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Megfelelőségi nyilatkozat

Kérelmező: **Sungrow Power Supply Co.,Ltd.**
No. 1699 Xiyou Rd., New & High Technology
Industrial Development Zone, Heifei, Anhui
P.R. China

Gyártmány: **Fotovillamos (PV) invertere**

**Termelési egység
neve:** **SG60KTL**

Vizsgálati elv:

A fent megnevezett gyártmány reprezentatív mintáján elvégzett vizsgálatok alapján kijelenthető, hogy a gyártmány alkalmas a rendeltetészerű használatra az igazolás napján érvényben lévő, a vizsgálati elvek alapján vizsgált hatályos biztonságtechnikai követelményeknek.

IEC 62109-1:2010-04 Ed.1.0; EN 62109-1:2011; DIN EN 62109-1:2011

Fotovillamos (PV) energetikai rendszerek teljesítményátalakítóinak biztonsága. 1. rész: Általános követelmények

IEC 62109-2:2011-06 Ed.1.0; EN 62109-2:2011; DIN EN 62109-2:2012

Fotovillamos (PV) energetikai rendszerek teljesítményátalakítóinak biztonsága. 2. rész: Külön követelmények inverterek

IEC 62116:2014

Fotovillamos (PV) inverterek nem kívánt szigetüzem elkerülési képességének mérése

EN 50438:2013, MSZ EN 50438:2014

Kis áramfejlesztők kisfeszültségű közcélú elosztóhálózatokra való párhuzamos csatlakoztatásának követelményei

Jelentés száma: **CQCTT-WT-2017-A0016a**
CQCTT-WT-2017-A0016b
PVNL161108N040_0

Tanúsítvány száma: **U17-0158**

Kiállítás dátuma: **2017-04-12**

Intézet tanúsítási



Holger Schaffer



A Bureau Veritas Consumer Products Services Germany GmbH minősítési helye
DIN EN ISO/IEC 17065 szerint akkreditálva

Appendix E Type Verification Test Report
 Extract from test report according to EN 50438 Nr. PVNL161108N040_0

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

Manufacturer / applicant:	Sungrow Power Supply Co.,Ltd. No. 1699 Xiyou Rd., New & High Technology Industrial Development Zone, Heifei, Anhui P.R. China
Micro-generator Type	Grid-tied photovoltaic inverter
Rated values	SG60KTL
Maximum rated capacity	60 kW
Rated voltage	3N/PE, 230/400, 50Hz
Firmware version	a. DSP_SG60KTL_V11_A b. LCD_SG60KTL_V03_A_M
Measurement period:	2016-11-08 to 2016-12-02

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

The power generation unit is equipped with a 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.

