Certificate of compliance

Applicant: **Huawei Technologies Co., Ltd.**
Administration Building, Headquarters of Huawei Technologies Co., Ltd.,
Bantian, Longgang District, Shenzhen, 518129,
P.R.China

Product: **Grid-tied photovoltaic (PV) inverter**

Model: **SUN2000-8KTL**
SUN2000-12KTL
SUN2000-17KTL
SUN2000-20KTL

Use in accordance with regulations:

Automatic disconnection device with three-phase mains surveillance in accordance with EN 50438:2013, TS EN 50438:2014 for photovoltaic systems with a three-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter.

Applied rules and standards:

EN 50438:2013, TS EN 50438:2014
Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks
DIN V VDE V 0126-1-1:2006-02 (Functional safety)
Automatic disconnection device between a generator and the public low-voltage grid

The generator(s) SUN2000-12KTL, SUN2000-17KTL and SUN2000-20KTL are rated >16A per phase. However all requirements of the EN 50438:2013 are fulfilled.

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

Report number: **PV180102N011**
Certificate number: **U18-0041**
Date of issue: **2018-02-13**

Certification body

Holger Schaffer
Certification body of Bureau Veritas Consumer Products Services Germany GmbH
Accredited according to DIN EN ISO/IEC 17065

DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-00

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Type Approval and declaration of compliance with the requirements of EN 50438.				
Manufacturer / applicant:	Huawei Technologies Co., Ltd. Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.China			
Micro-generator Type	Grid-tied photovoltaic inverter			
Rated values	SUN2000-8KTL	SUN2000-12KTL	SUN2000-17KTL	SUN2000-20KTL
Rated capacity	8000	12000	17000	20000
Rated voltage	230V / 400V, 3W+N+PE			
Firmware version	V100R001			
Measurement period:	2018-01-02 to 2018-01-29			

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.

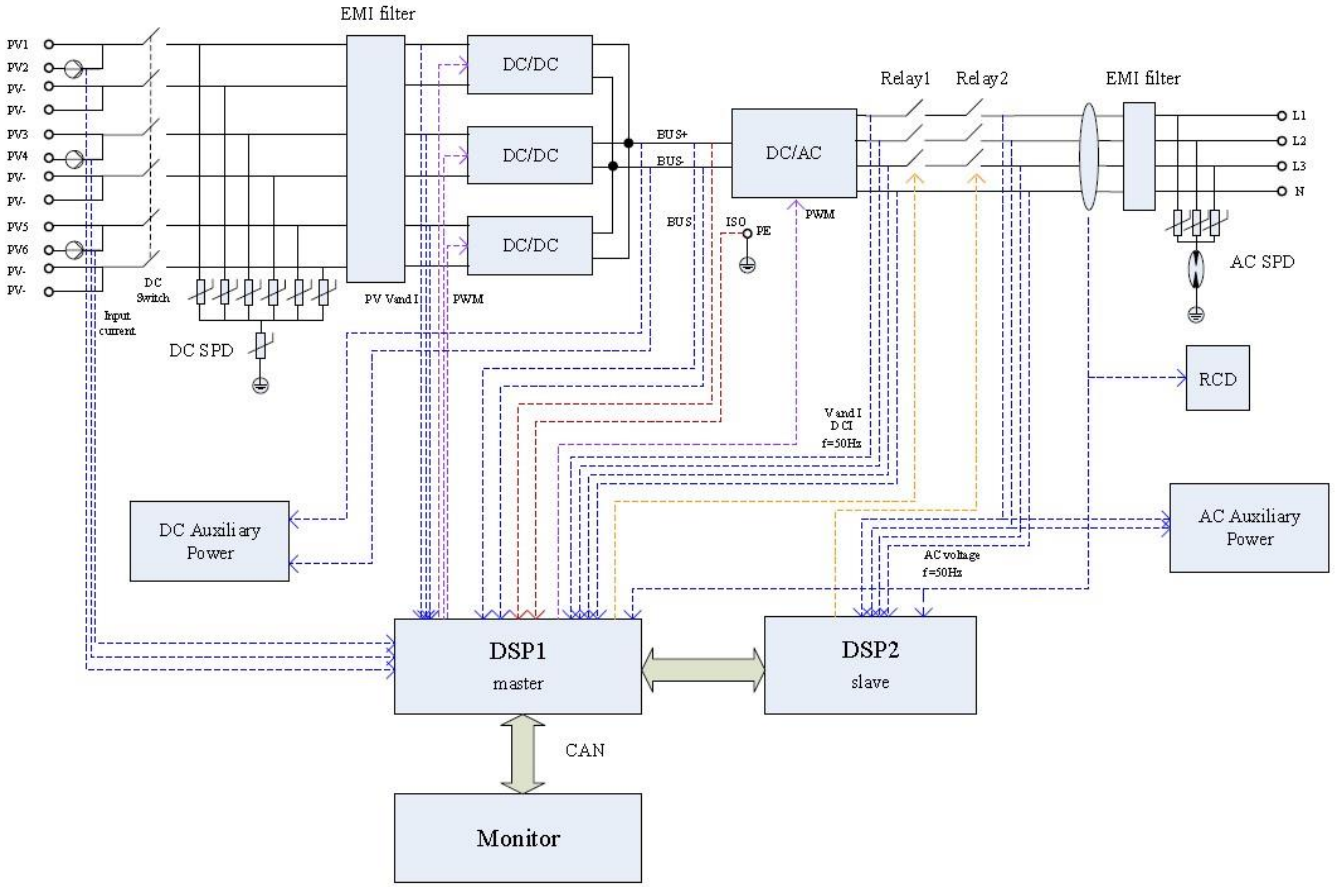

Figure 1 – Schematic structure of the power generation unit

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.

