



# Uygunluk Belgesi

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

**Ürün:** Güneş invertör

**Model:** SUN2000-3KTL-M0, SUN2000-4KTL-M0,  
SUN2000-5KTL-M0, SUN2000-6KTL-M0,  
SUN2000-8KTL-M0, SUN2000-10KTL-M0,  
SUN2000-3KTL-M1, SUN2000-4KTL-M1,  
SUN2000-5KTL-M1, SUN2000-6KTL-M1,  
SUN2000-8KTL-M1, SUN2000-10KTL-M1

## 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, TS EN 50438:2014**

Mikro jeneratörlerin alçak gerilim dağıtım şebekeleri ile paralel bağlanması için kurallar

**VDE 0126-1-1:2006:2006-02 (Fonksiyonel güvenlik)**

Bir şebeke bağlantılı jeneratör ve kamu alçak gerilim şebekesine arasında otomatik bağlantı kesme cihazı

Jeneratör SUN2000-10KTL-M0, SUN2000-10KTL-M1 faz başına 16A üzerinde bir akım için kullanılır. Ancak EN 50438:2013, TS EN 50438:2014 tüm gereklilikleri yerine getirilir.

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

**Rapor numarası:** PV180906N022-3

**Belge numarası:** U18-0624

**Tanzim tarihi:** 2018-11-19

**Sertifikasyon enstitüsü**



Holger Schaffer

Sertifikasyon enstitüsü Bureau Veritas Consumer Products Services Germany GmbH  
göre akredite DIN EN ISO/IEC 17065



Deutsche  
Akkreditierungsstelle  
D-ZE-12024-01-00

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

<b>Manufacturer / applicant:</b>	Huawei Technologies Co., Ltd. Administration Building, Headquarters of Huawei Technologies Co., Ltd. Bantian, Longgang District, Shenzhen, 518129 P.R.C		
<b>Micro-generator Type</b>	SOLAR INVERTER		
<b>Rated values</b>	SUN2000-3KTL-M0 SUN2000-3KTL-M1	SUN2000-4KTL-M0 SUN2000-4KTL-M1	SUN2000-5KTL-M0 SUN2000-5KTL-M1
<b>Rated capacity</b>	3 kW	4 kW	5 kW
<b>Rated values</b>	SUN2000-6KTL-M0 SUN2000-6KTL-M1	SUN2000-8KTL-M0 SUN2000-8KTL-M1	SUN2000-10KTL-M0 SUN2000-10KTL-M1
<b>Rated capacity</b>	6 kW	8 kW	10 kW
<b>Rated voltage</b>	230V/400V	230V/400V	230V/400V
<b>Firmware version</b>	V100R001		
<b>Measurement period:</b>	2018-09-06 to 2018-10-30		

## 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.

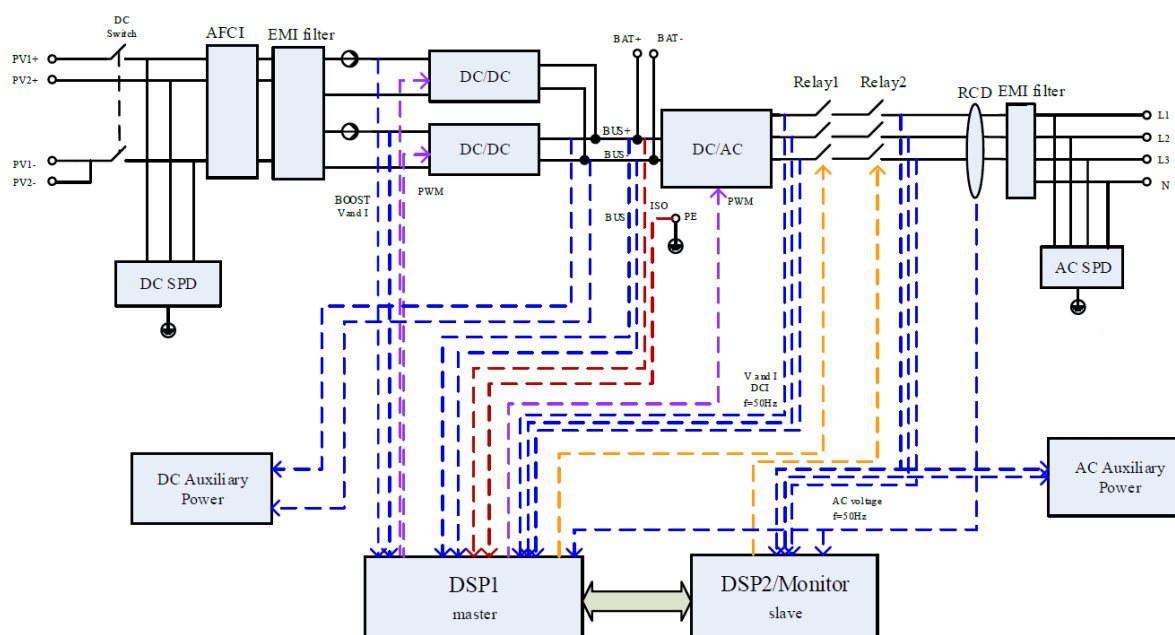


Figure 1 – Schematic structure of the power generation unit

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	3* / 600*	253,0	3* / 600*	253,7	2,985 / 526*
Over-voltage stage 2	264,5	0,2	264,5	0,2	265,2	0,184
Under-voltage stage 1	195,5	1,5	195,5	1,5	194,8	1,495

#### 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*	253,5	2,980 / 536*
Over-voltage stage 2	264,5	0,2	264,5	0,2	265,1	0,182
Under-voltage stage 1	195,5	1,5	195,5	1,5	194,2	1,482

#### 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*	253,8	2,995 / 533*
Over-voltage stage 2	264,5	0,2	264,5	0,2	265,3	0,187
Under-voltage stage 1	195,5	1,5	195,5	1,5	194,7	1,491

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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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	51,98	0,477
Under-frequency	47,50	0,5	47,50	0,5	47,51	0,487

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]	169	173	291	255	248	270
Trip time. Phase 2 fuse removed [ms]	169	173	291	255	248	270
Trip time. Phase 3 fuse removed [ms]	169	173	291	255	248	270

## 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	197,92	47,55	9903	0,9909
2	251,45	51,49	11000	0,9972

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 [W]:	11248	11249	11249
ΔP/PM [%] per 1 Hz:			0

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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 <sub>n</sub>							
Frequency [Hz]:	50,00	50,20	50,70	51,15	50,70	50,20	50,00
PM [kW]:	N/A	10,854	8,683	6,729	8,683	10,854	N/A
PE60 [kW]:	10,854	10,851	8,678	6,726	8,678	10,749	10,747
ΔPE60/PM [%]:	N/A	-0,03	-0,05	-0,03	-0,05	-0,95	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% P <sub>n</sub>							
Frequency [Hz]:	50,00	50,20	50,70	51,15	50,70	50,20	50,00
PM [kW]:	N/A	5,451	4,361	3,380	4,361	5,451	N/A
PE60 [kW]:	5,451	5,439	4,348	3,369	4,348	5,439	10,750
ΔPE60/PM [%]:	N/A	-0,11	-0,12	-0,10	-0,12	-0,11	N/A
Limit ΔP/P <sub>1min</sub> :	+ 10 % of P <sub>M</sub>						

Reactive power			
Uncontrollable reactive power			
SUN2000-10KTL-M0			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,999i	0,999i	0,999i
50% PN	0,999i	0,999i	0,999i
75% PN	0,999i	0,999i	0,999i
100% PN	0,999i	0,999i	0,999i
Limit	>0,95	>0,95	>0,95
SUN2000-3KTL-M0			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,999i	0,999i	0,999i
50% PN	0,999i	0,999i	0,999i
75% PN	0,999i	0,999i	0,999i
100% PN	0,999i	0,999i	0,999i
Limit	>0,95	>0,95	>0,95