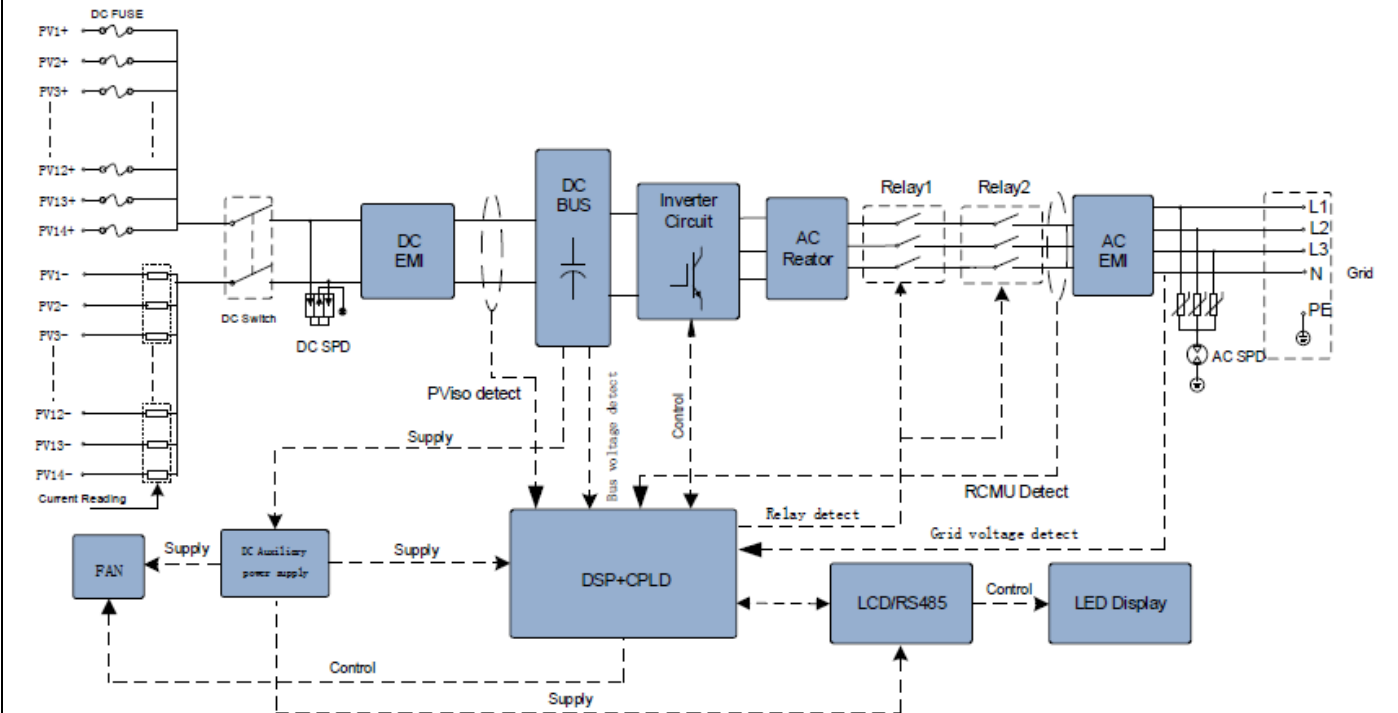


Figure 1 – Schematic structure of the power generation unit

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	3,0 / 600*	253,0	2,0 / 600*	252,9 / 253*	1,990 / 597*
Over-voltage stage 2	264,5	0,2	264,5	0,2	264,3	0,197
Under-voltage stage 1	195,5	1,5	195,5	1,5	195,2	1,490
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	3,0 / 600*	253,0	2,0 / 600*	252,9 / 253*	1,990 / 599*
Over-voltage stage 2	264,5	0,2	264,5	0,2	263,7	0,196
Under-voltage stage 1	195,5	1,5	195,5	1,5	194,3	1,500
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	3,0 / 600*	253,0	2,0 / 600*	252,9 / 253*	1,990 / 597*
Over-voltage stage 2	264,5	0,2	264,5	0,2	263,5	0,198
Under-voltage stage 1	195,5	1,5	195,5	1,5	194,2	1,500

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	47,49	0,470
Under-frequency	47,50	0,5	47,50	0,5	52,00	0,466

Note.
Minimum operation time according to default interface protection:
Over-frequency 0,5 s
Under-frequency 0,5 s

LoM test						
Method used	EN 62116					
Balancing load on islanded network	33% of -5% Q Test 22	66% of -5% Q Test 12	100% of -5% P Test 5	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time	492 ms	472 ms	569 ms	515 ms	482 ms	587 ms

Indicate additional shut down time included in above results.
(Integrated interface switch)

Type of switching equipment 1:
Relay with 30ms
Type of switching equipment 2:
Relay with 30ms



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Type testing of a micro-generator

Operating range				
Test 1: U = 195,5 V; f = 47,5 Hz; P = 1,00 Sn; cosφ = 1				
Test 2: U = 253,0 V; f = 51,5 Hz; P = 1,00 Sn; cosφ = 1				
Test sequence	Voltage [V]	Frequency [Hz]	Output power [W]	Cos φ [1]
1	197,5	47,55	55,555	0,989
2	253,1	51,50	57,845	0,984

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]:	60,034	60,025	60,015
ΔP/PM [%] per 1 Hz:			0

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	58,839	48,032	37,225	48,032	58,839	N/A
PE60 [kW]:	60,042	57,468	46,702	36,000	46,170	56,941	60,059
ΔPE60/PM [%]:	N/A	1,371	1,330	1,225	1,862	1,898	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	29,547	24,120	18,693	24,120	29,547	N/A
PE60 [kW]:	30,153	29,210	23,640	18,149	23,456	28,983	N/A
ΔPE60/PM [%]:	N/A	0,337	0,480	0,544	0,664	0,564	N/A
Limit ΔP/P _{1min} :	+ 10 % of P _M						