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

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	3 / 600*	253,0	3 / 600*	253,5	2,968 / 501*
Over-voltage stage 2	264,5	0,2	264,5	0,2	263,8	0,181
Under-voltage stage 1	195,5	1,5	195,5	1,5	196,3	1,480

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	3 / 600*	253,0	3 / 600*	253,6	2,972 / 502*
Over-voltage stage 2	264,5	0,2	264,5	0,2	263,7	0,181
Under-voltage stage 1	195,5	1,5	195,5	1,5	196,1	1,476

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	3 / 600*	253,0	3 / 600*	253,3	2,972 / 513*
Over-voltage stage 2	264,5	0,2	264,5	0,2	264,5	0,180
Under-voltage stage 1	195,5	1,5	195,5	1,5	196,3	1,472

Note.
Minimum operation time according to default interface protection:
Over-voltage stage 1 -
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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Extract from test report according to EN 50438 **Nr. PV180102N011**

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	52,0	0,5	52,0	0,5	52,00	0,472
Under-frequency	47,5	0,5	47,5	0,5	47,49	0,466

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]	162	161	170	171	166	178
Trip time. Phase 2 fuse removed [ms]	162	161	170	171	166	178
Trip time. Phase 3 fuse removed [ms]	162	161	170	171	166	178

Appendix E Type Verification Test Report	
Extract from test report according to EN 50438	**Nr. PV180102N011**

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	197,5	47,55	19,1	0,999
2	251,0	51,45	19,9	0,999

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	49,55	47,55
Active power [kW]:	19848	19862	19850
ΔP/PM [%] per 1 Hz:			0

Power response to over-frequency SUN2000-8KTL							
1-min mean value [Hz]:	**a) 50,00**	**b) 50,25**	**c) 50,70**	**d) 51,15**	**e) 50,70**	**f) 50,25**	**g) 50,00**
1. Measurement a) to g): Active power output > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	8680	7086	5491	7086	8680	N/A
PE60 [kW]:	8857	8668	7121	5517	7017	8675	8875
∆PE60/PM [%]:	N/A	-0,15	0,44	0,32	-0,86	-0,07	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	4286	3498	2711	3498	4286	N/A
PE60 [kW]:	4373	4298	3494	2713	3492	4297	8866
∆PE60/PM [%]:	N/A	0,16	-0,06	0,02	-0,07	0,14	N/A
Limit ΔP/P1min:	+ 10 % of P_M						

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power response to over-frequency SUN2000-20KTL							
1-min mean value [Hz]:	**a) 50,00**	**b) 50,25**	**c) 50,70**	**d) 51,15**	**e) 50,70**	**f) 50,25**	**g) 50,00**
1. Measurement a) to g): Active power output > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	21696	17711	13726	17711	21696	N/A
PE60 [kW]:	22139	21658	17679	13658	17611	21618	22116
∆PE60/PM [%]:	N/A	-0,19	-0,16	-0,34	-0,50	-0,39	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	10702	8736	6770	8736	10702	N/A
PE60 [kW]:	10920	10719	8727	6748	8728	10716	22106
∆PE60/PM [%]:	N/A	0,09	-0,04	-0,11	-0,04	0,07	N/A
Limit ΔP/P1min:	+ 10 % of P_M						

Reactive power			
Uncontrollable reactive power SUN2000-8KTL			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,969i	0,969i	0,970i
50% PN	0,990i	0,991i	0,992i
75% PN	0,995i	0,996i	0,996i
100% PN	0,997i	0,997i	0,998i
Limit	**>0,95**	**>0,95**	**>0,95**
Uncontrollable reactive power SUN2000-12KTL			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,983i	0,983i	0,986i
50% PN	0,995i	0,995i	0,996i
75% PN	0,997i	0,998i	0,998i
100% PN	0,998i	0,998i	0,999i
Limit	**>0,95**	**>0,95**	**>0,95**
Uncontrollable reactive power SUN2000-17KTL			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,991i	0,992i	0,993i
50% PN	0,997i	0,998i	0,998i
75% PN	0,998i	0,998i	0,999i
100% PN	0,998i	0,999i	0,999i
Limit	**>0,95**	**>0,95**	**>0,95**

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Uncontrollable reactive power SUN2000-20KTL			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,993i	0,994i	0,995i
50% PN	0,998i	0,998i	0,998i
75% PN	0,998i	0,999i	0,999i
100% PN	0,999i	0,999i	0,999i
Limit	**>0,95**	**>0,95**	**>0,95**

Controllable reactive power SUN2000-8KTL				
Inductive (supply reactive power)				
Power-BIN	**Active power [W]**	**Reactive power [Var]**	**Power factor (cos φ)**	**DC Power [W]**
0% - 10%	782	-409	0,886	819
10% - 20%	1549	-791	0,891	1595
20% - 30%	2355	-1189	0,893	2412
30% - 40%	3152	-1584	0,893	3219
40% - 50%	3945	-1972	0,894	4024
50% - 60%	4735	-2354	0,895	4828
60% - 70%	5525	-2741	0,896	5631
70% - 80%	6314	-3129	0,896	6435
80% - 90%	7101	-3505	0,897	7238
90% - 100%	7888	-3883	0,897	8042
Capacitive (supply reactive power)				
Power-BIN	**Active power [W]**	**Reactive power [Var]**	**Power factor (cos φ)**	**AC voltage [V]**
0% - 10%	794	316	0,929	826
10% - 20%	1579	736	0,906	1630
20% - 30%	2366	1090	0,908	2414
30% - 40%	3154	1466	0,907	3213
40% - 50%	3943	1841	0,906	4014
50% - 60%	4738	2224	0,905	4821
60% - 70%	5527	2601	0,905	5623
70% - 80%	6318	2975	0,905	6428
80% - 90%	7111	3356	0,904	7235
90% - 100%	7899	3730	0,904	8039
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%	791	-69	0,996	826
10% - 20%	1551	-66	0,999	1592
20% - 30%	2361	-61	0,999	2410
30% - 40%	3154	-58	0,999	3212
40% - 50%	3943	-64	0,999	4011
50% - 60%	4737	-70	0,999	4816
60% - 70%	5528	-72	0,999	5618
70% - 80%	6315	-79	0,999	6417
80% - 90%	7108	-86	0,999	7222
90% - 100%	7896	-89	0,999	8022

