



**BUREAU
VERITAS**

Verklaring van geen bezwaar

Aanvrager: Omnik New Energy Co., Ltd.
No.63 Weixin Road
SIP215122 Suzhou
China

Product: Fotovoltaïsche Omvormers

Model: Omniksol-15k-TL2
Omniksol-17k-TL2
Omniksol-20k-TL2

Reglementair voorgeschreven gebruik:

Automatisch schakelstation met driefasige netwerkbewaking conform DIN V VDE V 0126-1-1:2006-02 (afwijkende grenswaarden voor Nederland op basis van EN 50438:2013, NEN-EN 50438:2013, Annex A*) voor fotovoltaïsche installaties met een driefasige/enkelfasige parallelvoeding door middel van gelijkstroom-wisselstroommutator in het net van de openbare voorziening. Het automatische schakelstation vormt een integraal bestanddeel van de hoger vermelde transformatorloze gelijkstroom-wisselstroommutators. Deze dient als vervangmiddel voor een te allen tijde voor de distributienetexploitant ("VNB") toegankelijk schakelstation met scheidingsfunctie.

Controlebasis:

EN 50438:2013, NEN-EN 50438:2013

Eisen voor het aansluiten van microgeneratoren op het openbare laagspanningsnet

DIN V VDE V 0126-1-1:2006-02 (Single fouttolerantie van de bescherming-interface systeem)

Automatisch schakelstation tussen een netparallele zelfopwekinstallatie en het openbare laagspanningsnet

De omvormer Omnikol-15k-TL2, Omnikol-17k-TL2, Omnikol-20k-TL2 zijn ontworpen voor >16A per fase. Maar aan alle eisen van de EN 50438:2013, NEN-EN 50438:2013 wordt voldaan.

Een representatief testpatroon van het hoger vermelde product voldoet aan de op het moment van de uitreiking van dit attest geldende veiligheidstechnische eisen van de vermelde controlegrondbeginselen voor een reglementair voorgeschreven gebruik.

Rapportnummer: OMK-17SE0174FTSP

Certificaatnummer: U18-0237

Datum: 2018-04-27

Certificatie-instelling



Holger Schaffer

Certificatie-instelling Bureau Veritas Consumer Products Services Germany GmbH
Geaccrediteerd volgens DIN-EN ISO/IEC 17065



Appendix E Type Verification Test Report

Extract from test report according to EN 50438

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

Manufacturer / applicant:	Omnik New Energy Co., Ltd. No.63 Weixin Road SIP215122 Suzhou China		
Micro-generator Type	Grid-tied photovoltaic inverter		
Rated values	Omniksol-15k-TL2	Omniksol-17k-TL2	Omniksol-20k-TL2
Maximum rated capacity	15 kW	17 kW	20 kW
Rated voltage	230/400V	230/400V	230/400V
Firmware version	Main MCU: Build0036 Slave MCU: Build0015 Display MCU: Build00269		
Measurement period:	2017-09-08 to 2017-12-29		

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.

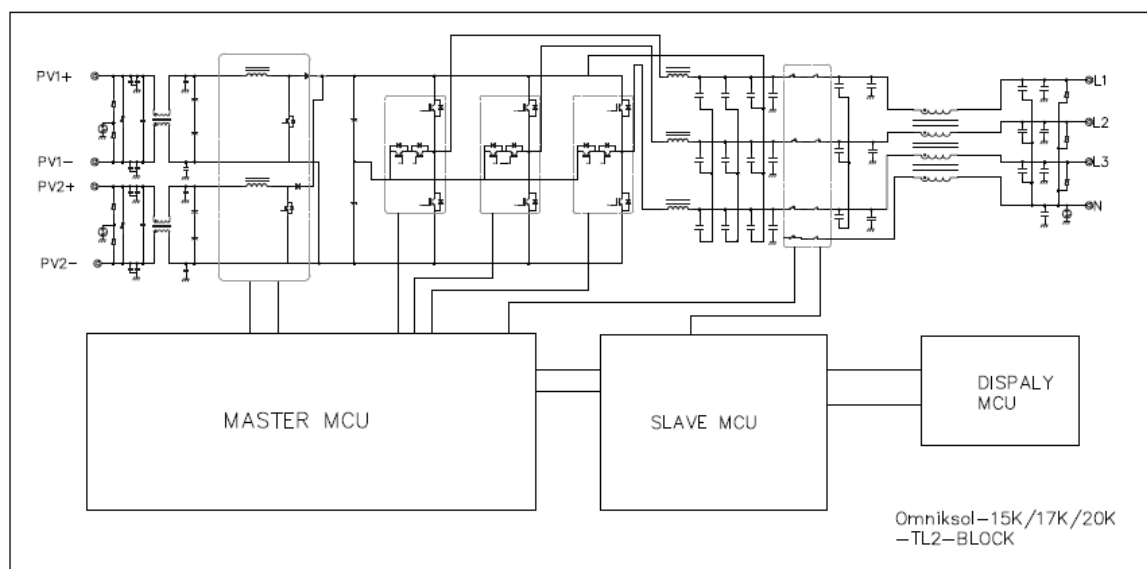


Figure 1 – Schematic structure of the power generation unit

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.