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Reactive power			
Uncontrollable reactive power			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9999c	0,9999c	0,9999c
50% PN	0,9999c	0,9999c	0,9999c
75% PN	0,9999c	0,9999c	0,9999c
100% PN	0,9999c	0,9999c	0,9999c
Limit	>0,95	>0,95	>0,95

Controllable reactive power				
Inductive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	DC power [W]
0% - 10%	5,934	-4,778	0,7789	5,979
10% - 20%	11,953	-9,232	0,7914	12,080
20% - 30%	17,944	-13,673	0,7954	18,204
30% - 40%	23,925	-18,102	0,7975	24,317
40% - 50%	29,890	-22,544	0,7984	30,451
50% - 60%	35,822	-26,949	0,7991	36,552
60% - 70%	41,711	-31,324	0,7996	42,682
70% - 80%	47,596	-35,694	0,8000	48,782
80% - 90%	51,162	-38,471	0,7993	52,555
90% - 100%	51,125	-38,482	0,7990	52,554
Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	DC power [W]
0% - 10%	5,906	4,818	0,7748	5,993
10% - 20%	11,921	9,148	0,7933	12,163
20% - 30%	17,908	13,655	0,7952	18,260
30% - 40%	23,883	18,011	0,7984	24,372
40% - 50%	29,826	22,340	0,8004	30,525
50% - 60%	35,763	26,668	0,8017	36,610
60% - 70%	41,639	30,948	0,8026	42,735
70% - 80%	47,525	35,231	0,8033	48,850
80% - 90%	51,694	38,272	0,8037	53,551
90% - 100%	51,689	38,254	0,8038	53,570
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%	5,941	0,068	0,9999	6,040
10% - 20%	11,982	0,058	0,9999	12,158
20% - 30%	18,014	0,044	0,9999	18,264
30% - 40%	24,041	0,038	0,9999	24,383
40% - 50%	30,050	0,019	0,9999	30,517
50% - 60%	36,043	0,002	0,9999	36,593
60% - 70%	41,996	0,023	0,9999	42,744
70% - 80%	47,973	0,051	0,9999	48,790
80% - 90%	53,888	0,098	0,9999	54,954
90% - 100%	60,028	0,143	0,9999	61,260