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Controllable reactive power				
SUN2000-10KTL-M0				
Inductive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos $\varphi$ )	DC power [W]
0% - 10%	-7	4773	-0,0010	84
10% - 20%	1098	4775	0,2240	1191
20% - 30%	2203	4777	0,4190	2302
30% - 40%	3306	4777	0,5690	3415
40% - 50%	4408	4776	0,6780	4528
50% - 60%	5514	4778	0,7560	5650
60% - 70%	6618	4779	0,8110	6773
70% - 80%	7720	4778	0,8500	7895
80% - 90%	8825	4779	0,8790	9021
90% - 100%	9923	4777	0,9010	10142
Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos $\varphi$ )	DC power [W]
0% - 10%	8	-4858	0,0020	121
10% - 20%	1112	-4856	0,2230	1227
20% - 30%	2216	-4854	0,4150	2336
30% - 40%	3320	-4853	0,5650	3449
40% - 50%	4424	-4854	0,6740	4564
50% - 60%	5529	-4855	0,7510	5684
60% - 70%	6632	-4853	0,8070	6806
70% - 80%	7736	-4853	0,8470	7928
80% - 90%	8841	-4855	0,8770	9054
90% - 100%	9934	-4853	0,8990	10171
Reactive power supply with set point Q=0				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos $\varphi$ )	DC power [W]
0% - 10%	1	474	0,0020	34
10% - 20%	1101	498	0,9110	1143
20% - 30%	2210	520	0,9730	2267
30% - 40%	3311	542	0,9870	3384
40% - 50%	4419	565	0,9920	4506
50% - 60%	5517	587	0,9940	5624
60% - 70%	6618	608	0,9960	6732
70% - 80%	7719	631	0,9970	7855
80% - 90%	8825	655	0,9970	8983
90% - 100%	9922	677	0,9980	10103

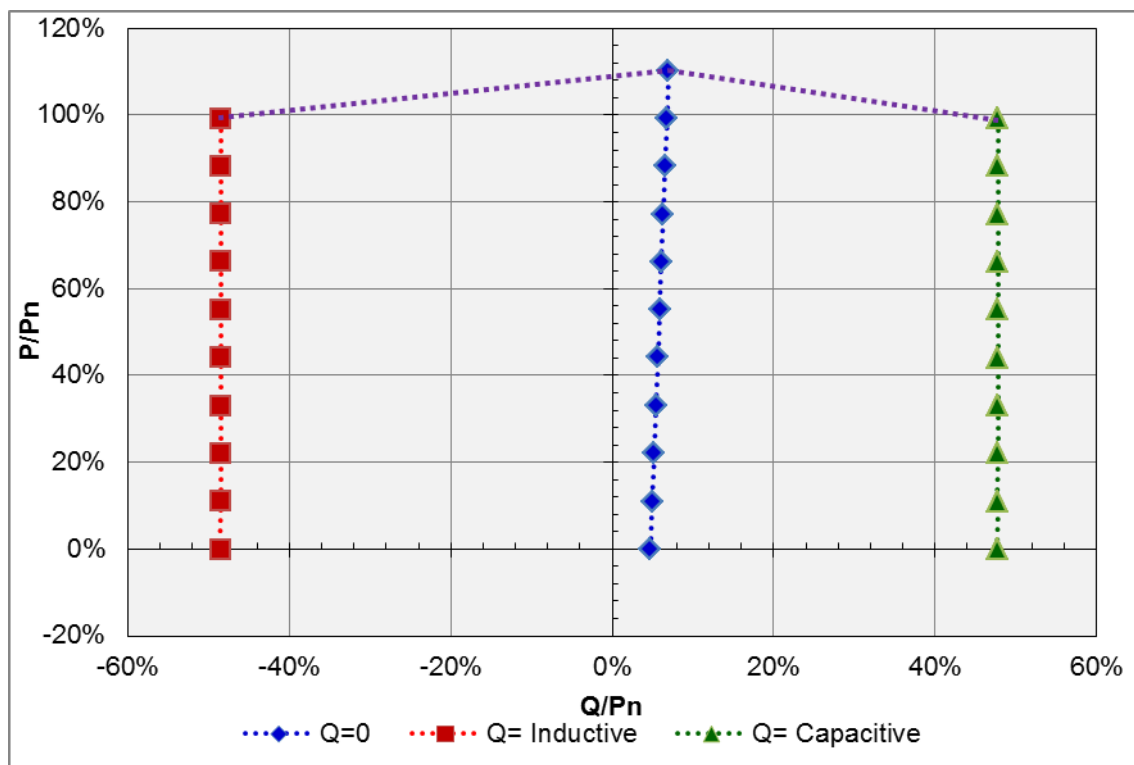
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Diagram of inductive reactive power absorption

SUN2000-10KTL-M0



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## Controllable reactive power

SUN2000-3KTL-M0

## Inductive (supply reactive power)

Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos $\varphi$ )	DC power [W]
0% - 10%	-2	1512	-0,0010	40
10% - 20%	338	1511	0,2180	382
20% - 30%	678	1509	0,4100	724
30% - 40%	1018	1506	0,5600	1067
40% - 50%	1356	1504	0,6700	1408
50% - 60%	1694	1503	0,7480	1749
60% - 70%	2032	1501	0,8040	2091
70% - 80%	2370	1501	0,8450	2432
80% - 90%	2708	1500	0,8750	2773
90% - 100%	3012	1498	0,8950	3079

## Capacitive (supply reactive power)

Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos $\varphi$ )	DC power [W]
0% - 10%	-2	-1492	-0,0010	54
10% - 20%	338	-1491	0,2210	394
20% - 30%	677	-1490	0,4140	735
30% - 40%	1016	-1489	0,5640	1075
40% - 50%	1354	-1488	0,6730	1416
50% - 60%	1692	-1488	0,7510	1756
60% - 70%	2031	-1487	0,8070	2097
70% - 80%	2369	-1487	0,8470	2439
80% - 90%	2707	-1486	0,8770	2779
90% - 100%	3043	-1484	0,8990	3117

## Reactive power supply with set point Q=0

Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos $\varphi$ )	DC power [W]
0% - 10%	-2	-175	-0,0100	37
10% - 20%	341	-169	0,8960	381
20% - 30%	684	-168	0,9710	725
30% - 40%	1021	-166	0,9870	1067
40% - 50%	1359	-165	0,9930	1408
50% - 60%	1695	-165	0,9950	1749
60% - 70%	2032	-162	0,9970	2089
70% - 80%	2370	-158	0,9980	2430
80% - 90%	2705	-139	0,9990	2763
90% - 100%	3041	-135	0,9990	3102