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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	2,0	253,0	2,0	252,9	1,540
Under-voltage stage 1	184,0	2,0	184,0	2,0	184,3	1,530
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	2,0	253,0	2,0	252,6	1,543
Under-voltage stage 1	184,0	2,0	184,0	2,0	184,3	1,528
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	2,0	253,0	2,0	252,6	1,535
Under-voltage stage 1	184,0	2,0	184,0	2,0	184,3	1,528

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	51,00	2,0	51,00	2,0	51,03	1,500
Under-frequency	48,00	2,0	48,00	2,0	47,99	1,490

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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]	39	54	43	36	32	28
Trip time. Phase 2 fuse removed [ms]	39	54	43	36	32	28
Trip time. Phase 3 fuse removed [ms]	39	54	43	36	32	28

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	196,3	47,5	17037,2	0,9973
2	251,4	51,5	19974,1	0,9963

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]:	19646	19647	19649
ΔP/PM [%] per 1 Hz:			0,72

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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_n							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	19,6	16,0	12,4	16,0	19,6	N/A
PE60 [kW]:	19,82	19,82	16,58	12,77	16,50	19,06	19,73
ΔPE60/PM [%]:	N/A	1,1	2,9	1,9	2,5	2,7	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	50,00
PM [kW]:	N/A	9,80	8,00	6,20	8,00	9,80	N/A
PE60 [kW]:	9,97	9,92	8,44	6,47	8,38	9,76	9,88
ΔPE60/PM [%]:	N/A	0,6	2,2	1,4	1,9	0,8	N/A
Limit ΔP/P _{1min} :	+ 10 % of P _M						

Reactive power			
Uncontrollable reactive power			
Omniksol-15k-TL2			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9919i	0,9917i	0,9879i
50% PN	0,9958i	0,9968i	0,9946i
75% PN	0,9977i	0,9974i	0,9976i
100% PN	0,9978i	0,9979i	0,9979i
Limit	>0,95	>0,95	>0,95
Omniksol-17k-TL2			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9917i	0,9934i	0,9893i
50% PN	0,9966i	0,9969i	0,9952i
75% PN	0,9978i	0,9973i	0,9965i
100% PN	0,9979i	0,9974i	0,9977i
Limit	>0,95	>0,95	>0,95
Uncontrollable reactive power			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9957i	0,9890i	0,9875i
50% PN	0,9965i	0,9970i	0,9974i
75% PN	0,9974i	0,9980i	0,9978i
100% PN	0,9979i	0,9980i	0,9978i
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)	AC voltage [V]
0% - 10%	913,2	-569,0	0,8474	229,7
10% - 20%	2916,3	-1477,7	0,8912	229,9
20% - 30%	4940,3	-2426,4	0,8967	230,1
30% - 40%	6954,3	-3350,7	0,8999	230,3
40% - 50%	8928,9	-4272,6	0,9011	230,4
50% - 60%	10823,2	-5163,4	0,9016	230,6
60% - 70%	12845,6	-6118,9	0,9018	230,8
70% - 80%	14818,9	-6992,9	0,9033	231,0
80% - 90%	16853,9	-8018,0	0,9020	231,2
90% - 100%	19723,3	-9334,8	0,9028	231,5
Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	900,6	475,1	0,8836	229,7
10% - 20%	2846,3	1363,4	0,9009	229,9
20% - 30%	4822,6	2306,1	0,9012	230,1
30% - 40%	6853,2	3256,3	0,9022	230,3
40% - 50%	8893,6	4227,2	0,9022	230,5
50% - 60%	10905,9	5192,1	0,9019	230,7
60% - 70%	12885,7	6132,2	0,9019	230,9
70% - 80%	14906,2	7118,9	0,9013	231,1
80% - 90%	16883,5	8086,5	0,9009	231,3
90% - 100%	19725,9	9491,8	0,9001	231,6
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%	912,6	235,2	0,9682	229,7
10% - 20%	2942,3	226,2	0,9958	229,9
20% - 30%	4955,2	210,6	0,9973	230,1
30% - 40%	6967,8	185,8	0,9976	230,3
40% - 50%	8956,7	182,7	0,9977	230,5
50% - 60%	10962,3	167,9	0,9977	230,7
60% - 70%	12975,8	57,9	0,9978	230,9
70% - 80%	14950,5	56,2	0,9978	231,1
80% - 90%	16931,9	39,3	0,9978	231,3
90% - 100%	19835,5	46,7	0,9977	231,6

Q adjustment				
	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured cos φ	Deviation compared to setpoint $\Delta Q / PN$ [%]
- Qmin	-9,686	-9,823	0,8919	0,69
0	0	0,371	0,9962	1,86
+ Qmax	9,686	9,886	0,8868	1,00