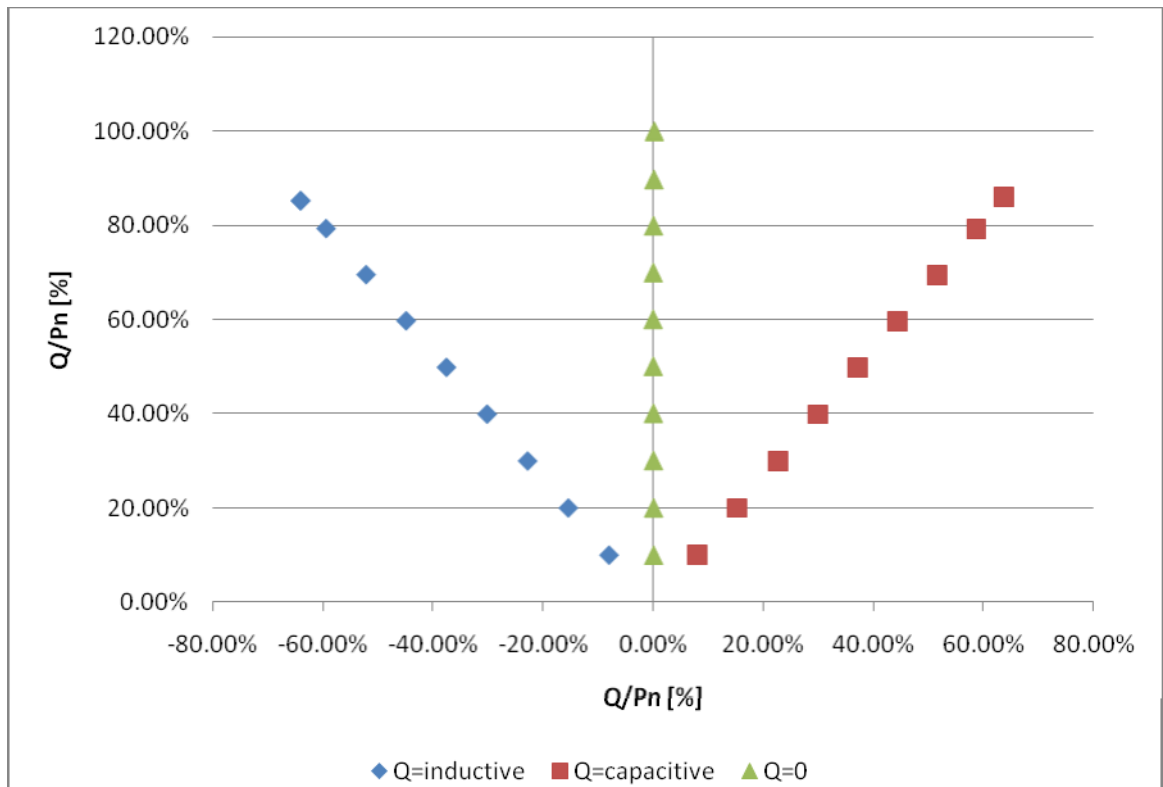


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Diagram of inductive reactive power absorption



Q adjustment				
	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured cos φ	Deviation compared to setpoint ΔQ / PN [%]
- Qmin	29,059	27,790	0,9045	2,12
0	0	0,113	0,9999	0,19
+ Qmax	29,059	28,032	0,9029	1,71



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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]	108	117
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]	108	116
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]	114	114
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]	114	112
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	Phase 1	I_p	N/A	20ms	4,38	129,90
	Phase 2				20,96	43,85
	Phase 3				17,21	19,67
Initial Value of aperiodic current	Phase 1	A	N/A	100ms	6,00	132,81
	Phase 2				45,63	36,40
	Phase 3				56,96	24,02
Initial symmetrical short-circuit current*	Phase 1	I_k	N/A	250ms	4,79	134,77
	Phase 2				31,00	107,21
	Phase 3				51,54	20,15
Decaying (aperiodic) component of short circuit current*	Phase 1	i_{DC}	N/A	500ms	---	---
	Phase 2				---	---
	Phase 3				---	---
Reactance/Resistance Ratio of source*	Phase 1	X/R	N/A	Time to trip	0,372	In seconds
	Phase 2				0,388	
	Phase 3				0,394	



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Power Quality. Harmonic current emission					
micro-generator		SG60KTL			
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	86,624	99,57	Phase 1	-	-
2nd	0,174	0,20	Phase 1	8	8
3rd	0,301	0,35	Phase 1	21,6	N/A
4th	0,263	0,30	Phase 1	4	4
5th	1,556	1,79	Phase 1	10,7	10,7
6th	0,226	0,26	Phase 1	2,67	2,67
7th	0,750	0,86	Phase 1	7,2	7,2
8th	0,196	0,23	Phase 1	2	2
9th	0,059	0,07	Phase 1	3,8	N/A
10th	0,165	0,19	Phase 1	1,6	1,6
11th	0,432	0,50	Phase 1	3,1	3,1
12th	0,108	0,12	Phase 1	1,33	1,33
13th	0,290	0,33	Phase 1	2	2
14th	0,066	0,08	Phase 1	N/A	N/A
15th	0,045	0,05	Phase 1	N/A	N/A
16th	0,052	0,06	Phase 1	N/A	N/A
17th	0,209	0,24	Phase 1	N/A	N/A
18th	0,053	0,06	Phase 1	N/A	N/A
19th	0,172	0,20	Phase 1	N/A	N/A
20th	0,058	0,07	Phase 1	N/A	N/A
21th	0,037	0,04	Phase 1	N/A	N/A
22th	0,047	0,05	Phase 1	N/A	N/A
23th	0,133	0,15	Phase 1	N/A	N/A
24th	0,038	0,04	Phase 1	N/A	N/A
25th	0,114	0,13	Phase 1	N/A	N/A
26th	0,037	0,04	Phase 1	N/A	N/A
27th	0,032	0,04	Phase 1	N/A	N/A
28th	0,037	0,04	Phase 1	N/A	N/A
29th	0,086	0,10	Phase 1	N/A	N/A
30th	0,035	0,04	Phase 1	N/A	N/A
31th	0,088	0,10	Phase 1	N/A	N/A
32th	0,035	0,04	Phase 1	N/A	N/A
33th	0,035	0,04	Phase 1	N/A	N/A
34th	0,091	0,10	Phase 1	N/A	N/A
35th	0,089	0,10	Phase 1	N/A	N/A
36th	0,038	0,04	Phase 1	N/A	N/A
37th	0,068	0,08	Phase 1	N/A	N/A
38th	0,049	0,06	Phase 1	N/A	N/A
39th	0,051	0,06	Phase 1	N/A	N/A
40th	0,033	0,04	Phase 1	N/A	N/A
THD ₄₀	-	2,22	Phase 1	13	13
PWHD	-	2,32	Phase 1	22	22