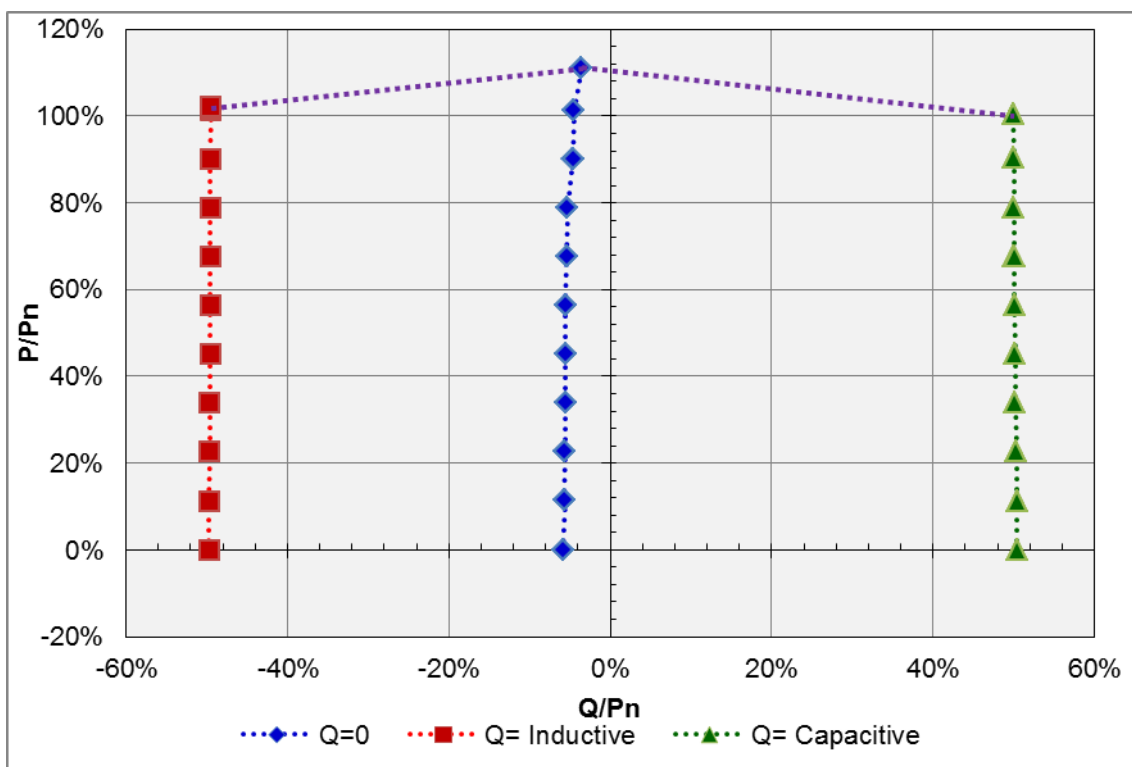
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### Diagram of inductive reactive power absorption

SUN2000-3KTL-M0



Q adjustment				
	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured $\cos \varphi$	Deviation compared to setpoint $\Delta Q / P_n$ [%]
- Qmin	-4843	-4854	0,7232	-0,11
0	0	135	0,9996	1,35
+ Qmax	4843	4775	0,7279	0,68

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Connection and starting to generate electrical power		
Test according EN 50438 with standard setting	Min. voltage for connection to grid:	195,5 V
	Max. voltage for connection to grid:	253,0 V
	Min. frequency for connection to grid:	47,50 Hz
	Max. frequency for connection to grid:	50,05 Hz
	Observation time ( $\geq 60s$ )	60 s
Connection and starting to generate electrical power		
	Voltage conditions	
a) Start up for voltage range	<85% Un for twice of observation time	>110% Un for twice of observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
b) In voltage range at start-up	$\geq 85\% U_n$ within twice setting observation time	$\leq 110\% U_n$ within twice setting observation time
Reconnection time [s]	65,6	65,8
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%Pn/min.	
c) In voltage range after voltage failure	$\geq 85\% U_n$ for twice of setting observation time	$\leq 110\% U_n$ for twice of setting observation time
Reconnection time [s]	65,4	65,6
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%Pn/min.	
	Frequency conditions	
d) Start up for frequency range	<47,5 Hz for twice of setting observation time	>50,1 Hz for twice of setting observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
e) In frequency range at start-up	$\geq 47,5$ Hz within twice of setting observation time	$\leq 50,1$ Hz within twice of setting observation time
Reconnection time [s]	65,8	87,2
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%Pn/min.	
f) In frequency range after frequency failure	$\geq 47,5$ Hz for twice of setting observation time	$\leq 50,05$ Hz for twice of setting observation time
Reconnection time [s]	65,4	87,2
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%Pn/min.	

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Short-circuit current contribution					
Short-circuit current parameters					
L1 Phase					
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	54	12,9
Initial Value of aperiodic current	A	N/A	100ms	39	7,7
Initial symmetrical short-circuit current*	$I_k$	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	$i_{DC}$	N/A	500ms	N/A	N/A
L2 Phase					
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	49	13,1
Initial Value of aperiodic current	A	N/A	100ms	38	8,2
Initial symmetrical short-circuit current*	$I_k$	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	$i_{DC}$	N/A	500ms	N/A	N/A
L3 Phase					
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	37	13,3
Initial Value of aperiodic current	A	N/A	100ms	35	7,7
Initial symmetrical short-circuit current*	$I_k$	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	$i_{DC}$	N/A	500ms	N/A	N/A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	0,074	In seconds

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-3KTL-M0		
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	4,357	99,980	Phase 1	-
2nd	0,008	0,189	Phase 1	1,080
3rd	0,012	0,278	Phase 1	2,300
4th	0,006	0,140	Phase 1	0,430
5th	0,009	0,207	Phase 1	1,140
6th	0,005	0,117	Phase 1	0,300
7th	0,007	0,157	Phase 1	0,770
8th	0,004	0,102	Phase 1	0,230
9th	0,009	0,196	Phase 1	0,400
10th	0,005	0,117	Phase 1	0,184
11th	0,007	0,152	Phase 1	0,330
12th	0,005	0,113	Phase 1	0,153
13th	0,006	0,141	Phase 1	0,210
14th	0,005	0,115	Phase 1	0,131
15th	0,007	0,153	Phase 1	0,150
16th	0,004	0,098	Phase 1	0,115
17th	0,007	0,160	Phase 1	0,132
18th	0,005	0,122	Phase 1	0,102
19th	0,006	0,139	Phase 1	0,118
20th	0,005	0,111	Phase 1	0,092
21th	0,006	0,131	Phase 1	0,107
22th	0,005	0,113	Phase 1	0,084
23th	0,007	0,170	Phase 1	0,098
24th	0,006	0,144	Phase 1	0,077
25th	0,007	0,167	Phase 1	0,090
26th	0,006	0,136	Phase 1	0,071
27th	0,006	0,135	Phase 1	0,083
28th	0,006	0,131	Phase 1	0,066
29th	0,006	0,141	Phase 1	0,078
30th	0,006	0,132	Phase 1	0,061
31th	0,005	0,126	Phase 1	0,073
32th	0,007	0,152	Phase 1	0,058
33th	0,007	0,150	Phase 1	0,068
34th	0,004	0,092	Phase 1	0,054
35th	0,005	0,111	Phase 1	0,064
36th	0,005	0,106	Phase 1	0,051
37th	0,005	0,104	Phase 1	0,061
38th	0,004	0,095	Phase 1	0,048
39th	0,004	0,097	Phase 1	0,058
40th	0,004	0,086	Phase 1	0,046