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Controllable reactive power
SUN2000-20KTL

Inductive (supply reactive power)

Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	DC Power [W]
0% - 10%	1944	-844	0,917	2006
10% - 20%	3912	-1816	0,907	4002
20% - 30%	5880	-2790	0,903	6000
30% - 40%	7853	-3774	0,901	8007
40% - 50%	9818	-4758	0,900	10009
50% - 60%	11981	-5838	0,899	12218
60% - 70%	13950	-6819	0,898	14231
70% - 80%	15904	-7797	0,898	16238
80% - 90%	17879	-8791	0,897	18267
90% - 100%	19444	-9584	0,897	19877

Capacitive (supply reactive power)

Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	1972	1087	0,876	2025
10% - 20%	3963	2034	0,890	4041
20% - 30%	5952	2973	0,895	6059
30% - 40%	7949	3913	0,897	8089
40% - 50%	9940	4854	0,899	10116
50% - 60%	11928	5794	0,900	12145
60% - 70%	13925	6738	0,900	14184
70% - 80%	15914	7680	0,901	16225
80% - 90%	17899	8603	0,901	18261
90% - 100%	19694	9435	0,902	20103

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%	1962	117	0,998	2019
10% - 20%	3933	102	0,999	4011
20% - 30%	5908	86	0,999	6024
30% - 40%	7897	72	0,999	8042
40% - 50%	9872	56	0,999	10057
50% - 60%	11849	32	0,999	12044
60% - 70%	13824	10	0,999	14056
70% - 80%	15809	-11	0,999	16084
80% - 90%	17984	-46	0,999	18306
90% - 100%	19971	-74	0,999	20337

Q adjustment

SUN2000-8KTL	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured cos φ	Deviation compared to setpoint ΔQ / PN [%]
- Qmin	-3875	-3970	0,893	-1,18
0	0	-65	0,999	-0,82
+ Qmax	3875	3828	0,900	-0,59

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Q adjustment				
SUN2000-20KTL	**Reactive power set point Q [Var]**	**Measured reactive power Q [Var]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-9686	-9583	0,897	0,51
0	0	-71	0,999	-0,35
+ Qmax	9686	9436	0,902	-1,25

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:	253,0V
	Min. frequency for connection to grid:	47,50Hz
	Max. frequency for connection to grid:	50,10Hz
	Observation time (≥60s)	60s

Test		
	Voltage conditions	
a) Start up for voltage range	**<84% Un for twice of observation time**	**>111% Un for twice of observation time**
Connection:	No connection	No connection
Limit:	No connection allowed	
b) In voltage range at start-up	**≥84% Un within twice setting observation time**	**≤111% Un within twice setting observation time**
Reconnection time [s]	84s	103s
Limit:	Connected after setting observation time (≥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%Pn/min. For recorded gradient see diagram below.	
c) In voltage range after voltage failure	**≥84% Un for twice of setting observation time**	**≤111% Un for twice of setting observation time**
Reconnection time [s]	122s	123s
Limit:	Reconnection after setting observation time (≥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%Pn/min. For recorded gradient see diagram below.	
	Frequency conditions	
d) Start up for frequency range	**<47,45 Hz for twice of setting observation time**	**>50,15 Hz for twice of setting observation time**
Connection:	No connection	No connection
Limit	No connection allowed	

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Extract from test report according to EN 50438 **Nr. PV180102N011**

e) In frequency range at start-up	**≥47,45 Hz within twice of setting observation time**	**≤51,15 Hz within twice of setting observation time**
Reconnection time [s]	98s	102s
Limit:	Connected after setting delay time(≥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%Pn/min. For recorded gradient see diagram below.	
f) In frequency range after frequency failure	**≥47,45 Hz for twice of setting observation time**	**≤51,15 Hz for twice of setting observation time**
Reconnection time [s]	124s	123s
Limit:	Reconnection after setting observation time (≥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%Pn/min. For recorded gradient see diagram below.	

Short-circuit current contribution

Short-circuit current parameters
SUN2000-8KTL

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	68	22,54
Initial Value of aperiodic current	A	N/A	100ms	64	26,10
Initial symmetrical short-circuit current*	I_k	N/A	250ms	67	--
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	65	--
Reactance/Resistance Ratio of source*	X/R	N/A	**Time to trip**	0,070	In seconds

Short-circuit current parameters
SUN2000-8KTL

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	64	37,83
Initial Value of aperiodic current	A	N/A	100ms	63	27,42
Initial symmetrical short-circuit current*	I_k	N/A	250ms	89	--
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	77	--
Reactance/Resistance Ratio of source*	X/R	N/A	**Time to trip**	0,058	In seconds

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission				
micro-generator		SUN2000-8KTL		
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	11,508	99,98	Phase 1	-
2nd	0,053	0,46	Phase 1	1,080
3rd	0,030	0,26	Phase 1	2,300
4th	0,017	0,15	Phase 1	0,430
5th	0,041	0,36	Phase 1	1,140
6th	0,008	0,07	Phase 1	0,300
7th	0,052	0,45	Phase 1	0,770
8th	0,009	0,08	Phase 1	0,230
9th	0,006	0,05	Phase 1	0,400
10th	0,007	0,06	Phase 1	0,184
11th	0,075	0,65	Phase 1	0,330
12th	0,007	0,06	Phase 1	0,153
13th	0,079	0,69	Phase 1	0,210
14th	0,008	0,07	Phase 1	0,131
15th	0,008	0,07	Phase 1	0,150
16th	0,009	0,07	Phase 1	0,115
17th	0,083	0,72	Phase 1	0,132
18th	0,008	0,07	Phase 1	0,102
19th	0,078	0,67	Phase 1	0,118
20th	0,009	0,08	Phase 1	0,092
21th	0,008	0,07	Phase 1	0,107
22th	0,009	0,07	Phase 1	0,084
23th	0,069	0,60	Phase 1	0,098
24th	0,007	0,06	Phase 1	0,077
25th	0,056	0,49	Phase 1	0,090
26th	0,007	0,06	Phase 1	0,071
27th	0,008	0,07	Phase 1	0,083
28th	0,007	0,06	Phase 1	0,066
29th	0,035	0,31	Phase 1	0,078
30th	0,006	0,05	Phase 1	0,061
31th	0,030	0,26	Phase 1	0,073
32th	0,006	0,05	Phase 1	0,058
33th	0,006	0,05	Phase 1	0,068
34th	0,005	0,04	Phase 1	0,054
35th	0,019	0,17	Phase 1	0,064
36th	0,005	0,04	Phase 1	0,051
37th	0,023	0,20	Phase 1	0,061
38th	0,005	0,05	Phase 1	0,048
39th	0,007	0,06	Phase 1	0,058
40th	0,005	0,04	Phase 1	0,046