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Power Quality. Harmonic current emission					
micro-generator		SG60KTL			
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	86,799	99,77	Phase 2	-	-
2nd	0,063	0,07	Phase 2	8	8
3rd	0,224	0,26	Phase 2	21,6	N/A
4th	0,040	0,05	Phase 2	4	4
5th	1,498	1,72	Phase 2	10,7	10,7
6th	0,044	0,05	Phase 2	2,67	2,67
7th	0,767	0,88	Phase 2	7,2	7,2
8th	0,036	0,04	Phase 2	2	2
9th	0,099	0,11	Phase 2	3,8	N/A
10th	0,037	0,04	Phase 2	1,6	1,6
11th	0,425	0,49	Phase 2	3,1	3,1
12th	0,037	0,04	Phase 2	1,33	1,33
13th	0,291	0,33	Phase 2	2	2
14th	0,039	0,04	Phase 2	N/A	N/A
15th	0,036	0,04	Phase 2	N/A	N/A
16th	0,036	0,04	Phase 2	N/A	N/A
17th	0,215	0,25	Phase 2	N/A	N/A
18th	0,034	0,04	Phase 2	N/A	N/A
19th	0,170	0,20	Phase 2	N/A	N/A
20th	0,033	0,04	Phase 2	N/A	N/A
21th	0,040	0,05	Phase 2	N/A	N/A
22th	0,036	0,04	Phase 2	N/A	N/A
23th	0,126	0,14	Phase 2	N/A	N/A
24th	0,033	0,04	Phase 2	N/A	N/A
25th	0,111	0,13	Phase 2	N/A	N/A
26th	0,032	0,04	Phase 2	N/A	N/A
27th	0,038	0,04	Phase 2	N/A	N/A
28th	0,034	0,04	Phase 2	N/A	N/A
29th	0,093	0,11	Phase 2	N/A	N/A
30th	0,033	0,04	Phase 2	N/A	N/A
31th	0,089	0,10	Phase 2	N/A	N/A
32th	0,033	0,04	Phase 2	N/A	N/A
33th	0,037	0,04	Phase 2	N/A	N/A
34th	0,129	0,15	Phase 2	N/A	N/A
35th	0,085	0,10	Phase 2	N/A	N/A
36th	0,039	0,04	Phase 2	N/A	N/A
37th	0,069	0,08	Phase 2	N/A	N/A
38th	0,052	0,06	Phase 2	N/A	N/A
39th	0,049	0,06	Phase 2	N/A	N/A
40th	0,033	0,04	Phase 2	N/A	N/A
THD ₄₀	-	2,09	Phase 2	13	13
PWHD	-	2,35	Phase 2	22	22