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-3KTL-M0		
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	4,385	99,977	Phase 2	-
2nd	0,009	0,204	Phase 2	1,080
3rd	0,025	0,576	Phase 2	2,300
4th	0,007	0,156	Phase 2	0,430
5th	0,009	0,210	Phase 2	1,140
6th	0,005	0,125	Phase 2	0,300
7th	0,008	0,177	Phase 2	0,770
8th	0,005	0,123	Phase 2	0,230
9th	0,007	0,165	Phase 2	0,400
10th	0,006	0,135	Phase 2	0,184
11th	0,007	0,153	Phase 2	0,330
12th	0,005	0,110	Phase 2	0,153
13th	0,006	0,145	Phase 2	0,210
14th	0,005	0,119	Phase 2	0,131
15th	0,007	0,161	Phase 2	0,150
16th	0,005	0,121	Phase 2	0,115
17th	0,007	0,165	Phase 2	0,132
18th	0,006	0,129	Phase 2	0,102
19th	0,006	0,144	Phase 2	0,118
20th	0,005	0,115	Phase 2	0,092
21th	0,008	0,171	Phase 2	0,107
22th	0,005	0,113	Phase 2	0,084
23th	0,007	0,161	Phase 2	0,098
24th	0,007	0,159	Phase 2	0,077
25th	0,008	0,174	Phase 2	0,090
26th	0,006	0,145	Phase 2	0,071
27th	0,009	0,195	Phase 2	0,083
28th	0,005	0,124	Phase 2	0,066
29th	0,006	0,142	Phase 2	0,078
30th	0,006	0,139	Phase 2	0,061
31th	0,006	0,129	Phase 2	0,073
32th	0,006	0,144	Phase 2	0,058
33th	0,007	0,148	Phase 2	0,068
34th	0,005	0,105	Phase 2	0,054
35th	0,005	0,111	Phase 2	0,064
36th	0,006	0,126	Phase 2	0,051
37th	0,005	0,104	Phase 2	0,061
38th	0,004	0,101	Phase 2	0,048
39th	0,007	0,168	Phase 2	0,058
40th	0,004	0,089	Phase 2	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-3KTL-M0		
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	4,360	99,976	Phase 3	-
2nd	0,006	0,144	Phase 3	1,080
3rd	0,014	0,319	Phase 3	2,300
4th	0,007	0,160	Phase 3	0,430
5th	0,006	0,128	Phase 3	1,140
6th	0,005	0,116	Phase 3	0,300
7th	0,006	0,141	Phase 3	0,770
8th	0,006	0,128	Phase 3	0,230
9th	0,008	0,173	Phase 3	0,400
10th	0,006	0,130	Phase 3	0,184
11th	0,005	0,120	Phase 3	0,330
12th	0,005	0,114	Phase 3	0,153
13th	0,006	0,141	Phase 3	0,210
14th	0,005	0,114	Phase 3	0,131
15th	0,009	0,217	Phase 3	0,150
16th	0,005	0,122	Phase 3	0,115
17th	0,007	0,156	Phase 3	0,132
18th	0,006	0,135	Phase 3	0,102
19th	0,005	0,124	Phase 3	0,118
20th	0,006	0,135	Phase 3	0,092
21th	0,007	0,160	Phase 3	0,107
22th	0,006	0,149	Phase 3	0,084
23th	0,006	0,148	Phase 3	0,098
24th	0,007	0,156	Phase 3	0,077
25th	0,007	0,156	Phase 3	0,090
26th	0,007	0,163	Phase 3	0,071
27th	0,010	0,218	Phase 3	0,083
28th	0,006	0,142	Phase 3	0,066
29th	0,005	0,126	Phase 3	0,078
30th	0,005	0,122	Phase 3	0,061
31th	0,005	0,114	Phase 3	0,073
32th	0,005	0,118	Phase 3	0,058
33th	0,013	0,289	Phase 3	0,068
34th	0,005	0,108	Phase 3	0,054
35th	0,005	0,123	Phase 3	0,064
36th	0,006	0,137	Phase 3	0,051
37th	0,005	0,113	Phase 3	0,061
38th	0,005	0,107	Phase 3	0,048
39th	0,007	0,159	Phase 3	0,058
40th	0,005	0,107	Phase 3	0,046

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Extract from test report according to EN 50438

Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-4KTL-M0		
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	5,870	99,969	Phase 1	-
2nd	0,038	0,645	Phase 1	1,080
3rd	0,017	0,290	Phase 1	2,300
4th	0,016	0,268	Phase 1	0,430
5th	0,026	0,447	Phase 1	1,140
6th	0,005	0,084	Phase 1	0,300
7th	0,033	0,564	Phase 1	0,770
8th	0,012	0,203	Phase 1	0,230
9th	0,007	0,124	Phase 1	0,400
10th	0,017	0,292	Phase 1	0,184
11th	0,014	0,247	Phase 1	0,330
12th	0,007	0,124	Phase 1	0,153
13th	0,023	0,388	Phase 1	0,210
14th	0,004	0,076	Phase 1	0,131
15th	0,007	0,122	Phase 1	0,150
16th	0,007	0,120	Phase 1	0,115
17th	0,069	1,169	Phase 1	0,132
18th	0,007	0,118	Phase 1	0,102
19th	0,045	0,761	Phase 1	0,118
20th	0,006	0,103	Phase 1	0,092
21th	0,006	0,107	Phase 1	0,107
22th	0,007	0,111	Phase 1	0,084
23th	0,009	0,158	Phase 1	0,098
24th	0,007	0,120	Phase 1	0,077
25th	0,015	0,247	Phase 1	0,090
26th	0,011	0,188	Phase 1	0,071
27th	0,007	0,127	Phase 1	0,083
28th	0,011	0,183	Phase 1	0,066
29th	0,012	0,210	Phase 1	0,078
30th	0,009	0,146	Phase 1	0,061
31th	0,010	0,163	Phase 1	0,073
32th	0,020	0,333	Phase 1	0,058
33th	0,008	0,134	Phase 1	0,068
34th	0,014	0,234	Phase 1	0,054
35th	0,009	0,156	Phase 1	0,064
36th	0,007	0,121	Phase 1	0,051
37th	0,012	0,196	Phase 1	0,061
38th	0,012	0,208	Phase 1	0,048
39th	0,011	0,187	Phase 1	0,058
40th	0,012	0,198	Phase 1	0,046

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Extract from test report according to EN 50438

Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-4KTL-M0		
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	5,902	99,972	Phase 2	-
2nd	0,023	0,391	Phase 2	1,080
3rd	0,010	0,162	Phase 2	2,300
4th	0,016	0,268	Phase 2	0,430
5th	0,027	0,458	Phase 2	1,140
6th	0,005	0,090	Phase 2	0,300
7th	0,029	0,496	Phase 2	0,770
8th	0,016	0,266	Phase 2	0,230
9th	0,016	0,274	Phase 2	0,400
10th	0,018	0,302	Phase 2	0,184
11th	0,014	0,232	Phase 2	0,330
12th	0,008	0,131	Phase 2	0,153
13th	0,022	0,372	Phase 2	0,210
14th	0,007	0,121	Phase 2	0,131
15th	0,006	0,095	Phase 2	0,150
16th	0,007	0,111	Phase 2	0,115
17th	0,069	1,176	Phase 2	0,132
18th	0,006	0,106	Phase 2	0,102
19th	0,045	0,764	Phase 2	0,118
20th	0,007	0,124	Phase 2	0,092
21th	0,008	0,130	Phase 2	0,107
22th	0,007	0,114	Phase 2	0,084
23th	0,010	0,166	Phase 2	0,098
24th	0,008	0,138	Phase 2	0,077
25th	0,014	0,245	Phase 2	0,090
26th	0,012	0,198	Phase 2	0,071
27th	0,008	0,136	Phase 2	0,083
28th	0,013	0,220	Phase 2	0,066
29th	0,009	0,152	Phase 2	0,078
30th	0,007	0,123	Phase 2	0,061
31th	0,008	0,134	Phase 2	0,073
32th	0,010	0,172	Phase 2	0,058
33th	0,009	0,147	Phase 2	0,068
34th	0,010	0,174	Phase 2	0,054
35th	0,007	0,122	Phase 2	0,064
36th	0,008	0,143	Phase 2	0,051
37th	0,012	0,206	Phase 2	0,061
38th	0,014	0,236	Phase 2	0,048
39th	0,008	0,141	Phase 2	0,058
40th	0,013	0,216	Phase 2	0,046



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Extract from test report according to EN 50438

