



BUREAU
VERITAS

Uygunluk Belgesi

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

Ürün: Şebekeye bağlı fotovoltaik (PV) invertör

Model: SUN2000-33KTL

Yönetmeliklere uygun kullanım:

EN 50438:2013, TS EN 50438:2014 'ye uygun üç fazlı şebeke denetlemeli otomatik bağlantı kesme cihazı, ana şebekedeki bir inverter aracılığıyla paralel bağlanan üç fazlı fotovoltaik sistemler içindir. Otomatik bağlantı kesme cihazı sözü geçen inverterin tümleşik bir parçasıdır. Bu, ağ tedarikçisinin her zaman ulaşabileceği yalıtım işlevli bağlantı kesme cihazının yerini alır.

Geçerli kurallar ve standartlar:

EN 50438:2013

Mikro jeneratörlerin alçak gerilim dağıtım şebekeleri ile paralel bağlanması için kurallar

DIN V VDE V 0126-1-1:2006-02 (Fonksiyonel güvenlik)

Düşük şebeke voltajı ve jeneratör bağlantısını otomatik olarak kesme cihazı

Jeneratör SUN2000-33KTL faz başına >16A değerlendirilmiştir. Ancak EN 50438 tüm gereksinimleri: 2013 yerine getirilir.

Yukarıda bahsedilen temsili ürünün güvenlik özellikleri, bu belgenin tanzim tarihinde yönetmeliklere uygun olarak belirlenen kullanım için geçerli güvenlik özelliklerine uygundur.

Rapor numarası: PV150825N007-EN50438

Belge numarası: U15-0327

Tanzim tarihi: 2015-09-01

Sertifikasyon enstitüsü

Dieter Zitzmann



Deutsche
Akkreditierungsstelle
D-ZE-12024-01-01

Sertifikasyon enstitüsü Bureau Veritas Consumer Products Services Germany GmbH
göre akredite EN 45011 - ISO / IEC Guide 65

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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:	Huawei Technologies Co., Ltd Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District Shenzhen, 518129, P.R.C
Micro-generator Type	Grid-tied photovoltaic inverter
Rated values	SUN2000-33KTL
Maximum rated capacity	30 kW
Rated voltage	230V
Firmware version	V200R001
Measurement period:	2015-08-25 to 2015-09-01

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.