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Power Quality. Harmonic current emission					
micro-generator		SG60KTL			
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	86,803	99,77	Phase 3	-	-
2nd	0,211	0,24	Phase 3	8	8
3rd	0,255	0,29	Phase 3	21,6	N/A
4th	0,278	0,32	Phase 3	4	4
5th	1,453	1,67	Phase 3	10,7	10,7
6th	0,252	0,29	Phase 3	2,67	2,67
7th	0,756	0,87	Phase 3	7,2	7,2
8th	0,205	0,24	Phase 3	2	2
9th	0,080	0,09	Phase 3	3,8	N/A
10th	0,159	0,18	Phase 3	1,6	1,6
11th	0,438	0,50	Phase 3	3,1	3,1
12th	0,117	0,13	Phase 3	1,33	1,33
13th	0,278	0,32	Phase 3	2	2
14th	0,069	0,08	Phase 3	N/A	N/A
15th	0,039	0,04	Phase 3	N/A	N/A
16th	0,046	0,05	Phase 3	N/A	N/A
17th	0,222	0,26	Phase 3	N/A	N/A
18th	0,052	0,06	Phase 3	N/A	N/A
19th	0,160	0,18	Phase 3	N/A	N/A
20th	0,053	0,06	Phase 3	N/A	N/A
21th	0,039	0,04	Phase 3	N/A	N/A
22th	0,047	0,05	Phase 3	N/A	N/A
23th	0,140	0,16	Phase 3	N/A	N/A
24th	0,036	0,04	Phase 3	N/A	N/A
25th	0,111	0,13	Phase 3	N/A	N/A
26th	0,036	0,04	Phase 3	N/A	N/A
27th	0,034	0,04	Phase 3	N/A	N/A
28th	0,036	0,04	Phase 3	N/A	N/A
29th	0,098	0,11	Phase 3	N/A	N/A
30th	0,034	0,04	Phase 3	N/A	N/A
31th	0,091	0,10	Phase 3	N/A	N/A
32th	0,033	0,04	Phase 3	N/A	N/A
33th	0,039	0,04	Phase 3	N/A	N/A
34th	0,052	0,06	Phase 3	N/A	N/A
35th	0,093	0,11	Phase 3	N/A	N/A
36th	0,037	0,04	Phase 3	N/A	N/A
37th	0,067	0,08	Phase 3	N/A	N/A
38th	0,042	0,05	Phase 3	N/A	N/A
39th	0,056	0,06	Phase 3	N/A	N/A
40th	0,034	0,04	Phase 3	N/A	N/A
THD ₄₀	-	2,13	Phase 3	13	13
PWHD	-	2,31	Phase 3	22	22







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Annex to the EN 50438 certificate of compliance No. U17-0158