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-4KTL-M0		
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	5,872	99,972	Phase 3	-
2nd	0,031	0,525	Phase 3	1,080
3rd	0,012	0,213	Phase 3	2,300
4th	0,014	0,234	Phase 3	0,430
5th	0,035	0,598	Phase 3	1,140
6th	0,006	0,095	Phase 3	0,300
7th	0,033	0,554	Phase 3	0,770
8th	0,013	0,220	Phase 3	0,230
9th	0,007	0,122	Phase 3	0,400
10th	0,018	0,301	Phase 3	0,184
11th	0,011	0,181	Phase 3	0,330
12th	0,005	0,093	Phase 3	0,153
13th	0,025	0,433	Phase 3	0,210
14th	0,006	0,106	Phase 3	0,131
15th	0,008	0,141	Phase 3	0,150
16th	0,006	0,108	Phase 3	0,115
17th	0,070	1,198	Phase 3	0,132
18th	0,006	0,105	Phase 3	0,102
19th	0,046	0,786	Phase 3	0,118
20th	0,007	0,123	Phase 3	0,092
21th	0,006	0,094	Phase 3	0,107
22th	0,007	0,119	Phase 3	0,084
23th	0,011	0,179	Phase 3	0,098
24th	0,007	0,118	Phase 3	0,077
25th	0,014	0,231	Phase 3	0,090
26th	0,009	0,159	Phase 3	0,071
27th	0,008	0,128	Phase 3	0,083
28th	0,010	0,171	Phase 3	0,066
29th	0,010	0,176	Phase 3	0,078
30th	0,007	0,122	Phase 3	0,061
31th	0,007	0,119	Phase 3	0,073
32th	0,014	0,239	Phase 3	0,058
33th	0,006	0,099	Phase 3	0,068
34th	0,013	0,216	Phase 3	0,054
35th	0,008	0,141	Phase 3	0,064
36th	0,007	0,116	Phase 3	0,051
37th	0,010	0,174	Phase 3	0,061
38th	0,011	0,195	Phase 3	0,048
39th	0,009	0,154	Phase 3	0,058
40th	0,009	0,149	Phase 3	0,046

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-5KTL-M0		
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	7,340	99,982	Phase 1	-
2nd	0,015	0,203	Phase 1	1,080
3rd	0,017	0,233	Phase 1	2,300
4th	0,007	0,097	Phase 1	0,430
5th	0,041	0,552	Phase 1	1,140
6th	0,007	0,102	Phase 1	0,300
7th	0,031	0,420	Phase 1	0,770
8th	0,005	0,069	Phase 1	0,230
9th	0,008	0,111	Phase 1	0,400
10th	0,006	0,076	Phase 1	0,184
11th	0,032	0,432	Phase 1	0,330
12th	0,006	0,084	Phase 1	0,153
13th	0,013	0,173	Phase 1	0,210
14th	0,007	0,094	Phase 1	0,131
15th	0,009	0,122	Phase 1	0,150
16th	0,006	0,086	Phase 1	0,115
17th	0,032	0,443	Phase 1	0,132
18th	0,006	0,079	Phase 1	0,102
19th	0,048	0,655	Phase 1	0,118
20th	0,008	0,112	Phase 1	0,092
21th	0,011	0,144	Phase 1	0,107
22th	0,006	0,085	Phase 1	0,084
23th	0,012	0,165	Phase 1	0,098
24th	0,007	0,092	Phase 1	0,077
25th	0,012	0,160	Phase 1	0,090
26th	0,009	0,118	Phase 1	0,071
27th	0,009	0,119	Phase 1	0,083
28th	0,008	0,103	Phase 1	0,066
29th	0,010	0,130	Phase 1	0,078
30th	0,010	0,142	Phase 1	0,061
31th	0,009	0,120	Phase 1	0,073
32th	0,010	0,132	Phase 1	0,058
33th	0,009	0,125	Phase 1	0,068
34th	0,008	0,108	Phase 1	0,054
35th	0,009	0,121	Phase 1	0,064
36th	0,009	0,128	Phase 1	0,051
37th	0,007	0,102	Phase 1	0,061
38th	0,010	0,141	Phase 1	0,048
39th	0,009	0,127	Phase 1	0,058
40th	0,008	0,103	Phase 1	0,046

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-5KTL-M0		
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	7,335	99,981	Phase 2	-
2nd	0,010	0,140	Phase 2	1,080
3rd	0,025	0,345	Phase 2	2,300
4th	0,007	0,101	Phase 2	0,430
5th	0,036	0,492	Phase 2	1,140
6th	0,007	0,093	Phase 2	0,300
7th	0,030	0,413	Phase 2	0,770
8th	0,006	0,078	Phase 2	0,230
9th	0,007	0,091	Phase 2	0,400
10th	0,006	0,081	Phase 2	0,184
11th	0,030	0,405	Phase 2	0,330
12th	0,006	0,087	Phase 2	0,153
13th	0,014	0,194	Phase 2	0,210
14th	0,007	0,089	Phase 2	0,131
15th	0,009	0,118	Phase 2	0,150
16th	0,007	0,097	Phase 2	0,115
17th	0,029	0,392	Phase 2	0,132
18th	0,009	0,123	Phase 2	0,102
19th	0,045	0,607	Phase 2	0,118
20th	0,010	0,134	Phase 2	0,092
21th	0,008	0,103	Phase 2	0,107
22th	0,007	0,098	Phase 2	0,084
23th	0,011	0,143	Phase 2	0,098
24th	0,007	0,092	Phase 2	0,077
25th	0,012	0,164	Phase 2	0,090
26th	0,007	0,102	Phase 2	0,071
27th	0,008	0,109	Phase 2	0,083
28th	0,008	0,102	Phase 2	0,066
29th	0,007	0,100	Phase 2	0,078
30th	0,011	0,148	Phase 2	0,061
31th	0,007	0,096	Phase 2	0,073
32th	0,010	0,130	Phase 2	0,058
33th	0,009	0,117	Phase 2	0,068
34th	0,009	0,118	Phase 2	0,054
35th	0,008	0,112	Phase 2	0,064
36th	0,009	0,118	Phase 2	0,051
37th	0,010	0,134	Phase 2	0,061
38th	0,010	0,133	Phase 2	0,048
39th	0,008	0,112	Phase 2	0,058
40th	0,010	0,135	Phase 2	0,046

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-5KTL-M0		
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	7,297	99,983	Phase 3	-
2nd	0,015	0,200	Phase 3	1,080
3rd	0,009	0,126	Phase 3	2,300
4th	0,007	0,095	Phase 3	0,430
5th	0,048	0,654	Phase 3	1,140
6th	0,005	0,070	Phase 3	0,300
7th	0,035	0,482	Phase 3	0,770
8th	0,006	0,079	Phase 3	0,230
9th	0,006	0,079	Phase 3	0,400
10th	0,005	0,069	Phase 3	0,184
11th	0,029	0,398	Phase 3	0,330
12th	0,005	0,075	Phase 3	0,153
13th	0,010	0,137	Phase 3	0,210
14th	0,006	0,083	Phase 3	0,131
15th	0,007	0,103	Phase 3	0,150
16th	0,007	0,096	Phase 3	0,115
17th	0,023	0,310	Phase 3	0,132
18th	0,008	0,109	Phase 3	0,102
19th	0,044	0,601	Phase 3	0,118
20th	0,007	0,097	Phase 3	0,092
21th	0,008	0,116	Phase 3	0,107
22th	0,006	0,088	Phase 3	0,084
23th	0,011	0,146	Phase 3	0,098
24th	0,007	0,091	Phase 3	0,077
25th	0,009	0,128	Phase 3	0,090
26th	0,007	0,100	Phase 3	0,071
27th	0,010	0,141	Phase 3	0,083
28th	0,008	0,108	Phase 3	0,066
29th	0,010	0,138	Phase 3	0,078
30th	0,008	0,106	Phase 3	0,061
31th	0,008	0,112	Phase 3	0,073
32th	0,010	0,130	Phase 3	0,058
33th	0,010	0,139	Phase 3	0,068
34th	0,008	0,103	Phase 3	0,054
35th	0,008	0,116	Phase 3	0,064
36th	0,009	0,121	Phase 3	0,051
37th	0,010	0,139	Phase 3	0,061
38th	0,008	0,114	Phase 3	0,048
39th	0,011	0,144	Phase 3	0,058
40th	0,009	0,118	Phase 3	0,046