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Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission				
micro-generator		SUN2000-8KTL		
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	11,508	99,98	Phase 2	-
2nd	0,023	0,20	Phase 2	1,080
3rd	0,027	0,24	Phase 2	2,300
4th	0,024	0,21	Phase 2	0,430
5th	0,041	0,36	Phase 2	1,140
6th	0,005	0,04	Phase 2	0,300
7th	0,056	0,49	Phase 2	0,770
8th	0,009	0,08	Phase 2	0,230
9th	0,006	0,06	Phase 2	0,400
10th	0,006	0,05	Phase 2	0,184
11th	0,075	0,65	Phase 2	0,330
12th	0,007	0,06	Phase 2	0,153
13th	0,082	0,71	Phase 2	0,210
14th	0,010	0,09	Phase 2	0,131
15th	0,008	0,07	Phase 2	0,150
16th	0,008	0,07	Phase 2	0,115
17th	0,086	0,74	Phase 2	0,132
18th	0,008	0,07	Phase 2	0,102
19th	0,077	0,67	Phase 2	0,118
20th	0,010	0,09	Phase 2	0,092
21th	0,009	0,07	Phase 2	0,107
22th	0,010	0,08	Phase 2	0,084
23th	0,074	0,64	Phase 2	0,098
24th	0,007	0,06	Phase 2	0,077
25th	0,055	0,48	Phase 2	0,090
26th	0,008	0,07	Phase 2	0,071
27th	0,008	0,07	Phase 2	0,083
28th	0,008	0,07	Phase 2	0,066
29th	0,038	0,33	Phase 2	0,078
30th	0,006	0,05	Phase 2	0,061
31th	0,028	0,24	Phase 2	0,073
32th	0,005	0,04	Phase 2	0,058
33th	0,006	0,06	Phase 2	0,068
34th	0,005	0,04	Phase 2	0,054
35th	0,022	0,19	Phase 2	0,064
36th	0,005	0,04	Phase 2	0,051
37th	0,023	0,20	Phase 2	0,061
38th	0,005	0,04	Phase 2	0,048
39th	0,008	0,07	Phase 2	0,058
40th	0,005	0,05	Phase 2	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission				
micro-generator		SUN2000-8KTL		
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	11,508	99,98	Phase 3	-
2nd	0,031	0,27	Phase 3	1,080
3rd	0,026	0,22	Phase 3	2,300
4th	0,022	0,19	Phase 3	0,430
5th	0,040	0,35	Phase 3	1,140
6th	0,008	0,07	Phase 3	0,300
7th	0,052	0,45	Phase 3	0,770
8th	0,006	0,05	Phase 3	0,230
9th	0,008	0,07	Phase 3	0,400
10th	0,008	0,07	Phase 3	0,184
11th	0,073	0,63	Phase 3	0,330
12th	0,011	0,10	Phase 3	0,153
13th	0,079	0,69	Phase 3	0,210
14th	0,007	0,06	Phase 3	0,131
15th	0,009	0,08	Phase 3	0,150
16th	0,007	0,06	Phase 3	0,115
17th	0,081	0,71	Phase 3	0,132
18th	0,010	0,09	Phase 3	0,102
19th	0,073	0,63	Phase 3	0,118
20th	0,008	0,07	Phase 3	0,092
21th	0,010	0,08	Phase 3	0,107
22th	0,008	0,07	Phase 3	0,084
23th	0,072	0,63	Phase 3	0,098
24th	0,008	0,07	Phase 3	0,077
25th	0,052	0,45	Phase 3	0,090
26th	0,007	0,06	Phase 3	0,071
27th	0,008	0,07	Phase 3	0,083
28th	0,007	0,06	Phase 3	0,066
29th	0,035	0,30	Phase 3	0,078
30th	0,006	0,05	Phase 3	0,061
31th	0,026	0,23	Phase 3	0,073
32th	0,006	0,05	Phase 3	0,058
33th	0,007	0,06	Phase 3	0,068
34th	0,005	0,05	Phase 3	0,054
35th	0,021	0,18	Phase 3	0,064
36th	0,005	0,05	Phase 3	0,051
37th	0,022	0,19	Phase 3	0,061
38th	0,005	0,05	Phase 3	0,048
39th	0,007	0,06	Phase 3	0,058
40th	0,005	0,04	Phase 3	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-12KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	17,256	99,98	Phase 1	-	-
2nd	0,067	0,39	Phase 1	8	8
3rd	0,035	0,20	Phase 1	21,6	N/A
4th	0,018	0,10	Phase 1	4	4
5th	0,062	0,36	Phase 1	10,7	10,7
6th	0,009	0,05	Phase 1	2,67	2,67
7th	0,082	0,48	Phase 1	7,2	7,2
8th	0,011	0,06	Phase 1	2	2
9th	0,009	0,05	Phase 1	3,8	N/A
10th	0,008	0,05	Phase 1	1,6	1,6
11th	0,137	0,79	Phase 1	3,1	3,1
12th	0,009	0,05	Phase 1	1,33	1,33
13th	0,152	0,88	Phase 1	2	2
14th	0,010	0,06	Phase 1	N/A	N/A
15th	0,010	0,06	Phase 1	N/A	N/A
16th	0,009	0,05	Phase 1	N/A	N/A
17th	0,141	0,82	Phase 1	N/A	N/A
18th	0,010	0,06	Phase 1	N/A	N/A
19th	0,131	0,76	Phase 1	N/A	N/A
20th	0,010	0,06	Phase 1	N/A	N/A
21th	0,009	0,05	Phase 1	N/A	N/A
22th	0,009	0,05	Phase 1	N/A	N/A
23th	0,099	0,57	Phase 1	N/A	N/A
24th	0,009	0,05	Phase 1	N/A	N/A
25th	0,078	0,45	Phase 1	N/A	N/A
26th	0,008	0,04	Phase 1	N/A	N/A
27th	0,008	0,04	Phase 1	N/A	N/A
28th	0,008	0,05	Phase 1	N/A	N/A
29th	0,049	0,28	Phase 1	N/A	N/A
30th	0,007	0,04	Phase 1	N/A	N/A
31th	0,039	0,23	Phase 1	N/A	N/A
32th	0,007	0,04	Phase 1	N/A	N/A
33th	0,007	0,04	Phase 1	N/A	N/A