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Qmin reactive power in accordance to standard characteristic curve Q=f(V)						
P/Pn	Vac [V] Set point	P/Pn [%]	Vac [V] measured	Q [Var] measured	Q [Var] expected	ΔQ [%]
< 20%	1,07Vn	9,3	245,8	-246,2	$\approx 0 (< \pm 2.5\% P_n)$	1,23
< 20%	1,09Vn	8,6	250,4	-249,6	$\approx 0 (< \pm 2.5\% P_n)$	1,25
< 20%-30%	1,09Vn	23,9	252,1	-4877,6	-0,5 Qmin	0,17
40%	1,09Vn	39,8	251,4	-4950,3	-0,5 Qmin	0,54
50%	1,09Vn	49,3	251,2	-4962,4	-0,5 Qmin	0,60
60%	1,09Vn	59,5	251,4	-5027,2	-0,5 Qmin	0,92
70%	1,09Vn	69,5	251,6	-5055,6	-0,5 Qmin	1,06
80%	1,09Vn	79,9	251,7	-5126,8	-0,5 Qmin	1,42
90%	1,09Vn	89,8	251,9	-5122,7	-0,5 Qmin	1,39
100%	1,09Vn	99,2	252,1	-5209,2	-0,5 Qmin	1,83
100%	1,1Vn	98,8	253,4	-10050,3	-Qmin	1,82
100%-10%	1,1Vn	10,1	253,8	-9882,1	-Qmin	0,98
10% → ≤5%	1,1Vn	4,3	253,1	-253,7	$\approx 0 (< \pm 2.5\% P_n)$	1,27
Qmax reactive power in accordance to standard characteristic curve Q=f(V)						
P/Pn	Vac [V] Set point	P/Pn [%]	Vac [V] measured	Q [Var] measured	Q [Var] expected	ΔQ [%]
< 20%	0,93Vn	9,7	213,6	308,1	$\approx 0 (< \pm 2.5\% P_n)$	1,54
< 20%	0,91Vn	9,6	208,9	326,8	$\approx 0 (< \pm 2.5\% P_n)$	1,63
< 20%-30%	0,91Vn	24,5	209,8	5147,5	-0,5 Qmin	1,52
40%	0,91Vn	40,1	209,5	5084,5	-0,5 Qmin	1,21
50%	0,91Vn	50,1	209,8	5041,6	-0,5 Qmin	0,99
60%	0,91Vn	60,1	209,9	5017,8	-0,5 Qmin	0,87
70%	0,91Vn	70,0	210,2	4967,6	-0,5 Qmin	0,62
80%	0,91Vn	79,9	210,4	4948,0	-0,5 Qmin	0,53
90%	0,91Vn	89,7	210,6	4894,1	-0,5 Qmin	0,26
100%	0,91Vn	95,7	210,7	4945,9	-0,5 Qmin	0,51
100%	0,90Vn	94,7	208,7	10018,7	-Qmin	1,66
100%-10%	0,90Vn	8,6	207,1	10099,3	-Qmin	2,07
10% → ≤5%	0,90Vn	4,4	207,0	212,8	$\approx 0 (< \pm 2.5\% P_n)$	1,06

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Connection and starting to generate electrical power		
Test according to EN 50438 with setting	Min. voltage for connection to grid:	193,2
	Max. voltage for connection to grid:	255,3
	Min. frequency for connection to grid:	47,95
	Max. frequency for connection to grid:	50,15
	Observation time ($\geq 60s$)	60
Test		
Voltage conditions		
a) Start up for voltage range	<84% U_n for twice of observation time	>111% U_n for twice of observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
b) In voltage range at start-up	$\geq 84\% U_n$ within twice setting observation time	$\leq 111\% U_n$ within twice setting observation time
Reconnection time [s]	62	61
Limit:	Connected after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min.	
c) In voltage range after voltage failure	$\geq 84\% U_n$ for twice of setting observation time	$\leq 111\% U_n$ for twice of setting observation time
Reconnection time [s]	60	60
Limit:	Reconnection after setting observation time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min.	
Frequency conditions		
d) Start up for frequency range	<47,95 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	$\geq 47,95$ Hz within twice of setting observation time	$\leq 50,15$ Hz within twice of setting observation time
Reconnection time [s]	61	60,5
Limit:	Connected after setting delay time ($\geq 60s$)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min.	

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f) In frequency range after frequency failure	$\geq 47,95$ Hz for twice of setting observation time	$\leq 50,15$ Hz for twice of setting observation time
Reconnection time [s]	61	61
Limit:	Reconnection after setting observation time (≥ 60 s)	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%Pn/min.	