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-6KTL-M0		
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	8,756	99,987	Phase 1	-
2nd	0,012	0,136	Phase 1	1,080
3rd	0,018	0,211	Phase 1	2,300
4th	0,007	0,081	Phase 1	0,430
5th	0,037	0,424	Phase 1	1,140
6th	0,008	0,090	Phase 1	0,300
7th	0,030	0,342	Phase 1	0,770
8th	0,006	0,068	Phase 1	0,230
9th	0,011	0,128	Phase 1	0,400
10th	0,006	0,073	Phase 1	0,184
11th	0,005	0,062	Phase 1	0,330
12th	0,007	0,085	Phase 1	0,153
13th	0,024	0,278	Phase 1	0,210
14th	0,007	0,082	Phase 1	0,131
15th	0,006	0,072	Phase 1	0,150
16th	0,006	0,069	Phase 1	0,115
17th	0,052	0,592	Phase 1	0,132
18th	0,009	0,098	Phase 1	0,102
19th	0,055	0,632	Phase 1	0,118
20th	0,009	0,106	Phase 1	0,092
21th	0,006	0,071	Phase 1	0,107
22th	0,006	0,070	Phase 1	0,084
23th	0,008	0,088	Phase 1	0,098
24th	0,010	0,110	Phase 1	0,077
25th	0,020	0,226	Phase 1	0,090
26th	0,009	0,098	Phase 1	0,071
27th	0,006	0,072	Phase 1	0,083
28th	0,007	0,078	Phase 1	0,066
29th	0,008	0,097	Phase 1	0,078
30th	0,010	0,118	Phase 1	0,061
31th	0,008	0,097	Phase 1	0,073
32th	0,010	0,109	Phase 1	0,058
33th	0,010	0,109	Phase 1	0,068
34th	0,008	0,088	Phase 1	0,054
35th	0,007	0,085	Phase 1	0,064
36th	0,009	0,098	Phase 1	0,051
37th	0,017	0,189	Phase 1	0,061
38th	0,008	0,095	Phase 1	0,048
39th	0,007	0,085	Phase 1	0,058
40th	0,007	0,075	Phase 1	0,046

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-6KTL-M0		
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	8,750	99,985	Phase 2	-
2nd	0,010	0,110	Phase 2	1,080
3rd	0,024	0,273	Phase 2	2,300
4th	0,008	0,090	Phase 2	0,430
5th	0,035	0,400	Phase 2	1,140
6th	0,007	0,081	Phase 2	0,300
7th	0,033	0,378	Phase 2	0,770
8th	0,008	0,090	Phase 2	0,230
9th	0,006	0,066	Phase 2	0,400
10th	0,006	0,070	Phase 2	0,184
11th	0,009	0,100	Phase 2	0,330
12th	0,007	0,082	Phase 2	0,153
13th	0,021	0,240	Phase 2	0,210
14th	0,007	0,080	Phase 2	0,131
15th	0,009	0,098	Phase 2	0,150
16th	0,006	0,073	Phase 2	0,115
17th	0,049	0,562	Phase 2	0,132
18th	0,009	0,105	Phase 2	0,102
19th	0,055	0,629	Phase 2	0,118
20th	0,008	0,095	Phase 2	0,092
21th	0,007	0,082	Phase 2	0,107
22th	0,008	0,094	Phase 2	0,084
23th	0,010	0,117	Phase 2	0,098
24th	0,010	0,114	Phase 2	0,077
25th	0,015	0,170	Phase 2	0,090
26th	0,010	0,109	Phase 2	0,071
27th	0,011	0,129	Phase 2	0,083
28th	0,009	0,101	Phase 2	0,066
29th	0,014	0,163	Phase 2	0,078
30th	0,011	0,124	Phase 2	0,061
31th	0,012	0,138	Phase 2	0,073
32th	0,011	0,128	Phase 2	0,058
33th	0,009	0,098	Phase 2	0,068
34th	0,010	0,112	Phase 2	0,054
35th	0,009	0,104	Phase 2	0,064
36th	0,011	0,123	Phase 2	0,051
37th	0,010	0,110	Phase 2	0,061
38th	0,009	0,104	Phase 2	0,048
39th	0,015	0,170	Phase 2	0,058
40th	0,009	0,097	Phase 2	0,046

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Extract from test report according to EN 50438

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-6KTL-M0		
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	8,706	99,986	Phase 3	-
2nd	0,009	0,105	Phase 3	1,080
3rd	0,013	0,154	Phase 3	2,300
4th	0,007	0,079	Phase 3	0,430
5th	0,048	0,553	Phase 3	1,140
6th	0,007	0,080	Phase 3	0,300
7th	0,034	0,390	Phase 3	0,770
8th	0,007	0,079	Phase 3	0,230
9th	0,005	0,060	Phase 3	0,400
10th	0,007	0,081	Phase 3	0,184
11th	0,007	0,086	Phase 3	0,330
12th	0,006	0,071	Phase 3	0,153
13th	0,027	0,313	Phase 3	0,210
14th	0,007	0,084	Phase 3	0,131
15th	0,008	0,091	Phase 3	0,150
16th	0,007	0,081	Phase 3	0,115
17th	0,049	0,567	Phase 3	0,132
18th	0,007	0,077	Phase 3	0,102
19th	0,055	0,630	Phase 3	0,118
20th	0,009	0,099	Phase 3	0,092
21th	0,006	0,064	Phase 3	0,107
22th	0,008	0,089	Phase 3	0,084
23th	0,008	0,095	Phase 3	0,098
24th	0,008	0,089	Phase 3	0,077
25th	0,016	0,186	Phase 3	0,090
26th	0,008	0,093	Phase 3	0,071
27th	0,007	0,086	Phase 3	0,083
28th	0,008	0,095	Phase 3	0,066
29th	0,017	0,191	Phase 3	0,078
30th	0,010	0,112	Phase 3	0,061
31th	0,012	0,133	Phase 3	0,073
32th	0,008	0,093	Phase 3	0,058
33th	0,008	0,092	Phase 3	0,068
34th	0,009	0,107	Phase 3	0,054
35th	0,009	0,100	Phase 3	0,064
36th	0,008	0,097	Phase 3	0,051
37th	0,015	0,174	Phase 3	0,061
38th	0,007	0,086	Phase 3	0,048
39th	0,008	0,090	Phase 3	0,058
40th	0,007	0,086	Phase 3	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-8KTL-M0		
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	11,646	99,991	Phase 1	-
2nd	0,017	0,145	Phase 1	1,080
3rd	0,023	0,198	Phase 1	2,300
4th	0,009	0,077	Phase 1	0,430
5th	0,058	0,502	Phase 1	1,140
6th	0,006	0,048	Phase 1	0,300
7th	0,031	0,264	Phase 1	0,770
8th	0,006	0,052	Phase 1	0,230
9th	0,016	0,134	Phase 1	0,400
10th	0,007	0,063	Phase 1	0,184
11th	0,007	0,060	Phase 1	0,330
12th	0,006	0,050	Phase 1	0,153
13th	0,030	0,261	Phase 1	0,210
14th	0,006	0,056	Phase 1	0,131
15th	0,005	0,046	Phase 1	0,150
16th	0,007	0,060	Phase 1	0,115
17th	0,026	0,219	Phase 1	0,132
18th	0,009	0,073	Phase 1	0,102
19th	0,034	0,293	Phase 1	0,118
20th	0,010	0,083	Phase 1	0,092
21th	0,008	0,069	Phase 1	0,107
22th	0,008	0,067	Phase 1	0,084
23th	0,009	0,077	Phase 1	0,098
24th	0,011	0,096	Phase 1	0,077
25th	0,015	0,131	Phase 1	0,090
26th	0,010	0,085	Phase 1	0,071
27th	0,009	0,075	Phase 1	0,083
28th	0,010	0,083	Phase 1	0,066
29th	0,009	0,073	Phase 1	0,078
30th	0,014	0,124	Phase 1	0,061
31th	0,016	0,138	Phase 1	0,073
32th	0,014	0,120	Phase 1	0,058
33th	0,011	0,091	Phase 1	0,068
34th	0,011	0,097	Phase 1	0,054
35th	0,012	0,099	Phase 1	0,064
36th	0,014	0,120	Phase 1	0,051
37th	0,010	0,084	Phase 1	0,061
38th	0,014	0,118	Phase 1	0,048
39th	0,014	0,121	Phase 1	0,058
40th	0,010	0,090	Phase 1	0,046