34th	0,006	0,04	Phase 1	N/A	N/A
35th	0,027	0,16	Phase 1	N/A	N/A
36th	0,007	0,04	Phase 1	N/A	N/A
37th	0,028	0,16	Phase 1	N/A	N/A
38th	0,006	0,04	Phase 1	N/A	N/A
39th	0,006	0,04	Phase 1	N/A	N/A
40th	0,006	0,04	Phase 1	N/A	N/A
THD_{40}	-	2,038	Phase 1	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-12KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	17,256	99,98	Phase 2	-	-
2nd	0,038	0,22	Phase 2	8	8
3rd	0,032	0,18	Phase 2	21,6	N/A
4th	0,027	0,15	Phase 2	4	4
5th	0,063	0,37	Phase 2	10,7	10,7
6th	0,007	0,04	Phase 2	2,67	2,67
7th	0,088	0,51	Phase 2	7,2	7,2
8th	0,014	0,08	Phase 2	2	2
9th	0,011	0,06	Phase 2	3,8	N/A
10th	0,008	0,05	Phase 2	1,6	1,6
11th	0,139	0,80	Phase 2	3,1	3,1
12th	0,008	0,05	Phase 2	1,33	1,33
13th	0,155	0,90	Phase 2	2	2
14th	0,013	0,07	Phase 2	N/A	N/A
15th	0,012	0,07	Phase 2	N/A	N/A
16th	0,009	0,05	Phase 2	N/A	N/A
17th	0,149	0,86	Phase 2	N/A	N/A
18th	0,010	0,06	Phase 2	N/A	N/A
19th	0,131	0,76	Phase 2	N/A	N/A
20th	0,012	0,07	Phase 2	N/A	N/A
21th	0,010	0,06	Phase 2	N/A	N/A
22th	0,010	0,06	Phase 2	N/A	N/A
23th	0,107	0,62	Phase 2	N/A	N/A
24th	0,009	0,05	Phase 2	N/A	N/A
25th	0,076	0,44	Phase 2	N/A	N/A
26th	0,008	0,05	Phase 2	N/A	N/A
27th	0,009	0,05	Phase 2	N/A	N/A
28th	0,009	0,05	Phase 2	N/A	N/A
29th	0,051	0,30	Phase 2	N/A	N/A
30th	0,007	0,04	Phase 2	N/A	N/A
31th	0,036	0,21	Phase 2	N/A	N/A
32th	0,006	0,04	Phase 2	N/A	N/A
33th	0,008	0,04	Phase 2	N/A	N/A
34th	0,006	0,04	Phase 2	N/A	N/A
35th	0,030	0,17	Phase 2	N/A	N/A
36th	0,006	0,04	Phase 2	N/A	N/A
37th	0,027	0,15	Phase 2	N/A	N/A
38th	0,006	0,03	Phase 2	N/A	N/A
39th	0,008	0,05	Phase 2	N/A	N/A
40th	0,006	0,04	Phase 2	N/A	N/A
THD_{40}	-	2,068	Phase 2	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-12KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	17,257	17,257	Phase 3	-	-
2nd	0,034	0,034	Phase 3	8	8
3rd	0,030	0,030	Phase 3	21,6	N/A
4th	0,025	0,025	Phase 3	4	4
5th	0,060	0,060	Phase 3	10,7	10,7
6th	0,010	0,010	Phase 3	2,67	2,67
7th	0,080	0,080	Phase 3	7,2	7,2
8th	0,008	0,008	Phase 3	2	2
9th	0,013	0,013	Phase 3	3,8	N/A
10th	0,010	0,010	Phase 3	1,6	1,6
11th	0,134	0,134	Phase 3	3,1	3,1
12th	0,010	0,010	Phase 3	1,33	1,33
13th	0,149	0,149	Phase 3	2	2
14th	0,009	0,009	Phase 3	N/A	N/A
15th	0,012	0,012	Phase 3	N/A	N/A
16th	0,009	0,009	Phase 3	N/A	N/A
17th	0,139	0,139	Phase 3	N/A	N/A
18th	0,012	0,012	Phase 3	N/A	N/A
19th	0,125	0,125	Phase 3	N/A	N/A
20th	0,010	0,010	Phase 3	N/A	N/A
21th	0,011	0,011	Phase 3	N/A	N/A
22th	0,009	0,009	Phase 3	N/A	N/A
23th	0,102	0,102	Phase 3	N/A	N/A
24th	0,008	0,008	Phase 3	N/A	N/A
25th	0,076	0,076	Phase 3	N/A	N/A
26th	0,008	0,008	Phase 3	N/A	N/A
27th	0,009	0,009	Phase 3	N/A	N/A
28th	0,008	0,008	Phase 3	N/A	N/A
29th	0,048	0,048	Phase 3	N/A	N/A
30th	0,007	0,007	Phase 3	N/A	N/A
31th	0,036	0,036	Phase 3	N/A	N/A
32th	0,007	0,04	Phase 3	N/A	N/A
33th	0,008	0,04	Phase 3	N/A	N/A
34th	0,007	0,04	Phase 3	N/A	N/A
35th	0,028	0,16	Phase 3	N/A	N/A
36th	0,006	0,04	Phase 3	N/A	N/A
37th	0,029	0,17	Phase 3	N/A	N/A
38th	0,006	0,04	Phase 3	N/A	N/A
39th	0,007	0,04	Phase 3	N/A	N/A
40th	0,007	0,04	Phase 3	N/A	N/A
THD_{40}	-	1,975	Phase 3	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-17KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	24,437	99,99	Phase 1	-	-
2nd	0,089	0,36	Phase 1	8	8
3rd	0,034	0,14	Phase 1	21,6	N/A
4th	0,025	0,10	Phase 1	4	4
5th	0,069	0,28	Phase 1	10,7	10,7
6th	0,015	0,06	Phase 1	2,67	2,67
7th	0,080	0,33	Phase 1	7,2	7,2
8th	0,013	0,05	Phase 1	2	2
9th	0,010	0,04	Phase 1	3,8	N/A
10th	0,010	0,04	Phase 1	1,6	1,6
11th	0,143	0,59	Phase 1	3,1	3,1
12th	0,010	0,04	Phase 1	1,33	1,33
13th	0,162	0,66	Phase 1	2	2
14th	0,012	0,05	Phase 1	N/A	N/A
15th	0,012	0,05	Phase 1	N/A	N/A
16th	0,011	0,04	Phase 1	N/A	N/A
17th	0,160	0,65	Phase 1	N/A	N/A
18th	0,011	0,05	Phase 1	N/A	N/A
19th	0,150	0,61	Phase 1	N/A	N/A
20th	0,010	0,04	Phase 1	N/A	N/A
21th	0,010	0,04	Phase 1	N/A	N/A
22th	0,010	0,04	Phase 1	N/A	N/A