Short-circuit current contribution					
Short-circuit current parameters					
Omniksol-20k-TL2 – Phase 1					
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	44,13	38,93
Initial Value of aperiodic current	A	N/A	100ms	30,22	13,01
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	37,25 ms	
Omniksol-20k-TL2 – Phase 2					
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	32,94	39,53
Initial Value of aperiodic current	A	N/A	100ms	33,29	31,08
Initial symmetrical short-circuit current*	I_k	N/A	250ms	30,62	10,48
Decaying (aperiodic) component of short circuit current*	i_{dc}	N/A	500ms	---	---
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	146,5 ms	
Omniksol-20k-TL2 – Phase 3					
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	32,84	38,93
Initial Value of aperiodic current	A	N/A	100ms	31,31	23,04
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	71 ms	

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Power Quality. Harmonic current emission					
micro-generator		Omniksol-15k-TL2			
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	21,627	--	Phase 1	-	-
2nd	0,178	0,824	Phase 1	8	8
3rd	0,031	0,145	Phase 1	21,6	N/A
4th	0,024	0,113	Phase 1	4	4
5th	0,060	0,278	Phase 1	10,7	10,7
6th	0,039	0,181	Phase 1	2,67	2,67
7th	0,080	0,369	Phase 1	7,2	7,2
8th	0,017	0,078	Phase 1	2	2
9th	0,017	0,081	Phase 1	3,8	N/A
10th	0,018	0,085	Phase 1	1,6	1,6
11th	0,036	0,167	Phase 1	3,1	3,1
12th	0,022	0,100	Phase 1	1,33	1,33
13th	0,036	0,166	Phase 1	2	2
14th	0,011	0,051	Phase 1	N/A	N/A
15th	0,014	0,063	Phase 1	N/A	N/A
16th	0,010	0,047	Phase 1	N/A	N/A
17th	0,043	0,198	Phase 1	N/A	N/A
18th	0,015	0,067	Phase 1	N/A	N/A
19th	0,040	0,184	Phase 1	N/A	N/A
20th	0,009	0,041	Phase 1	N/A	N/A
21th	0,014	0,064	Phase 1	N/A	N/A
22th	0,012	0,055	Phase 1	N/A	N/A
23th	0,043	0,199	Phase 1	N/A	N/A
24th	0,007	0,034	Phase 1	N/A	N/A
25th	0,042	0,193	Phase 1	N/A	N/A
26th	0,010	0,046	Phase 1	N/A	N/A
27th	0,016	0,075	Phase 1	N/A	N/A
28th	0,012	0,055	Phase 1	N/A	N/A
29th	0,044	0,204	Phase 1	N/A	N/A
30th	0,008	0,036	Phase 1	N/A	N/A
31th	0,044	0,205	Phase 1	N/A	N/A
32th	0,012	0,055	Phase 1	N/A	N/A
33th	0,014	0,063	Phase 1	N/A	N/A
34th	0,013	0,060	Phase 1	N/A	N/A
35th	0,048	0,220	Phase 1	N/A	N/A
36th	0,011	0,049	Phase 1	N/A	N/A
37th	0,054	0,252	Phase 1	N/A	N/A
38th	0,015	0,069	Phase 1	N/A	N/A
39th	0,011	0,053	Phase 1	N/A	N/A
40th	0,015	0,068	Phase 1	N/A	N/A
THD ₄₀	---	1,27	Phase 1	13	13
PWHD	---		Phase 1	22	22