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PVNL161108N040_0

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 Phase 1	Flicker Mode Uover: ■ ■ ■ ■ YOKOGAWA ◆ IEC61000-4-15 Ed2.0 Iover: ■ ■ ■ ■ Flicker:Complete 2:00:00																																																																																														
	Count  12/12 Interval  10m00s/10m00s Element 1 Volt Range A 300V(230V/50Hz) Element1 Judgement: Pass Un (U1) 227.478 V Total Judgement: Pass Freq(U1) 50.000 Hz (Element1,2,3)																																																																																														
	<table border="1"> <thead> <tr> <th></th> <th>dc[%]</th> <th>dmax[%]</th> <th>Tmax[ms]</th> <th>Pst</th> <th>Plt</th> </tr> </thead> <tbody> <tr> <td>Limit</td> <td>3.30</td> <td>4.00</td> <td>500 3.30(%)</td> <td>1.00</td> <td>0.65 N:12</td> </tr> <tr> <td>No. 1</td> <td>0.06 Pass</td> <td>0.26 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>2</td> <td>0.00 Pass</td> <td>0.00 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>3</td> <td>0.10 Pass</td> <td>0.27 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>4</td> <td>0.17 Pass</td> <td>0.32 Pass</td> <td>0 Pass</td> <td>0.10 Pass</td> <td></td> </tr> <tr> <td>5</td> <td>0.09 Pass</td> <td>0.28 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>6</td> <td>0.01 Pass</td> <td>0.06 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>7</td> <td>0.04 Pass</td> <td>0.20 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>8</td> <td>0.02 Pass</td> <td>0.23 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>9</td> <td>0.02 Pass</td> <td>0.21 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>10</td> <td>0.17 Pass</td> <td>0.41 Pass</td> <td>0 Pass</td> <td>0.11 Pass</td> <td></td> </tr> <tr> <td>11</td> <td>0.05 Pass</td> <td>0.28 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>12</td> <td>0.15 Pass</td> <td>0.45 Pass</td> <td>0 Pass</td> <td>0.11 Pass</td> <td></td> </tr> <tr> <td>Result</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>0.10 Pass</td> </tr> </tbody> </table>						dc[%]	dmax[%]	Tmax[ms]	Pst	Plt	Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12	No. 1	0.06 Pass	0.26 Pass	0 Pass	0.09 Pass		2	0.00 Pass	0.00 Pass	0 Pass	0.09 Pass		3	0.10 Pass	0.27 Pass	0 Pass	0.09 Pass		4	0.17 Pass	0.32 Pass	0 Pass	0.10 Pass		5	0.09 Pass	0.28 Pass	0 Pass	0.09 Pass		6	0.01 Pass	0.06 Pass	0 Pass	0.09 Pass		7	0.04 Pass	0.20 Pass	0 Pass	0.09 Pass		8	0.02 Pass	0.23 Pass	0 Pass	0.09 Pass		9	0.02 Pass	0.21 Pass	0 Pass	0.09 Pass		10	0.17 Pass	0.41 Pass	0 Pass	0.11 Pass		11	0.05 Pass	0.28 Pass	0 Pass	0.09 Pass		12	0.15 Pass	0.45 Pass	0 Pass	0.11 Pass		Result	Pass	Pass	Pass	Pass	0.10 Pass
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12	0.15 Pass	0.45 Pass	0 Pass	0.11 Pass																																																																																											
Result	Pass	Pass	Pass	Pass	0.10 Pass																																																																																										
	Update 3600		2016/11/18 18:46:05																																																																																												
Test value Phase 2	Flicker Mode Uover: ■ ■ ■ ■ YOKOGAWA ◆ IEC61000-4-15 Ed2.0 Iover: ■ ■ ■ ■ Flicker:Complete 2:00:00																																																																																														
	Count  12/12 Interval  10m00s/10m00s Element 2 Volt Range A 300V(230V/50Hz) Element2 Judgement: Pass Un (U2) 227.769 V Total Judgement: Pass Freq(U2) ----- (Element1,2,3)																																																																																														
	<table border="1"> <thead> <tr> <th></th> <th>dc[%]</th> <th>dmax[%]</th> <th>Tmax[ms]</th> <th>Pst</th> <th>Plt</th> </tr> </thead> <tbody> <tr> <td>Limit</td> <td>3.30</td> <td>4.00</td> <td>500 3.30(%)</td> <td>1.00</td> <td>0.65 N:12</td> </tr> <tr> <td>No. 1</td> <td>0.02 Pass</td> <td>0.30 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>2</td> <td>0.04 Pass</td> <td>0.21 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>3</td> <td>0.06 Pass</td> <td>0.28 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>4</td> <td>0.03 Pass</td> <td>0.30 Pass</td> <td>0 Pass</td> <td>0.10 Pass</td> <td></td> </tr> <tr> <td>5</td> <td>0.03 Pass</td> <td>0.26 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>6</td> <td>0.05 Pass</td> <td>0.20 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>7</td> <td>0.03 Pass</td> <td>0.26 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>8</td> <td>0.07 Pass</td> <td>0.24 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>9</td> <td>0.09 Pass</td> <td>0.21 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>10</td> <td>0.05 Pass</td> <td>0.43 Pass</td> <td>0 Pass</td> <td>0.11 Pass</td> <td></td> </tr> <tr> <td>11</td> <td>0.01 Pass</td> <td>0.23 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>12</td> <td>0.14 Pass</td> <td>0.46 Pass</td> <td>0 Pass</td> <td>0.11 Pass</td> <td></td> </tr> <tr> <td>Result</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>0.10 Pass</td> </tr> </tbody> </table>						dc[%]	dmax[%]	Tmax[ms]	Pst	Plt	Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12	No. 1	0.02 Pass	0.30 Pass	0 Pass	0.09 Pass		2	0.04 Pass	0.21 Pass	0 Pass	0.09 Pass		3	0.06 Pass	0.28 Pass	0 Pass	0.09 Pass		4	0.03 Pass	0.30 Pass	0 Pass	0.10 Pass		5	0.03 Pass	0.26 Pass	0 Pass	0.09 Pass		6	0.05 Pass	0.20 Pass	0 Pass	0.09 Pass		7	0.03 Pass	0.26 Pass	0 Pass	0.09 Pass		8	0.07 Pass	0.24 Pass	0 Pass	0.09 Pass		9	0.09 Pass	0.21 Pass	0 Pass	0.09 Pass		10	0.05 Pass	0.43 Pass	0 Pass	0.11 Pass		11	0.01 Pass	0.23 Pass	0 Pass	0.09 Pass		12	0.14 Pass	0.46 Pass	0 Pass	0.11 Pass		Result	Pass	Pass	Pass	Pass	0.10 Pass
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BUREAU
VERITAS