23th	0,119	0,49	Phase 1	N/A	N/A
24th	0,009	0,04	Phase 1	N/A	N/A
25th	0,094	0,38	Phase 1	N/A	N/A
26th	0,009	0,04	Phase 1	N/A	N/A
27th	0,008	0,03	Phase 1	N/A	N/A
28th	0,009	0,04	Phase 1	N/A	N/A
29th	0,069	0,28	Phase 1	N/A	N/A
30th	0,007	0,03	Phase 1	N/A	N/A
31th	0,057	0,23	Phase 1	N/A	N/A
32th	0,007	0,03	Phase 1	N/A	N/A
33th	0,007	0,03	Phase 1	N/A	N/A
34th	0,006	0,03	Phase 1	N/A	N/A
35th	0,046	0,19	Phase 1	N/A	N/A
36th	0,006	0,03	Phase 1	N/A	N/A
37th	0,047	0,19	Phase 1	N/A	N/A
38th	0,006	0,03	Phase 1	N/A	N/A
39th	0,006	0,03	Phase 1	N/A	N/A
40th	0,007	0,03	Phase 1	N/A	N/A
THD_{40}	-	1,645	Phase 1	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-17KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	24,447	99,99	Phase 2	-	-
2nd	0,058	0,24	Phase 2	8	8
3rd	0,031	0,13	Phase 2	21,6	N/A
4th	0,032	0,13	Phase 2	4	4
5th	0,072	0,29	Phase 2	10,7	10,7
6th	0,010	0,04	Phase 2	2,67	2,67
7th	0,087	0,36	Phase 2	7,2	7,2
8th	0,014	0,06	Phase 2	2	2
9th	0,016	0,07	Phase 2	3,8	N/A
10th	0,010	0,04	Phase 2	1,6	1,6
11th	0,147	0,60	Phase 2	3,1	3,1
12th	0,010	0,04	Phase 2	1,33	1,33
13th	0,167	0,68	Phase 2	2	2
14th	0,015	0,06	Phase 2	N/A	N/A
15th	0,015	0,06	Phase 2	N/A	N/A
16th	0,010	0,04	Phase 2	N/A	N/A
17th	0,169	0,69	Phase 2	N/A	N/A
18th	0,012	0,05	Phase 2	N/A	N/A
19th	0,152	0,62	Phase 2	N/A	N/A
20th	0,014	0,06	Phase 2	N/A	N/A
21th	0,014	0,06	Phase 2	N/A	N/A
22th	0,011	0,05	Phase 2	N/A	N/A
23th	0,129	0,53	Phase 2	N/A	N/A
24th	0,010	0,04	Phase 2	N/A	N/A
25th	0,093	0,38	Phase 2	N/A	N/A
26th	0,010	0,04	Phase 2	N/A	N/A
27th	0,009	0,04	Phase 2	N/A	N/A
28th	0,010	0,04	Phase 2	N/A	N/A
29th	0,072	0,29	Phase 2	N/A	N/A
30th	0,008	0,03	Phase 2	N/A	N/A
31th	0,053	0,22	Phase 2	N/A	N/A
32th	0,007	0,03	Phase 2	N/A	N/A
33th	0,007	0,03	Phase 2	N/A	N/A
34th	0,007	0,03	Phase 2	N/A	N/A
35th	0,049	0,20	Phase 2	N/A	N/A
36th	0,007	0,03	Phase 2	N/A	N/A
37th	0,045	0,19	Phase 2	N/A	N/A
38th	0,007	0,03	Phase 2	N/A	N/A
39th	0,007	0,03	Phase 2	N/A	N/A
40th	0,007	0,03	Phase 2	N/A	N/A
THD_{40}	-	1,679	Phase 2	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-17KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	24,437	99,99	Phase 3	-	-
2nd	0,051	0,21	Phase 3	8	8
3rd	0,035	0,14	Phase 3	21,6	N/A
4th	0,023	0,09	Phase 3	4	4
5th	0,070	0,29	Phase 3	10,7	10,7
6th	0,011	0,05	Phase 3	2,67	2,67
7th	0,079	0,32	Phase 3	7,2	7,2
8th	0,010	0,04	Phase 3	2	2
9th	0,019	0,08	Phase 3	3,8	N/A
10th	0,013	0,05	Phase 3	1,6	1,6
11th	0,139	0,57	Phase 3	3,1	3,1
12th	0,012	0,05	Phase 3	1,33	1,33
13th	0,159	0,65	Phase 3	2	2
14th	0,012	0,05	Phase 3	N/A	N/A
15th	0,016	0,07	Phase 3	N/A	N/A
16th	0,012	0,05	Phase 3	N/A	N/A
17th	0,155	0,63	Phase 3	N/A	N/A
18th	0,013	0,05	Phase 3	N/A	N/A
19th	0,145	0,59	Phase 3	N/A	N/A
20th	0,013	0,05	Phase 3	N/A	N/A
21th	0,015	0,06	Phase 3	N/A	N/A
22th	0,012	0,05	Phase 3	N/A	N/A
23th	0,122	0,50	Phase 3	N/A	N/A
24th	0,010	0,04	Phase 3	N/A	N/A
25th	0,092	0,38	Phase 3	N/A	N/A
26th	0,009	0,04	Phase 3	N/A	N/A
27th	0,010	0,04	Phase 3	N/A	N/A
28th	0,008	0,03	Phase 3	N/A	N/A
29th	0,067	0,27	Phase 3	N/A	N/A
30th	0,008	0,03	Phase 3	N/A	N/A
31th	0,054	0,22	Phase 3	N/A	N/A
32th	0,008	0,03	Phase 3	N/A	N/A
33th	0,008	0,03	Phase 3	N/A	N/A
34th	0,007	0,03	Phase 3	N/A	N/A
35th	0,047	0,19	Phase 3	N/A	N/A
36th	0,007	0,03	Phase 3	N/A	N/A
37th	0,048	0,20	Phase 3	N/A	N/A
38th	0,007	0,03	Phase 3	N/A	N/A
39th	0,008	0,03	Phase 3	N/A	N/A
40th	0,007	0,03	Phase 3	N/A	N/A
THD_{40}	-	1,600	Phase 3	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-20KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	27,717	99,99	Phase 1	-	-
2nd	0,099	0,36	Phase 1	8	8
3rd	0,032	0,11	Phase 1	21,6	N/A
4th	0,023	0,08	Phase 1	4	4
5th	0,079	0,28	Phase 1	10,7	10,7
6th	0,012	0,04	Phase 1	2,67	2,67
7th	0,080	0,29	Phase 1	7,2	7,2
8th	0,013	0,05	Phase 1	2	2
9th	0,010	0,04	Phase 1	3,8	N/A
10th	0,010	0,04	Phase 1	1,6	1,6
11th	0,142	0,51	Phase 1	3,1	3,1