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Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-8KTL-M0		
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	11,640	99,991	Phase 2	-
2nd	0,015	0,129	Phase 2	1,080
3rd	0,027	0,232	Phase 2	2,300
4th	0,010	0,082	Phase 2	0,430
5th	0,053	0,459	Phase 2	1,140
6th	0,007	0,059	Phase 2	0,300
7th	0,033	0,283	Phase 2	0,770
8th	0,006	0,055	Phase 2	0,230
9th	0,007	0,060	Phase 2	0,400
10th	0,007	0,058	Phase 2	0,184
11th	0,006	0,049	Phase 2	0,330
12th	0,006	0,051	Phase 2	0,153
13th	0,029	0,252	Phase 2	0,210
14th	0,008	0,066	Phase 2	0,131
15th	0,009	0,075	Phase 2	0,150
16th	0,007	0,064	Phase 2	0,115
17th	0,020	0,175	Phase 2	0,132
18th	0,007	0,061	Phase 2	0,102
19th	0,036	0,308	Phase 2	0,118
20th	0,009	0,075	Phase 2	0,092
21th	0,011	0,094	Phase 2	0,107
22th	0,008	0,065	Phase 2	0,084
23th	0,009	0,075	Phase 2	0,098
24th	0,009	0,074	Phase 2	0,077
25th	0,017	0,148	Phase 2	0,090
26th	0,009	0,076	Phase 2	0,071
27th	0,008	0,072	Phase 2	0,083
28th	0,011	0,093	Phase 2	0,066
29th	0,012	0,106	Phase 2	0,078
30th	0,013	0,108	Phase 2	0,061
31th	0,016	0,138	Phase 2	0,073
32th	0,015	0,128	Phase 2	0,058
33th	0,012	0,104	Phase 2	0,068
34th	0,011	0,098	Phase 2	0,054
35th	0,017	0,146	Phase 2	0,064
36th	0,015	0,125	Phase 2	0,051
37th	0,012	0,100	Phase 2	0,061
38th	0,015	0,132	Phase 2	0,048
39th	0,014	0,122	Phase 2	0,058
40th	0,011	0,092	Phase 2	0,046

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Extract from test report according to EN 50438

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-8KTL-M0		
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	11,583	99,991	Phase 3	-
2nd	0,007	0,065	Phase 3	1,080
3rd	0,018	0,159	Phase 3	2,300
4th	0,008	0,066	Phase 3	0,430
5th	0,074	0,636	Phase 3	1,140
6th	0,007	0,063	Phase 3	0,300
7th	0,035	0,300	Phase 3	0,770
8th	0,006	0,048	Phase 3	0,230
9th	0,007	0,058	Phase 3	0,400
10th	0,006	0,055	Phase 3	0,184
11th	0,007	0,063	Phase 3	0,330
12th	0,006	0,053	Phase 3	0,153
13th	0,032	0,276	Phase 3	0,210
14th	0,006	0,054	Phase 3	0,131
15th	0,008	0,071	Phase 3	0,150
16th	0,008	0,069	Phase 3	0,115
17th	0,025	0,218	Phase 3	0,132
18th	0,007	0,061	Phase 3	0,102
19th	0,034	0,296	Phase 3	0,118
20th	0,008	0,070	Phase 3	0,092
21th	0,007	0,060	Phase 3	0,107
22th	0,008	0,072	Phase 3	0,084
23th	0,008	0,067	Phase 3	0,098
24th	0,007	0,064	Phase 3	0,077
25th	0,017	0,145	Phase 3	0,090
26th	0,010	0,084	Phase 3	0,071
27th	0,010	0,083	Phase 3	0,083
28th	0,010	0,086	Phase 3	0,066
29th	0,014	0,123	Phase 3	0,078
30th	0,012	0,103	Phase 3	0,061
31th	0,014	0,117	Phase 3	0,073
32th	0,011	0,098	Phase 3	0,058
33th	0,011	0,099	Phase 3	0,068
34th	0,013	0,116	Phase 3	0,054
35th	0,015	0,134	Phase 3	0,064
36th	0,013	0,116	Phase 3	0,051
37th	0,010	0,083	Phase 3	0,061
38th	0,015	0,131	Phase 3	0,048
39th	0,013	0,115	Phase 3	0,058
40th	0,010	0,084	Phase 3	0,046

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Extract from test report according to EN 50438

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Power Quality. Harmonic current emission				
micro-generator		SUN2000-10KTL-M0		
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	14,608	99,990	Phase 1	-
2nd	0,015	0,184	Phase 1	1,080
3rd	0,024	0,206	Phase 1	2,300
4th	0,011	0,096	Phase 1	0,430
5th	0,017	0,426	Phase 1	1,140
6th	0,013	0,094	Phase 1	0,300
7th	0,008	0,198	Phase 1	0,770
8th	0,009	0,090	Phase 1	0,230
9th	0,010	0,083	Phase 1	0,400
10th	0,010	0,089	Phase 1	0,184
11th	0,011	0,307	Phase 1	0,330
12th	0,012	0,095	Phase 1	0,153
13th	0,008	0,287	Phase 1	0,210
14th	0,010	0,095	Phase 1	0,131
15th	0,009	0,092	Phase 1	0,150
16th	0,009	0,092	Phase 1	0,115
17th	0,010	0,146	Phase 1	0,132
18th	0,013	0,099	Phase 1	0,102
19th	0,008	0,133	Phase 1	0,118
20th	0,009	0,096	Phase 1	0,092
21th	0,010	0,080	Phase 1	0,107
22th	0,009	0,087	Phase 1	0,084
23th	0,008	0,073	Phase 1	0,098
24th	0,014	0,098	Phase 1	0,077
25th	0,010	0,087	Phase 1	0,090
26th	0,011	0,098	Phase 1	0,071
27th	0,012	0,067	Phase 1	0,083
28th	0,011	0,088	Phase 1	0,066
29th	0,011	0,071	Phase 1	0,078
30th	0,016	0,093	Phase 1	0,061
31th	0,011	0,154	Phase 1	0,073
32th	0,013	0,092	Phase 1	0,058
33th	0,014	0,059	Phase 1	0,068
34th	0,015	0,086	Phase 1	0,054
35th	0,013	0,269	Phase 1	0,064
36th	0,017	0,080	Phase 1	0,051
37th	0,015	0,515	Phase 1	0,061
38th	0,015	0,070	Phase 1	0,048
39th	0,017	0,060	Phase 1	0,058
40th	0,014	0,066	Phase 1	0,046