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Power Quality. Harmonic current emission					
micro-generator		Omniksol-15k-TL2			
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	21,665	--	Phase 2	-	-
2nd	0,201	0,927	Phase 2	8	8
3rd	0,018	0,085	Phase 2	21,6	N/A
4th	0,069	0,320	Phase 2	4	4
5th	0,071	0,327	Phase 2	10,7	10,7
6th	0,068	0,314	Phase 2	2,67	2,67
7th	0,097	0,447	Phase 2	7,2	7,2
8th	0,070	0,324	Phase 2	2	2
9th	0,020	0,091	Phase 2	3,8	N/A
10th	0,018	0,083	Phase 2	1,6	1,6
11th	0,063	0,289	Phase 2	3,1	3,1
12th	0,035	0,161	Phase 2	1,33	1,33
13th	0,040	0,186	Phase 2	2	2
14th	0,016	0,074	Phase 2	N/A	N/A
15th	0,034	0,159	Phase 2	N/A	N/A
16th	0,017	0,079	Phase 2	N/A	N/A
17th	0,047	0,219	Phase 2	N/A	N/A
18th	0,014	0,063	Phase 2	N/A	N/A
19th	0,040	0,183	Phase 2	N/A	N/A
20th	0,012	0,056	Phase 2	N/A	N/A
21th	0,019	0,086	Phase 2	N/A	N/A
22th	0,015	0,071	Phase 2	N/A	N/A
23th	0,047	0,218	Phase 2	N/A	N/A
24th	0,014	0,065	Phase 2	N/A	N/A
25th	0,038	0,174	Phase 2	N/A	N/A
26th	0,015	0,069	Phase 2	N/A	N/A
27th	0,020	0,093	Phase 2	N/A	N/A
28th	0,016	0,076	Phase 2	N/A	N/A
29th	0,043	0,197	Phase 2	N/A	N/A
30th	0,018	0,084	Phase 2	N/A	N/A
31th	0,041	0,189	Phase 2	N/A	N/A
32th	0,016	0,075	Phase 2	N/A	N/A
33th	0,017	0,077	Phase 2	N/A	N/A
34th	0,020	0,094	Phase 2	N/A	N/A
35th	0,046	0,211	Phase 2	N/A	N/A
36th	0,019	0,088	Phase 2	N/A	N/A
37th	0,054	0,250	Phase 2	N/A	N/A
38th	0,020	0,092	Phase 2	N/A	N/A
39th	0,024	0,109	Phase 2	N/A	N/A
40th	0,022	0,103	Phase 2	N/A	N/A
THD ₄₀	---	1,59	Phase 2	13	13
PWHD	---		Phase 2	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-15k-TL2			
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	21,719	--	Phase 3	-	-
2nd	0,132	0,606	Phase 3	8	8
3rd	0,027	0,125	Phase 3	21,6	N/A
4th	0,086	0,398	Phase 3	4	4
5th	0,083	0,380	Phase 3	10,7	10,7
6th	0,056	0,257	Phase 3	2,67	2,67
7th	0,067	0,308	Phase 3	7,2	7,2
8th	0,075	0,345	Phase 3	2	2
9th	0,026	0,122	Phase 3	3,8	N/A
10th	0,013	0,059	Phase 3	1,6	1,6
11th	0,045	0,206	Phase 3	3,1	3,1
12th	0,034	0,155	Phase 3	1,33	1,33
13th	0,034	0,155	Phase 3	2	2
14th	0,015	0,070	Phase 3	N/A	N/A
15th	0,030	0,138	Phase 3	N/A	N/A
16th	0,013	0,058	Phase 3	N/A	N/A
17th	0,046	0,211	Phase 3	N/A	N/A
18th	0,012	0,057	Phase 3	N/A	N/A
19th	0,038	0,175	Phase 3	N/A	N/A
20th	0,010	0,045	Phase 3	N/A	N/A
21th	0,019	0,086	Phase 3	N/A	N/A
22th	0,013	0,061	Phase 3	N/A	N/A
23th	0,046	0,210	Phase 3	N/A	N/A
24th	0,015	0,067	Phase 3	N/A	N/A
25th	0,040	0,185	Phase 3	N/A	N/A
26th	0,012	0,056	Phase 3	N/A	N/A
27th	0,016	0,075	Phase 3	N/A	N/A
28th	0,010	0,046	Phase 3	N/A	N/A
29th	0,044	0,203	Phase 3	N/A	N/A
30th	0,015	0,069	Phase 3	N/A	N/A
31th	0,043	0,198	Phase 3	N/A	N/A
32th	0,013	0,058	Phase 3	N/A	N/A
33th	0,011	0,050	Phase 3	N/A	N/A
34th	0,015	0,071	Phase 3	N/A	N/A
35th	0,048	0,220	Phase 3	N/A	N/A
36th	0,017	0,076	Phase 3	N/A	N/A
37th	0,052	0,239	Phase 3	N/A	N/A
38th	0,018	0,081	Phase 3	N/A	N/A
39th	0,016	0,076	Phase 3	N/A	N/A
40th	0,020	0,090	Phase 3	N/A	N/A
THD ₄₀	---	1,30	Phase 3	13	13
PWHD	---		Phase 3	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-17k-TL2			
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	24,587	--	Phase 1	-	-
2nd	0,219	0,892	Phase 1	8	8
3rd	0,028	0,114	Phase 1	21,6	N/A
4th	0,029	0,116	Phase 1	4	4
5th	0,076	0,308	Phase 1	10,7	10,7
6th	0,030	0,123	Phase 1	2,67	2,67
7th	0,089	0,362	Phase 1	7,2	7,2
8th	0,021	0,084	Phase 1	2	2
9th	0,019	0,077	Phase 1	3,8	N/A
10th	0,018	0,074	Phase 1	1,6	1,6
11th	0,051	0,206	Phase 1	3,1	3,1
12th	0,027	0,111	Phase 1	1,33	1,33
13th	0,050	0,201	Phase 1	2	2
14th	0,012	0,049	Phase 1	N/A	N/A
15th	0,014	0,056	Phase 1	N/A	N/A
16th	0,015	0,060	Phase 1	N/A	N/A
17th	0,054	0,221	Phase 1	N/A	N/A
18th	0,015	0,061	Phase 1	N/A	N/A
19th	0,050	0,204	Phase 1	N/A	N/A
20th	0,012	0,049	Phase 1	N/A	N/A
21th	0,014	0,058	Phase 1	N/A	N/A
22th	0,017	0,067	Phase 1	N/A	N/A
23th	0,053	0,215	Phase 1	N/A	N/A
24th	0,009	0,036	Phase 1	N/A	N/A
25th	0,053	0,215	Phase 1	N/A	N/A
26th	0,014	0,055	Phase 1	N/A	N/A
