micro-generator		StecaGrid 3203		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	4,345	100,000	Phase 2	-
2nd	0,015	0,140	Phase 2	1,080
3rd	0,044	0,033	Phase 2	2,300
4th	0,011	0,088	Phase 2	0,430
5th	0,037	0,582	Phase 2	1,140
6th	0,006	0,047	Phase 2	0,300
7th	0,053	0,401	Phase 2	0,770
8th	0,006	0,038	Phase 2	0,230
9th	0,006	0,029	Phase 2	0,400
10th	0,006	0,037	Phase 2	0,184
11th	0,009	0,262	Phase 2	0,330
12th	0,006	0,022	Phase 2	0,153
13th	0,012	0,308	Phase 2	0,210
14th	0,006	0,035	Phase 2	0,131
15th	0,004	0,023	Phase 2	0,150
16th	0,006	0,024	Phase 2	0,115
17th	0,009	0,286	Phase 2	0,132
18th	0,006	0,021	Phase 2	0,102
19th	0,010	0,300	Phase 2	0,118
20th	0,006	0,028	Phase 2	0,092
21th	0,004	0,024	Phase 2	0,107
22th	0,006	0,035	Phase 2	0,084
23th	0,006	0,300	Phase 2	0,098
24th	0,006	0,024	Phase 2	0,077
25th	0,006	0,314	Phase 2	0,090
26th	0,005	0,028	Phase 2	0,071
27th	0,003	0,024	Phase 2	0,083
28th	0,005	0,032	Phase 2	0,066
29th	0,003	0,300	Phase 2	0,078
30th	0,005	0,026	Phase 2	0,061
31th	0,004	0,295	Phase 2	0,073
32th	0,004	0,025	Phase 2	0,058
33th	0,003	0,027	Phase 2	0,068
34th	0,004	0,034	Phase 2	0,054
35th	0,003	0,234	Phase 2	0,064
36th	0,004	0,026	Phase 2	0,051
37th	0,003	0,221	Phase 2	0,061
38th	0,004	0,026	Phase 2	0,048
39th	0,003	0,037	Phase 2	0,058
40th	0,003	0,026	Phase 2	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. 13TH0511-EN50438-2013_0

Power Quality. Harmonic current emission				
micro-generator		StecaGrid 3203		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	4,367	100,000	Phase 3	-
2nd	0,015	0,455	Phase 3	1,080
3rd	0,045	0,077	Phase 3	2,300
4th	0,011	0,080	Phase 3	0,430
5th	0,034	0,579	Phase 3	1,140
6th	0,008	0,038	Phase 3	0,300
7th	0,047	0,441	Phase 3	0,770
8th	0,007	0,030	Phase 3	0,230
9th	0,008	0,024	Phase 3	0,400
10th	0,008	0,031	Phase 3	0,184
11th	0,006	0,249	Phase 3	0,330
12th	0,007	0,026	Phase 3	0,153
13th	0,010	0,311	Phase 3	0,210
14th	0,007	0,042	Phase 3	0,131
15th	0,006	0,030	Phase 3	0,150
16th	0,007	0,023	Phase 3	0,115
17th	0,008	0,293	Phase 3	0,132
18th	0,007	0,023	Phase 3	0,102
19th	0,008	0,300	Phase 3	0,118
20th	0,007	0,025	Phase 3	0,092
21th	0,005	0,022	Phase 3	0,107
22th	0,007	0,036	Phase 3	0,084
23th	0,005	0,297	Phase 3	0,098
24th	0,007	0,025	Phase 3	0,077
25th	0,006	0,295	Phase 3	0,090
26th	0,007	0,031	Phase 3	0,071
27th	0,004	0,026	Phase 3	0,083
28th	0,007	0,031	Phase 3	0,066
29th	0,004	0,299	Phase 3	0,078
30th	0,006	0,025	Phase 3	0,061
31th	0,004	0,270	Phase 3	0,073
32th	0,006	0,025	Phase 3	0,058
33th	0,004	0,026	Phase 3	0,068
34th	0,006	0,031	Phase 3	0,054
35th	0,003	0,264	Phase 3	0,064
36th	0,007	0,026	Phase 3	0,051
37th	0,003	0,214	Phase 3	0,061
38th	0,005	0,025	Phase 3	0,048
39th	0,003	0,045	Phase 3	0,058
40th	0,006	0,030	Phase 3	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. 13TH0511-EN50438-2013_0

Voltage fluctuation and Flicker.					
	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	Pst	Plt 2 hours	d(t) _{500ms}	dc	dmax
Limit	1,0	0,65	3,3%	3,3%	4%
Test value	0,14	0,14	0,0%	0,979%	0,0%

DC-Injection.				
Protection limit	Tested at four power levels, limit 0,5% of IAC _{nom} (43mA)			
Output power	~20%	~50%	75%	~100%
Max. test value (phase L1) [mA]	1,03	3,40	4,68	4,15
Max. test value (phase L2) [mA]	0,55	2,00	4,28	3,55
Max. test value (phase L3) [mA]	0,67	1,50	3,69	2,26