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. PVNL161108N040_0

Test value Phase 3	Flicker Mode IEC61000-4-15 Ed2.0 Uover: ■■■■ Iover: ■■■■ Flicker:Complete 2:00:00 YOKOGAWA																																																																																														
	Count 12/12 Interval 10m00s/10m00s																																																																																														
	Element 3 Volt Range A 300V(230V/50Hz) Element3 Judgement: Pass Un (U3) 228.980 V Total Judgement: Pass Freq(U3) ----- (Element1,2,3)																																																																																														
	<table border="1"> <thead> <tr> <th></th> <th>dc[%]</th> <th>dmax[%]</th> <th>Tmax[ms]</th> <th>Pst</th> <th>Pit</th> </tr> </thead> <tbody> <tr> <td>Limit</td> <td>3.30</td> <td>4.00</td> <td>500 3.30C%</td> <td>1.00</td> <td>0.65 N:12</td> </tr> <tr> <td>No. 1</td> <td>0.21 Pass</td> <td>0.44 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>2</td> <td>0.27 Pass</td> <td>0.42 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>3</td> <td>0.21 Pass</td> <td>0.44 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>4</td> <td>0.20 Pass</td> <td>0.38 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>5</td> <td>0.25 Pass</td> <td>0.42 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>6</td> <td>0.22 Pass</td> <td>0.46 Pass</td> <td>0 Pass</td> <td>0.08 Pass</td> <td></td> </tr> <tr> <td>7</td> <td>0.24 Pass</td> <td>0.39 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>8</td> <td>0.24 Pass</td> <td>0.34 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>9</td> <td>0.23 Pass</td> <td>0.40 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>10</td> <td>0.31 Pass</td> <td>0.50 Pass</td> <td>0 Pass</td> <td>0.10 Pass</td> <td></td> </tr> <tr> <td>11</td> <td>0.22 Pass</td> <td>0.41 Pass</td> <td>0 Pass</td> <td>0.09 Pass</td> <td></td> </tr> <tr> <td>12</td> <td>0.24 Pass</td> <td>0.52 Pass</td> <td>0 Pass</td> <td>0.11 Pass</td> <td></td> </tr> <tr> <td>Result</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>Pass</td> <td>0.09 Pass</td> </tr> </tbody> </table>						dc[%]	dmax[%]	Tmax[ms]	Pst	Pit	Limit	3.30	4.00	500 3.30C%	1.00	0.65 N:12	No. 1	0.21 Pass	0.44 Pass	0 Pass	0.09 Pass		2	0.27 Pass	0.42 Pass	0 Pass	0.09 Pass		3	0.21 Pass	0.44 Pass	0 Pass	0.09 Pass		4	0.20 Pass	0.38 Pass	0 Pass	0.09 Pass		5	0.25 Pass	0.42 Pass	0 Pass	0.09 Pass		6	0.22 Pass	0.46 Pass	0 Pass	0.08 Pass		7	0.24 Pass	0.39 Pass	0 Pass	0.09 Pass		8	0.24 Pass	0.34 Pass	0 Pass	0.09 Pass		9	0.23 Pass	0.40 Pass	0 Pass	0.09 Pass		10	0.31 Pass	0.50 Pass	0 Pass	0.10 Pass		11	0.22 Pass	0.41 Pass	0 Pass	0.09 Pass		12	0.24 Pass	0.52 Pass	0 Pass	0.11 Pass		Result	Pass	Pass	Pass	Pass	0.09 Pass
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Result	Pass	Pass	Pass	Pass	0.09 Pass																																																																																										
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DC-Injection.				
Protection limit	Tested at four power levels, limit 0,5% of IAC _{nom} (435mA)			
Output power	~20%	~50%	75%	~100%
Max. test value (phase L1) [mA]	-0,16	-0,19	0,13	-0,15
Max. test value (phase L2) [mA]	0,33	0,30	0,30	0,23
Max. test value (phase L3) [mA]	0,20	0,18	0,20	0,17