27th	0,016	0,064	Phase 1	N/A	N/A
28th	0,018	0,071	Phase 1	N/A	N/A
29th	0,057	0,230	Phase 1	N/A	N/A
30th	0,009	0,039	Phase 1	N/A	N/A
31th	0,060	0,243	Phase 1	N/A	N/A
32th	0,015	0,060	Phase 1	N/A	N/A
33th	0,014	0,056	Phase 1	N/A	N/A
34th	0,018	0,075	Phase 1	N/A	N/A
35th	0,048	0,195	Phase 1	N/A	N/A
36th	0,012	0,051	Phase 1	N/A	N/A
37th	0,059	0,242	Phase 1	N/A	N/A
38th	0,013	0,051	Phase 1	N/A	N/A
39th	0,009	0,038	Phase 1	N/A	N/A
40th	0,017	0,069	Phase 1	N/A	N/A
THD ₄₀	---	1,26	Phase 1	13	13
PWHD	---		Phase 1	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-17k-TL2			
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	24,630		Phase 2	-	-
2nd	0,244	0,990	Phase 2	8	8
3rd	0,023	0,093	Phase 2	21,6	N/A
4th	0,073	0,295	Phase 2	4	4
5th	0,087	0,352	Phase 2	10,7	10,7
6th	0,056	0,229	Phase 2	2,67	2,67
7th	0,105	0,428	Phase 2	7,2	7,2
8th	0,071	0,290	Phase 2	2	2
9th	0,021	0,085	Phase 2	3,8	N/A
10th	0,017	0,069	Phase 2	1,6	1,6
11th	0,077	0,315	Phase 2	3,1	3,1
12th	0,045	0,183	Phase 2	1,33	1,33
13th	0,051	0,207	Phase 2	2	2
14th	0,017	0,069	Phase 2	N/A	N/A
15th	0,037	0,151	Phase 2	N/A	N/A
16th	0,022	0,091	Phase 2	N/A	N/A
17th	0,057	0,233	Phase 2	N/A	N/A
18th	0,016	0,066	Phase 2	N/A	N/A
19th	0,047	0,191	Phase 2	N/A	N/A
20th	0,017	0,070	Phase 2	N/A	N/A
21th	0,019	0,078	Phase 2	N/A	N/A
22th	0,020	0,082	Phase 2	N/A	N/A
23th	0,055	0,225	Phase 2	N/A	N/A
24th	0,018	0,075	Phase 2	N/A	N/A
25th	0,049	0,199	Phase 2	N/A	N/A
26th	0,021	0,087	Phase 2	N/A	N/A
27th	0,020	0,082	Phase 2	N/A	N/A
28th	0,024	0,096	Phase 2	N/A	N/A
29th	0,053	0,215	Phase 2	N/A	N/A
30th	0,022	0,088	Phase 2	N/A	N/A
31th	0,053	0,215	Phase 2	N/A	N/A
32th	0,023	0,093	Phase 2	N/A	N/A
33th	0,017	0,070	Phase 2	N/A	N/A
34th	0,028	0,112	Phase 2	N/A	N/A
35th	0,044	0,178	Phase 2	N/A	N/A
36th	0,023	0,094	Phase 2	N/A	N/A
37th	0,056	0,227	Phase 2	N/A	N/A
38th	0,019	0,078	Phase 2	N/A	N/A
39th	0,019	0,077	Phase 2	N/A	N/A
40th	0,018	0,072	Phase 2	N/A	N/A
THD ₄₀	---	1,61	Phase 2	13	13
PWHD	---		Phase 2	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-17k-TL2			
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	24,697	--	Phase 3	-	-
2nd	0,165	0,667	Phase 3	8	8
3rd	0,028	0,111	Phase 3	21,6	N/A
4th	0,090	0,366	Phase 3	4	4
5th	0,098	0,397	Phase 3	10,7	10,7
6th	0,052	0,211	Phase 3	2,67	2,67
7th	0,070	0,284	Phase 3	7,2	7,2
8th	0,076	0,308	Phase 3	2	2
9th	0,027	0,109	Phase 3	3,8	N/A
10th	0,015	0,060	Phase 3	1,6	1,6
11th	0,060	0,243	Phase 3	3,1	3,1
12th	0,039	0,156	Phase 3	1,33	1,33
13th	0,048	0,193	Phase 3	2	2
14th	0,016	0,066	Phase 3	N/A	N/A
15th	0,032	0,130	Phase 3	N/A	N/A
16th	0,015	0,061	Phase 3	N/A	N/A
17th	0,058	0,235	Phase 3	N/A	N/A
18th	0,015	0,059	Phase 3	N/A	N/A
19th	0,047	0,191	Phase 3	N/A	N/A
20th	0,014	0,058	Phase 3	N/A	N/A
21th	0,019	0,077	Phase 3	N/A	N/A
22th	0,015	0,062	Phase 3	N/A	N/A
23th	0,057	0,231	Phase 3	N/A	N/A
24th	0,018	0,074	Phase 3	N/A	N/A
25th	0,053	0,213	Phase 3	N/A	N/A
26th	0,018	0,073	Phase 3	N/A	N/A
27th	0,017	0,069	Phase 3	N/A	N/A
28th	0,014	0,055	Phase 3	N/A	N/A
29th	0,058	0,234	Phase 3	N/A	N/A
30th	0,019	0,077	Phase 3	N/A	N/A
31th	0,057	0,230	Phase 3	N/A	N/A
32th	0,018	0,074	Phase 3	N/A	N/A
33th	0,013	0,051	Phase 3	N/A	N/A
34th	0,020	0,080	Phase 3	N/A	N/A
35th	0,052	0,209	Phase 3	N/A	N/A
36th	0,020	0,082	Phase 3	N/A	N/A
37th	0,054	0,217	Phase 3	N/A	N/A
38th	0,016	0,064	Phase 3	N/A	N/A
39th	0,016	0,065	Phase 3	N/A	N/A
40th	0,019	0,075	Phase 3	N/A	N/A
THD ₄₀	---	1,30	Phase 3	13	13
PWHD	---		Phase 3	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-20k-TL2			
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	28,267	--	Phase 1	-	-
2nd	0,237	0,840	Phase 1	8	8
3rd	0,026	0,094	Phase 1	21,6	N/A
4th	0,030	0,107	Phase 1	4	4
5th	0,168	0,596	Phase 1	10,7	10,7
6th	0,015	0,052	Phase 1	2,67	2,67
7th	0,066	0,235	Phase 1	7,2	7,2
8th	0,019	0,068	Phase 1	2	2
9th	0,011	0,038	Phase 1	3,8	N/A
10th	0,022	0,078	Phase 1	1,6	1,6
11th	0,050	0,178	Phase 1	3,1	3,1
12th	0,021	0,074	Phase 1	1,33	1,33
13th	0,047	0,167	Phase 1	2	2