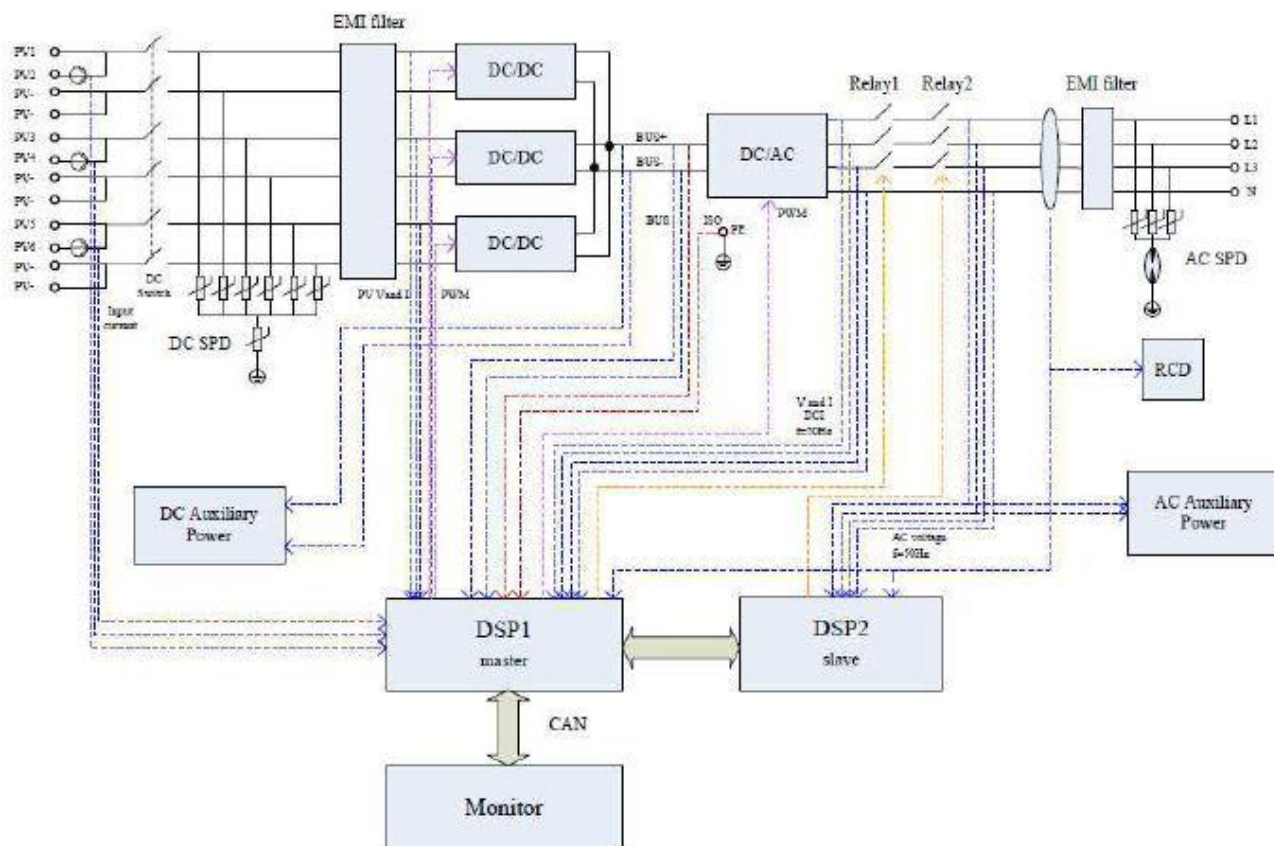


Figure 1 – Schematic structure of the power generation unit

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	*	253	*	--	502
Over-voltage stage 2	264,5	0,2	264,5	0,2	265,5	0,189
Under-voltage stage 1	195,5	1,5	195,5	1,5	195,8	1,484
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	*	253	*	--	494
Over-voltage stage 2	264,5	0,2	264,5	0,2	265,1	0,183
Under-voltage stage 1	195,5	1,5	195,5	1,5	196,2	1,486
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	*	253	*	--	502
Over-voltage stage 2	264,5	0,2	264,5	0,2	265,6	0,187
Under-voltage stage 1	195,5	1,5	195,5	1,5	196,3	1,488

Note.
 Minimum operation time according to default interface protection:
 *Over-voltage stage 1 10 min-mean-value corresponding to EN 50160 with disconnection value set to 253V with a disconnection time 600s
 Over-voltage stage 2 0,1s
 Under-voltage 1,2s

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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	52,0	0,5	52,0	0,5	52,0	0,476
Under-frequency	47,5	0,5	47,5	0,5	47,5	0,488
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	72,8ms	65,2ms	150,8ms	71,2ms	85,2ms	113,6ms
Trip time. Phase 2 fuse removed	72,8ms	65,2ms	150,8ms	71,2ms	85,2ms	113,6ms
Trip time. Phase 3 fuse removed	72,8ms	65,2ms	150,8ms	71,2ms	85,2ms	113,6ms
Note: The relays are direct coupled and open at the same time.						

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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 [kW]	Cos φ [1]
1	253,1	51,50	30,247	0,999
2	197,7	47,55	28,353	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]:	30,271	30,267	30,264
ΔP/PM [%] per 1 Hz:			0,023

Power response to over-frequency

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% P_n							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	29,493	24,056	18,650	24,066	29,487	N/A
PE60 [kW]:	30,103	29,404	24,100	18,697	24,100	29,400	30,103
ΔPE60/PM [%]:	N/A	-0,30	0,15	0,15	0,11	-0,29	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	51,15	50,70	50,25	N/A
PM [kW]:	N/A	17,793	12,074	9,355	12,076	14,793	N/A
PE60 [kW]:	15,103	14,800	12,120	9,371	12,100	14,893	N/A
ΔPE60/PM [%]:	N/A	0,02	0,15	0,05	0,08	0,33	N/A
Limit ΔP/P1min:	+ 10 % of P _M						