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Extract from test report according to EN 50438

Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-10KTL-M0		
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	14,680	99,988	Phase 2	-
2nd	0,018	0,129	Phase 2	1,080
3rd	0,027	0,156	Phase 2	2,300
4th	0,011	0,107	Phase 2	0,430
5th	0,018	0,321	Phase 2	1,140
6th	0,014	0,090	Phase 2	0,300
7th	0,009	0,231	Phase 2	0,770
8th	0,010	0,090	Phase 2	0,230
9th	0,013	0,104	Phase 2	0,400
10th	0,010	0,099	Phase 2	0,184
11th	0,010	0,322	Phase 2	0,330
12th	0,012	0,088	Phase 2	0,153
13th	0,012	0,321	Phase 2	0,210
14th	0,011	0,105	Phase 2	0,131
15th	0,008	0,097	Phase 2	0,150
16th	0,010	0,095	Phase 2	0,115
17th	0,008	0,215	Phase 2	0,132
18th	0,013	0,098	Phase 2	0,102
19th	0,008	0,150	Phase 2	0,118
20th	0,010	0,099	Phase 2	0,092
21th	0,008	0,093	Phase 2	0,107
22th	0,010	0,089	Phase 2	0,084
23th	0,008	0,079	Phase 2	0,098
24th	0,014	0,092	Phase 2	0,077
25th	0,008	0,096	Phase 2	0,090
26th	0,011	0,095	Phase 2	0,071
27th	0,010	0,071	Phase 2	0,083
28th	0,012	0,088	Phase 2	0,066
29th	0,010	0,078	Phase 2	0,078
30th	0,014	0,093	Phase 2	0,061
31th	0,012	0,160	Phase 2	0,073
32th	0,014	0,087	Phase 2	0,058
33th	0,016	0,121	Phase 2	0,068
34th	0,014	0,080	Phase 2	0,054
35th	0,015	0,279	Phase 2	0,064
36th	0,020	0,081	Phase 2	0,051
37th	0,017	0,520	Phase 2	0,061
38th	0,019	0,073	Phase 2	0,048
39th	0,019	0,070	Phase 2	0,058
40th	0,018	0,065	Phase 2	0,046

## Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PV180906N022-3

Power Quality. Harmonic current emission				
micro-generator		SUN2000-10KTL-M0		
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	14,607	99,989	Phase 3	-
2nd	0,017	0,239	Phase 3	1,080
3rd	0,028	0,291	Phase 3	2,300
4th	0,012	0,094	Phase 3	0,430
5th	0,016	0,530	Phase 3	1,140
6th	0,011	0,093	Phase 3	0,300
7th	0,010	0,249	Phase 3	0,770
8th	0,011	0,088	Phase 3	0,230
9th	0,010	0,109	Phase 3	0,400
10th	0,011	0,093	Phase 3	0,184
11th	0,009	0,345	Phase 3	0,330
12th	0,010	0,095	Phase 3	0,153
13th	0,010	0,355	Phase 3	0,210
14th	0,012	0,092	Phase 3	0,131
15th	0,011	0,078	Phase 3	0,150
16th	0,012	0,091	Phase 3	0,115
17th	0,011	0,198	Phase 3	0,132
18th	0,010	0,101	Phase 3	0,102
19th	0,010	0,130	Phase 3	0,118
20th	0,011	0,095	Phase 3	0,092
21th	0,010	0,097	Phase 3	0,107
22th	0,012	0,090	Phase 3	0,084
23th	0,009	0,076	Phase 3	0,098
24th	0,014	0,098	Phase 3	0,077
25th	0,010	0,103	Phase 3	0,090
26th	0,012	0,091	Phase 3	0,071
27th	0,012	0,072	Phase 3	0,083
28th	0,013	0,086	Phase 3	0,066
29th	0,010	0,095	Phase 3	0,078
30th	0,013	0,096	Phase 3	0,061
31th	0,012	0,151	Phase 3	0,073
32th	0,013	0,079	Phase 3	0,058
33th	0,017	0,091	Phase 3	0,068
34th	0,016	0,076	Phase 3	0,054
35th	0,013	0,285	Phase 3	0,064
36th	0,019	0,080	Phase 3	0,051
37th	0,016	0,457	Phase 3	0,061
38th	0,019	0,065	Phase 3	0,048
39th	0,016	0,057	Phase 3	0,058
40th	0,019	0,060	Phase 3	0,046

## Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PV180906N022-3

Voltage fluctuation and Flicker.					
	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	P <sub>st</sub>	P <sub>lt</sub> 2 hours	d(t) <sub>500ms</sub>	dc	d <sub>max</sub>
Limit	1,0	0,65	3,3%	3,3%	4%
Test value SUN2000-3KTL-M0					
L1 Phase	0,07	0,07	0,00%	0,00%	0,00%
L2 Phase	0,07	0,07	0,00%	0,00%	0,00%
L3 Phase	0,07	0,07	0,00%	0,00%	0,00%
Test value SUN2000-4KTL-M0					
L1 Phase	0,07	0,07	0,00%	0,00%	0,00%
L2 Phase	0,07	0,07	0,00%	0,00%	0,00%
L3 Phase	0,08	0,07	0,00%	0,00%	0,00%
Test value SUN2000-5KTL-M0					
L1 Phase	0,07	0,07	0,00%	0,00%	0,00%
L2 Phase	0,07	0,07	0,00%	0,00%	0,00%
L3 Phase	0,07	0,07	0,00%	0,00%	0,00%
Test value SUN2000-6KTL-M0					
L1 Phase	0,07	0,07	0,00%	0,00%	0,00%
L2 Phase	0,07	0,07	0,00%	0,00%	0,00%
L3 Phase	0,07	0,07	0,00%	0,00%	0,00%
Test value SUN2000-8KTL-M0					
L1 Phase	0,07	0,07	0,00%	0,00%	0,00%
L2 Phase	0,07	0,07	0,00%	0,00%	0,00%
L3 Phase	0,07	0,07	0,00%	0,00%	0,00%
Test value SUN2000-10KTL-M0					
L1 Phase	0,10	0,08	0,00%	0,00%	0,00%
L2 Phase	0,08	0,08	0,00%	0,00%	0,00%
L3 Phase	0,08	0,08	0,00%	0,00%	0,00%

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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<b>DC-Injection.</b>				
<b>SUN2000-10KTL-M0</b>				
<b>Protection limit</b>	Tested at four power levels, limit 0,5% of $IAC_{nom}$ (72mA)			
<b>Output power</b>	<b>~20%</b>	<b>~50%</b>	<b>75%</b>	<b>~100%</b>
<b>Max. test value (phase L1) [mA]</b>	7,3	8,7	8,5	11,7
<b>Max. test value (phase L2) [mA]</b>	7,8	8,0	9,9	13,6
<b>Max. test value (phase L3) [mA]</b>	4,0	4,5	8,0	11,1
<b>SUN2000-3KTL-M0</b>				
<b>Protection limit</b>	Tested at four power levels, limit 0,5% of $IAC_{nom}$ (22mA)			
<b>Output power</b>	<b>~20%</b>	<b>~50%</b>	<b>75%</b>	<b>~100%</b>
<b>Max. test value (phase L1) [mA]</b>	6,8	8,5	9,3	9,0
<b>Max. test value (phase L2) [mA]</b>	6,6	9,5	10,8	9,2
<b>Max. test value (phase L3) [mA]</b>	1,5	6,5	6,0	6,2