14th	0,019	0,068	Phase 1	N/A	N/A
15th	0,018	0,065	Phase 1	N/A	N/A
16th	0,023	0,083	Phase 1	N/A	N/A
17th	0,053	0,186	Phase 1	N/A	N/A
18th	0,012	0,042	Phase 1	N/A	N/A
19th	0,053	0,188	Phase 1	N/A	N/A
20th	0,026	0,091	Phase 1	N/A	N/A
21th	0,019	0,068	Phase 1	N/A	N/A
22th	0,028	0,100	Phase 1	N/A	N/A
23th	0,053	0,189	Phase 1	N/A	N/A
24th	0,008	0,029	Phase 1	N/A	N/A
25th	0,054	0,193	Phase 1	N/A	N/A
26th	0,028	0,101	Phase 1	N/A	N/A
27th	0,017	0,059	Phase 1	N/A	N/A
28th	0,031	0,110	Phase 1	N/A	N/A
29th	0,055	0,195	Phase 1	N/A	N/A
30th	0,012	0,043	Phase 1	N/A	N/A
31th	0,059	0,207	Phase 1	N/A	N/A
32th	0,034	0,121	Phase 1	N/A	N/A
33th	0,011	0,038	Phase 1	N/A	N/A
34th	0,035	0,124	Phase 1	N/A	N/A
35th	0,058	0,206	Phase 1	N/A	N/A
36th	0,014	0,050	Phase 1	N/A	N/A
37th	0,067	0,238	Phase 1	N/A	N/A
38th	0,034	0,121	Phase 1	N/A	N/A
39th	0,009	0,031	Phase 1	N/A	N/A
40th	0,041	0,145	Phase 1	N/A	N/A
THD ₄₀	---	1,85	Phase 1	13	13
PWHD	---		Phase 1	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-20k-TL2			
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	28,341	--	Phase 2	-	-
2nd	0,244	0,861	Phase 2	8	8
3rd	0,037	0,129	Phase 2	21,6	N/A
4th	0,017	0,060	Phase 2	4	4
5th	0,178	0,629	Phase 2	10,7	10,7
6th	0,017	0,058	Phase 2	2,67	2,67
7th	0,060	0,212	Phase 2	7,2	7,2
8th	0,026	0,091	Phase 2	2	2
9th	0,012	0,041	Phase 2	3,8	N/A
10th	0,033	0,115	Phase 2	1,6	1,6
11th	0,052	0,182	Phase 2	3,1	3,1
12th	0,013	0,046	Phase 2	1,33	1,33
13th	0,044	0,157	Phase 2	2	2
14th	0,027	0,095	Phase 2	N/A	N/A
15th	0,015	0,054	Phase 2	N/A	N/A
16th	0,026	0,093	Phase 2	N/A	N/A
17th	0,047	0,167	Phase 2	N/A	N/A
18th	0,010	0,036	Phase 2	N/A	N/A
19th	0,049	0,174	Phase 2	N/A	N/A
20th	0,032	0,112	Phase 2	N/A	N/A
21th	0,014	0,048	Phase 2	N/A	N/A
22th	0,031	0,109	Phase 2	N/A	N/A
23th	0,050	0,175	Phase 2	N/A	N/A
24th	0,013	0,046	Phase 2	N/A	N/A
25th	0,050	0,177	Phase 2	N/A	N/A
26th	0,038	0,134	Phase 2	N/A	N/A
27th	0,013	0,045	Phase 2	N/A	N/A
28th	0,036	0,128	Phase 2	N/A	N/A
29th	0,048	0,170	Phase 2	N/A	N/A
30th	0,014	0,050	Phase 2	N/A	N/A
31th	0,052	0,182	Phase 2	N/A	N/A
32th	0,045	0,158	Phase 2	N/A	N/A
33th	0,017	0,060	Phase 2	N/A	N/A
34th	0,043	0,153	Phase 2	N/A	N/A
35th	0,049	0,173	Phase 2	N/A	N/A
36th	0,017	0,060	Phase 2	N/A	N/A
37th	0,061	0,215	Phase 2	N/A	N/A
38th	0,045	0,160	Phase 2	N/A	N/A
39th	0,019	0,069	Phase 2	N/A	N/A
40th	0,048	0,168	Phase 2	N/A	N/A
THD ₄₀	---	2,19	Phase 2	13	13
PWHD	---		Phase 2	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Power Quality. Harmonic current emission					
micro-generator		Omniksol-20k-TL2			
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	28,460	--	Phase 3	-	-
2nd	0,249	0,874	Phase 3	8	8
3rd	0,025	0,089	Phase 3	21,6	N/A
4th	0,021	0,075	Phase 3	4	4
5th	0,149	0,525	Phase 3	10,7	10,7
6th	0,014	0,050	Phase 3	2,67	2,67
7th	0,046	0,162	Phase 3	7,2	7,2
8th	0,026	0,092	Phase 3	2	2
9th	0,011	0,037	Phase 3	3,8	N/A
10th	0,032	0,111	Phase 3	1,6	1,6
11th	0,048	0,169	Phase 3	3,1	3,1
12th	0,021	0,074	Phase 3	1,33	1,33
13th	0,052	0,183	Phase 3	2	2
14th	0,021	0,074	Phase 3	N/A	N/A
15th	0,015	0,053	Phase 3	N/A	N/A
16th	0,019	0,067	Phase 3	N/A	N/A
17th	0,050	0,174	Phase 3	N/A	N/A
18th	0,012	0,044	Phase 3	N/A	N/A
19th	0,056	0,197	Phase 3	N/A	N/A
20th	0,026	0,090	Phase 3	N/A	N/A
21th	0,010	0,035	Phase 3	N/A	N/A
22th	0,022	0,079	Phase 3	N/A	N/A
23th	0,051	0,178	Phase 3	N/A	N/A
24th	0,013	0,046	Phase 3	N/A	N/A
25th	0,058	0,202	Phase 3	N/A	N/A
26th	0,031	0,108	Phase 3	N/A	N/A
27th	0,015	0,054	Phase 3	N/A	N/A
28th	0,027	0,094	Phase 3	N/A	N/A
29th	0,053	0,186	Phase 3	N/A	N/A
30th	0,014	0,049	Phase 3	N/A	N/A
31th	0,060	0,209	Phase 3	N/A	N/A
32th	0,036	0,127	Phase 3	N/A	N/A
33th	0,010	0,035	Phase 3	N/A	N/A
34th	0,033	0,118	Phase 3	N/A	N/A
35th	0,058	0,203	Phase 3	N/A	N/A
36th	0,017	0,060	Phase 3	N/A	N/A
37th	0,064	0,226	Phase 3	N/A	N/A
38th	0,037	0,132	Phase 3	N/A	N/A
39th	0,013	0,046	Phase 3	N/A	N/A
40th	0,040	0,140	Phase 3	N/A	N/A
THD ₄₀	---	1,57	Phase 3	13	13
PWHD	---		Phase 3	22	22