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Reactive power			
Uncontrollable reactive power			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,998c	0,9990c	0,9986c
50% PN	0,9996c	0,9995c	0,9994c
75% PN	0,9997c	0,9997c	0,9995c
100% PN	0,9997i	0,9995c	0,9996c
Limit	>0,95	>0,95	>0,95

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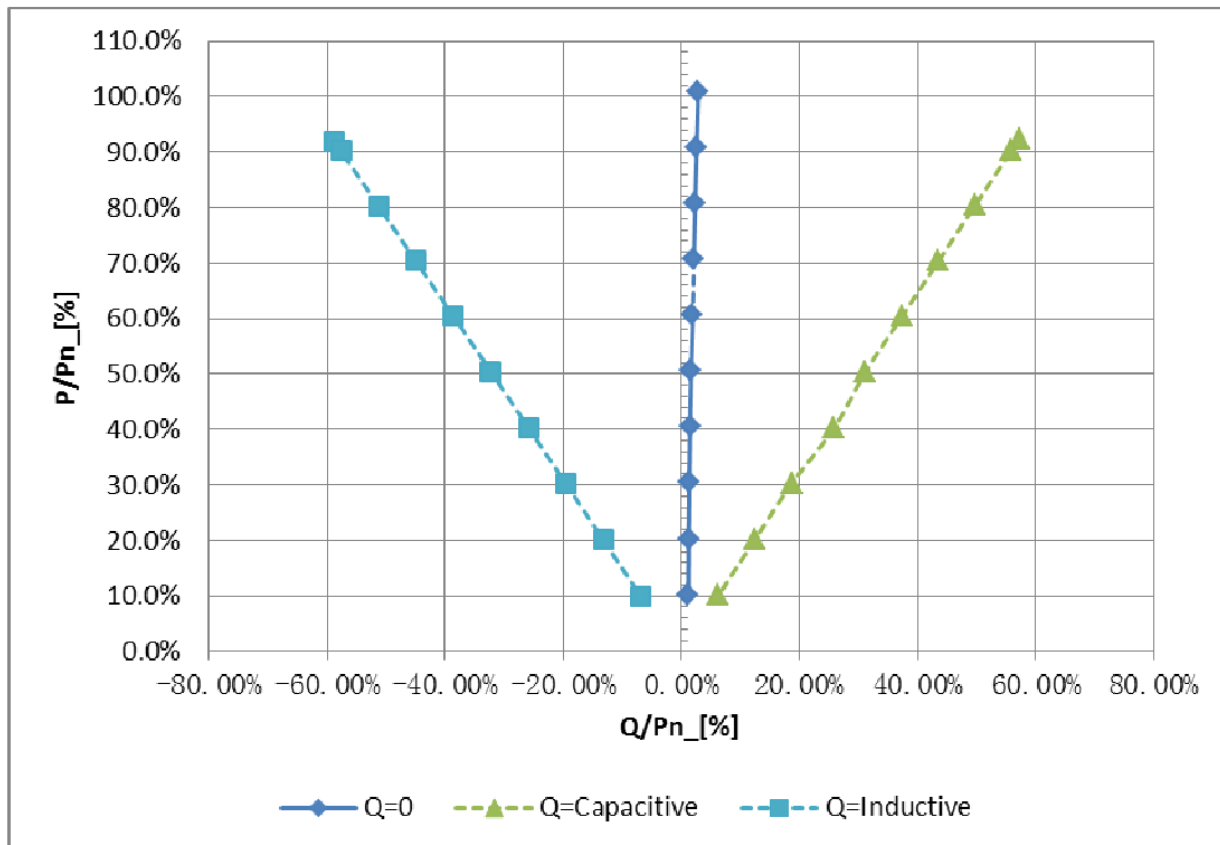
Controllable reactive power				
Inductive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	DC power [W]
0% - 10%	3,011	-2,084	0,8222	3,097
10% - 20%	6,055	-3,977	0,8358	6,192
20% - 30%	9,088	-5,872	0,8399	9,286
30% - 40%	12,109	7,767	0,8417	12,380
40% - 50%	15,119	-9,660	0,8427	15,473
50% - 60%	18,118	-11,563	0,8429	18,564
60% - 70%	21,107	-13,469	0,8430	21,656
70% - 80%	24,089	-15,379	0,8429	24,749
80% - 90%	27,059	-17,278	0,8428	27,835
90% - 100%	27,558	-17,640	0,8422	28,385
Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	DC power [W]
0% - 10%	3,025	1,874	0,8499	3,098
10% - 20%	6,071	3,743	0,8511	6,192
20% - 30%	9,107	5,620	0,8510	9,286
30% - 40%	12,109	7,767	0,8417	12,380
40% - 50%	15,147	9,367	0,8505	15,474
50% - 60%	18,150	11,223	0,8505	18,565
60% - 70%	21,143	13,070	0,8506	21,655
70% - 80%	24,129	14,916	0,8506	24,746
80% - 90%	27,108	16,762	0,8505	27,838
90% - 100%	27,715	17,176	0,8500	28,499
Reactive power supply with set point Q=0				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	DC power [W]
0% - 10%	3,025	0,354	0,9932	3,098
10% - 20%	6,084	0,370	0,9981	6,193
20% - 30%	9,134	0,403	0,9990	9,287
30% - 40%	12,175	0,445	0,9993	12,381
40% - 50%	15,211	0,496	0,9995	15,475
50% - 60%	18,221	0,578	0,9995	18,562
60% - 70%	21,236	0,639	0,9995	21,654
70% - 80%	24,243	0,705	0,9996	24,745
80% - 90%	27,243	0,784	0,9996	27,835
90% - 100%	30,240	0,867	0,9996	30,925