12th	0,011	0,04	Phase 1	1,33	1,33
13th	0,165	0,59	Phase 1	2	2
14th	0,014	0,05	Phase 1	N/A	N/A
15th	0,012	0,04	Phase 1	N/A	N/A
16th	0,012	0,04	Phase 1	N/A	N/A
17th	0,162	0,59	Phase 1	N/A	N/A
18th	0,012	0,04	Phase 1	N/A	N/A
19th	0,147	0,53	Phase 1	N/A	N/A
20th	0,011	0,04	Phase 1	N/A	N/A
21th	0,011	0,04	Phase 1	N/A	N/A
22th	0,010	0,04	Phase 1	N/A	N/A
23th	0,123	0,44	Phase 1	N/A	N/A
24th	0,009	0,03	Phase 1	N/A	N/A
25th	0,097	0,35	Phase 1	N/A	N/A
26th	0,008	0,03	Phase 1	N/A	N/A
27th	0,008	0,03	Phase 1	N/A	N/A
28th	0,009	0,03	Phase 1	N/A	N/A
29th	0,071	0,26	Phase 1	N/A	N/A
30th	0,007	0,02	Phase 1	N/A	N/A
31th	0,059	0,21	Phase 1	N/A	N/A
32th	0,006	0,02	Phase 1	N/A	N/A
33th	0,007	0,02	Phase 1	N/A	N/A
34th	0,006	0,02	Phase 1	N/A	N/A
35th	0,049	0,18	Phase 1	N/A	N/A
36th	0,006	0,02	Phase 1	N/A	N/A
37th	0,049	0,18	Phase 1	N/A	N/A
38th	0,006	0,02	Phase 1	N/A	N/A
39th	0,006	0,02	Phase 1	N/A	N/A
40th	0,006	0,02	Phase 1	N/A	N/A
THD_{40}	-	1,485	Phase 1	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-20KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	28,737	99,99	Phase 2	-	-
2nd	0,071	0,25	Phase 2	8	8
3rd	0,029	0,10	Phase 2	21,6	N/A
4th	0,034	0,12	Phase 2	4	4
5th	0,086	0,30	Phase 2	10,7	10,7
6th	0,010	0,04	Phase 2	2,67	2,67
7th	0,088	0,31	Phase 2	7,2	7,2
8th	0,017	0,06	Phase 2	2	2
9th	0,020	0,07	Phase 2	3,8	N/A
10th	0,011	0,04	Phase 2	1,6	1,6
11th	0,150	0,52	Phase 2	3,1	3,1
12th	0,011	0,04	Phase 2	1,33	1,33
13th	0,175	0,61	Phase 2	2	2
14th	0,016	0,05	Phase 2	N/A	N/A
15th	0,018	0,06	Phase 2	N/A	N/A
16th	0,011	0,04	Phase 2	N/A	N/A
17th	0,177	0,62	Phase 2	N/A	N/A
18th	0,012	0,04	Phase 2	N/A	N/A
19th	0,155	0,54	Phase 2	N/A	N/A
20th	0,014	0,05	Phase 2	N/A	N/A
21th	0,015	0,05	Phase 2	N/A	N/A
22th	0,011	0,04	Phase 2	N/A	N/A
23th	0,136	0,47	Phase 2	N/A	N/A
24th	0,010	0,03	Phase 2	N/A	N/A
25th	0,100	0,35	Phase 2	N/A	N/A
26th	0,010	0,03	Phase 2	N/A	N/A
27th	0,010	0,03	Phase 2	N/A	N/A
28th	0,010	0,03	Phase 2	N/A	N/A
29th	0,077	0,27	Phase 2	N/A	N/A
30th	0,007	0,03	Phase 2	N/A	N/A
31th	0,059	0,20	Phase 2	N/A	N/A
32th	0,008	0,03	Phase 2	N/A	N/A
33th	0,007	0,03	Phase 2	N/A	N/A
34th	0,007	0,02	Phase 2	N/A	N/A
35th	0,055	0,19	Phase 2	N/A	N/A
36th	0,007	0,03	Phase 2	N/A	N/A
37th	0,050	0,17	Phase 2	N/A	N/A
38th	0,008	0,03	Phase 2	N/A	N/A
39th	0,008	0,03	Phase 2	N/A	N/A
40th	0,007	0,02	Phase 2	N/A	N/A
THD_{40}	-	1,512	Phase 2	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Power Quality. Harmonic current emission					
micro-generator		SUN2000-20KTL			
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN61000-3-12 [%]	
				1 phase	3 phase
1st	28,737	99,99	Phase 3	-	-
2nd	0,064	0,22	Phase 3	8	8
3rd	0,032	0,11	Phase 3	21,6	N/A
4th	0,026	0,09	Phase 3	4	4
5th	0,083	0,29	Phase 3	10,7	10,7
6th	0,010	0,03	Phase 3	2,67	2,67
7th	0,079	0,28	Phase 3	7,2	7,2
8th	0,012	0,04	Phase 3	2	2
9th	0,022	0,08	Phase 3	3,8	N/A
10th	0,013	0,05	Phase 3	1,6	1,6
11th	0,144	0,50	Phase 3	3,1	3,1
12th	0,013	0,05	Phase 3	1,33	1,33
13th	0,169	0,59	Phase 3	2	2
14th	0,012	0,04	Phase 3	N/A	N/A
15th	0,021	0,07	Phase 3	N/A	N/A
16th	0,013	0,05	Phase 3	N/A	N/A
17th	0,163	0,57	Phase 3	N/A	N/A
18th	0,015	0,05	Phase 3	N/A	N/A
19th	0,148	0,51	Phase 3	N/A	N/A
20th	0,013	0,04	Phase 3	N/A	N/A
21th	0,018	0,06	Phase 3	N/A	N/A
22th	0,011	0,04	Phase 3	N/A	N/A
23th	0,130	0,45	Phase 3	N/A	N/A
24th	0,011	0,04	Phase 3	N/A	N/A
25th	0,097	0,34	Phase 3	N/A	N/A
26th	0,009	0,03	Phase 3	N/A	N/A
27th	0,013	0,04	Phase 3	N/A	N/A
28th	0,009	0,03	Phase 3	N/A	N/A
29th	0,070	0,24	Phase 3	N/A	N/A
30th	0,008	0,03	Phase 3	N/A	N/A
31th	0,058	0,20	Phase 3	N/A	N/A
32th	0,008	0,03	Phase 3	N/A	N/A
33th	0,009	0,03	Phase 3	N/A	N/A
34th	0,007	0,03	Phase 3	N/A	N/A
35th	0,052	0,18	Phase 3	N/A	N/A
36th	0,007	0,03	Phase 3	N/A	N/A
37th	0,050	0,17	Phase 3	N/A	N/A
38th	0,007	0,03	Phase 3	N/A	N/A
39th	0,009	0,03	Phase 3	N/A	N/A
40th	0,007	0,02	Phase 3	N/A	N/A
THD_{40}	-	1,443	Phase 3	13	13