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. OMK-17SE0174FTSP

Voltage fluctuation and Flicker.					
Omniksol-20k-TL2 – Phase 1	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3/-3-11				
Value	Pst	Plt 2 hours	d(t) _{500ms}	dc	dmax
Limit	1,0	0,65	3,3%	3,3%	4%
Test value Omniksol-20k-TL2 – Phase 1	0,15	0,12	0,00	0,66	0,76
Test value Omniksol-20k-TL2 – Phase 2	0,17	0,14	0,00	0,75	0,86
Test value Omniksol-20k-TL2 – Phase 3	0,15	0,13	0,00	0,69	0,77

DC-Injection.				
Protection limit	Tested at four power levels, limit 0,5% of IAC _{max} (145mA)			
Output power	~20%	~50%	75%	~100%
Max. test value [mA] Omniksol-20k-TL2 – Phase 1	133	140	140	66
Max. test value [mA] Omniksol-20k-TL2 – Phase 2	111	113	113	122
Max. test value [mA] Omniksol-20k-TL2 – Phase 3	135	96	109	112
Protection limit	Tested at four power levels, limit 0,5% of IAC _{max} (130mA)			
Output power	~20%	~50%	75%	~100%
Max. test value [mA] Omniksol-17k-TL2 – Phase 1	127	107	124	74
Max. test value [mA] Omniksol-17k-TL2 – Phase 2	129	102	91	123
Max. test value [mA] Omniksol-17k-TL2 – Phase 3	113	81	89	103
Protection limit	Tested at four power levels, limit 0,5% of IAC _{max} (115mA)			
Output power	~20%	~50%	75%	~100%
Max. test value [mA] Omniksol-15k-TL2 – Phase 1	84	85	102	88
Max. test value [mA] Omniksol-15k-TL2 – Phase 2	48	103	112	88
Max. test value [mA] Omniksol-15k-TL2 – Phase 3	69	76	90	89