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Diagram of inductive reactive power absorption



Q adjustment				
Test: 100%Pn				
	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured cos φ	Deviation compared to setpoint ΔQ / PN [%]
- Qmin	14,400	15,015	0,8717	2,05
0	0	0,834	0,9996	2,78
+ Qmax	14,400	15,105	0,8692	2,35
Test: 50%Pn				
	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured cos φ	Deviation compared to setpoint ΔQ / PN [%]
- Qmin	14,400	15,064	0,7062	2,21
0	0	0,495	0,9995	1,65
+ Qmax	14,400	15,133	0,7178	2,44

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Connection and starting to generate electrical power		
	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]	76s	76s
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]	77s	78s
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	
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]	77s	78s
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]	123s	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.	

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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	53,7	53,9
Initial Value of aperiodic current	A	N/A	100ms	29,6	41,0
Initial symmetrical short-circuit current*	I_k	N/A	250ms	--	--
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500ms	--	--
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	0,066	In seconds

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Power Quality. Harmonic current emission					
micro-generator		SUN2000-33KTL			
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	43,291	0,64	Phase 1	-	-
2nd	0,275	0,18	Phase 1	8	8
3rd	0,076	0,20	Phase 1	21,6	N/A
4th	0,087	0,12	Phase 1	4	4
5th	0,050	0,08	Phase 1	10,7	10,7
6th	0,033	0,23	Phase 1	2,67	2,67
7th	0,100	0,05	Phase 1	7,2	7,2
8th	0,022	0,04	Phase 1	2	2
9th	0,017	0,05	Phase 1	3,8	N/A
10th	0,022	0,64	Phase 1	1,6	1,6
11th	0,276	0,04	Phase 1	3,1	3,1
12th	0,016	0,57	Phase 1	1,33	1,33
13th	0,246	0,04	Phase 1	2	2
14th	0,019	0,05	Phase 1	N/A	N/A
15th	0,022	0,05	Phase 1	N/A	N/A
16th	0,023	0,60	Phase 1	N/A	N/A
17th	0,261	0,04	Phase 1	N/A	N/A
18th	0,017	0,58	Phase 1	N/A	N/A
19th	0,251	0,06	Phase 1	N/A	N/A
20th	0,027	0,05	Phase 1	N/A	N/A