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. PV180102N011**

Voltage fluctuation and Flicker.					
SUN2000-8KTL	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3-11				
Value	**Pst**	**Plt 2 hours**	**d(t) 500ms**	**dc**	**dmax**
Limit	1,0	0,65	3,3%	3,3%	4%
Test value	0,44	0,22	0,00%	0,14%	0,43%
SUN2000-20KTL	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3-11				
Value	**Pst**	**Plt 2 hours**	**d(t) 500ms**	**dc**	**dmax**
Limit	1,0	0,65	3,3%	3,3%	4%
Test value	0,44	0,31	0,00%	0,51%	0,38%

DC-Injection.				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (58mA)			
Output power SUN2000-8KTL	**~20%**	**~50%**	**75%**	**~100%**
Max. test value (phase L1) [mA]	0,0218	0,0249	0,0255	0,0243
Max. test value (phase L2) [mA]	0,0239	0,0243	0,0277	0,0272
Max. test value (phase L3) [mA]	0,0232	0,0245	0,0289	0,0265
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (87mA)			
Output power SUN2000-12KTL	**~20%**	**~50%**	**75%**	**~100%**
Max. test value (phase L1) [mA]	0,0209	0,0206	0,0218	0,0215
Max. test value (phase L2) [mA]	0,0245	0,0225	0,0232	0,0240
Max. test value (phase L3) [mA]	0,0232	0,0262	0,0287	0,0296
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (123mA)			
Output power SUN2000-17KTL	**~20%**	**~50%**	**75%**	**~100%**
Max. test value (phase L1) [mA]	0,0213	0,0204	0,0257	0,0298
Max. test value (phase L2) [mA]	0,0229	0,0222	0,0296	0,0304
Max. test value (phase L3) [mA]	0,0275	0,0278	0,0222	0,0258
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (145mA)			
Output power SUN2000-20KTL	**~20%**	**~50%**	**75%**	**~100%**
Max. test value (phase L1) [mA]	0,0223	0,0193	0,0269	0,0296
Max. test value (phase L2) [mA]	0,0216	0,0170	0,0272	0,0320
Max. test value (phase L3) [mA]	0,0276	0,0269	0,0274	0,0256