21th	0,022	0,06	Phase 1	N/A	N/A
22th	0,024	0,50	Phase 1	N/A	N/A
23th	0,216	0,04	Phase 1	N/A	N/A
24th	0,016	0,40	Phase 1	N/A	N/A
25th	0,173	0,06	Phase 1	N/A	N/A
26th	0,024	0,03	Phase 1	N/A	N/A
27th	0,013	0,04	Phase 1	N/A	N/A
28th	0,019	0,27	Phase 1	N/A	N/A
29th	0,115	0,02	Phase 1	N/A	N/A
30th	0,010	0,22	Phase 1	N/A	N/A
31th	0,094	0,03	Phase 1	N/A	N/A
32th	0,015	0,03	Phase 1	N/A	N/A
33th	0,012	0,03	Phase 1	N/A	N/A
34th	0,014	0,14	Phase 1	N/A	N/A
35th	0,060	0,02	Phase 1	N/A	N/A
36th	0,008	0,13	Phase 1	N/A	N/A
37th	0,056	0,03	Phase 1	N/A	N/A
38th	0,011	0,02	Phase 1	N/A	N/A
39th	0,008	0,02	Phase 1	N/A	N/A
40th	0,010	0,64	Phase 1	N/A	N/A
THD ₄₀	0,018	0,03	Phase 1	13	13
PWHD	-0,079	0,18	Phase 1	22	22

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Power Quality. Harmonic current emission					
micro-generator		SUN2000-33KTL			
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	43,217	0,76	Phase 2	-	-
2nd	0,329	0,18	Phase 2	8	8
3rd	0,079	0,20	Phase 2	21,6	N/A
4th	0,088	0,08	Phase 2	4	4
5th	0,035	0,07	Phase 2	10,7	10,7
6th	0,029	0,24	Phase 2	2,67	2,67
7th	0,102	0,07	Phase 2	7,2	7,2
8th	0,030	0,04	Phase 2	2	2
9th	0,018	0,05	Phase 2	3,8	N/A
10th	0,021	0,64	Phase 2	1,6	1,6
11th	0,276	0,05	Phase 2	3,1	3,1
12th	0,020	0,60	Phase 2	1,33	1,33
13th	0,257	0,06	Phase 2	2	2
14th	0,025	0,05	Phase 2	N/A	N/A
15th	0,022	0,06	Phase 2	N/A	N/A
16th	0,028	0,62	Phase 2	N/A	N/A
17th	0,269	0,06	Phase 2	N/A	N/A
18th	0,027	0,61	Phase 2	N/A	N/A
19th	0,262	0,07	Phase 2	N/A	N/A
20th	0,031	0,06	Phase 2	N/A	N/A
21th	0,024	0,06	Phase 2	N/A	N/A
22th	0,024	0,52	Phase 2	N/A	N/A
23th	0,226	0,05	Phase 2	N/A	N/A
24th	0,022	0,41	Phase 2	N/A	N/A
25th	0,178	0,06	Phase 2	N/A	N/A
26th	0,025	0,03	Phase 2	N/A	N/A
27th	0,012	0,04	Phase 2	N/A	N/A
28th	0,018	0,27	Phase 2	N/A	N/A
29th	0,118	0,03	Phase 2	N/A	N/A
30th	0,014	0,21	Phase 2	N/A	N/A
31th	0,091	0,04	Phase 2	N/A	N/A
32th	0,016	0,02	Phase 2	N/A	N/A
33th	0,011	0,03	Phase 2	N/A	N/A
34th	0,012	0,14	Phase 2	N/A	N/A
35th	0,061	0,03	Phase 2	N/A	N/A
36th	0,011	0,12	Phase 2	N/A	N/A
37th	0,052	0,03	Phase 2	N/A	N/A
38th	0,012	0,02	Phase 2	N/A	N/A
39th	0,009	0,02	Phase 2	N/A	N/A
40th	0,010	0,76	Phase 2	N/A	N/A
THD ₄₀	0,016	0,04	Phase 2	13	13
PWHD	0,083	0,19	Phase 2	22	22

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Power Quality. Harmonic current emission					
micro-generator		SUN2000-33KTL			
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	43,188	0,77	Phase 3	-	-
2nd	0,334	0,14	Phase 3	8	8
3rd	0,059	0,14	Phase 3	21,6	N/A
4th	0,059	0,10	Phase 3	4	4
5th	0,043	0,06	Phase 3	10,7	10,7
6th	0,024	0,23	Phase 3	2,67	2,67
7th	0,098	0,05	Phase 3	7,2	7,2
8th	0,021	0,03	Phase 3	2	2
9th	0,012	0,05	Phase 3	3,8	N/A
10th	0,022	0,65	Phase 3	1,6	1,6
11th	0,281	0,04	Phase 3	3,1	3,1
12th	0,019	0,57	Phase 3	1,33	1,33
13th	0,247	0,05	Phase 3	2	2
14th	0,022	0,04	Phase 3	N/A	N/A
15th	0,016	0,06	Phase 3	N/A	N/A
16th	0,025	0,63	Phase 3	N/A	N/A
17th	0,271	0,06	Phase 3	N/A	N/A
18th	0,024	0,59	Phase 3	N/A	N/A
19th	0,256	0,06	Phase 3	N/A	N/A
20th	0,028	0,04	Phase 3	N/A	N/A
21th	0,017	0,06	Phase 3	N/A	N/A
22th	0,027	0,51	Phase 3	N/A	N/A
23th	0,219	0,05	Phase 3	N/A	N/A
24th	0,024	0,42	Phase 3	N/A	N/A
25th	0,182	0,05	Phase 3	N/A	N/A
26th	0,023	0,03	Phase 3	N/A	N/A
27th	0,013	0,04	Phase 3	N/A	N/A
28th	0,018	0,27	Phase 3	N/A	N/A
29th	0,117	0,04	Phase 3	N/A	N/A
30th	0,015	0,22	Phase 3	N/A	N/A
31th	0,094	0,03	Phase 3	N/A	N/A
32th	0,014	0,02	Phase 3	N/A	N/A
33th	0,009	0,03	Phase 3	N/A	N/A
34th	0,012	0,15	Phase 3	N/A	N/A
35th	0,063	0,02	Phase 3	N/A	N/A
36th	0,009	0,13	Phase 3	N/A	N/A
37th	0,054	0,02	Phase 3	N/A	N/A
38th	0,010	0,02	Phase 3	N/A	N/A
39th	0,007	0,02	Phase 3	N/A	N/A
40th	0,010	0,77	Phase 3	N/A	N/A
THD ₄₀	0,016	0,04	Phase 3	13	13
PWHD	0,082	0,19	Phase 3	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PV150825N007

Voltage fluctuation and Flicker.					
	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-11				
Value	Pst	Plt 2 hours	d(t) _{500ms}	dc	dmax
Limit	1,0	0,65	3,3%	3,3%	4%
Test value L1:	0,25	0,19	0	0,60	0,74
Test value L2:	0,25	0,19	0	0,65	0,82
Test value L3:	0,26	0,20	0	0,65	0,79

DC-Injection.				
Protection limit	Tested at four power levels limit 0,5% of IAC _{nom}			
Output power	~20%	~50%	75%	~100%
Max. test value (phase L1) [mA]	55,0	-55,0	-44,0	-54,0
Max. test value (phase L2) [mA]	46,0	68,0	59,0	71,0
Max. test value (phase L3) [mA]	-64,0	-42,0	-42,0	-37,0

Comments
The generator SUN2000-33KTL is rated >16A per phase. However all requirements of the EN 50438:2013 are fulfilled.