



**BUREAU  
VERITAS**

# Świadectwo zgodności

**Zgłaszający:** SolaX Power Network Technology (Zhe jang) Co., Ltd.  
No. 288 Shizhu Road, Tonglu Economic Development Zone,  
Dongxing District 311500, Tonglu City, Zhejiang Province  
China

**Produkt:** Sieciowy falownik fotowoltaiczny (PV)

**Model:** X3-Hybrid-5.0-D-C, X3-Hybrid-5.0-N-C,  
X3-Hybrid-5.0-D-E, X3-Hybrid-5.0-N-E,  
X3-Hybrid-6.0-D-C, X3-Hybrid-6.0-N-C,  
X3-Hybrid-6.0-D-E, X3-Hybrid-6.0-N-E,  
X3-Hybrid-8.0-D-C, X3-Hybrid-8.0-N-C,  
X3-Hybrid-8.0-D-E, X3-Hybrid-8.0-N-E,  
X3-Hybrid-10.0-D-C, X3-Hybrid-10.0-N-C,  
X3-Hybrid-10.0-D-E, X3-Hybrid-10.0-N-E,  
X3-Fit-8.0C, X3-Fit-8.0E, X3-Fit-10.0C, X3-Fit-10.0E

## Zastosowanie zgodnie z przepisami:

Automatyczne urządzenie wyłączające, monitorujące sieć trójfazową w systemach fotowoltaicznych z obwodem równoległym trójfazowym poprzez przetwornicę w publicznej sieci zasilania. Automatyczne urządzenie wyłączające stanowi część wyżej wymienionej przetwornicy.

## Zastosowane przepisy i normy:

**EN 50438:2013, PN-EN 50438:2014**

Wymagania dla instalacji mikrogeneracyjnych przeznaczonych do równoległego przyłączenia do publicznych sieci dystrybucyjnych niskiego napięcia

**DIN V VDE V 0126-1-1:2006-02 (bezpieczeństwo funkcjonalne)**

Automatyczne urządzenie odłączające między generatorem a publiczną siecią niskiego napięcia

W momencie wydania niniejszego certyfikatu pojęcie zabezpieczenia interfejsu wyżej wymienionego, reprezentatywnego produktu spełnia wymagania bezpieczeństwa obowiązujące dla określonego zastosowania zgodnie z przepisami.

**Numer raportu:** SXP-18MA0125FCSP-R1

**Numer świadectwa:** U18-0562

**Data wydania:** 2018-10-02



Institut certifikacji Bureau Veritas Consumer Products Services Germany GmbH

Akredytowane zgodnie z normą DIN EN ISO/IEC 17065

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

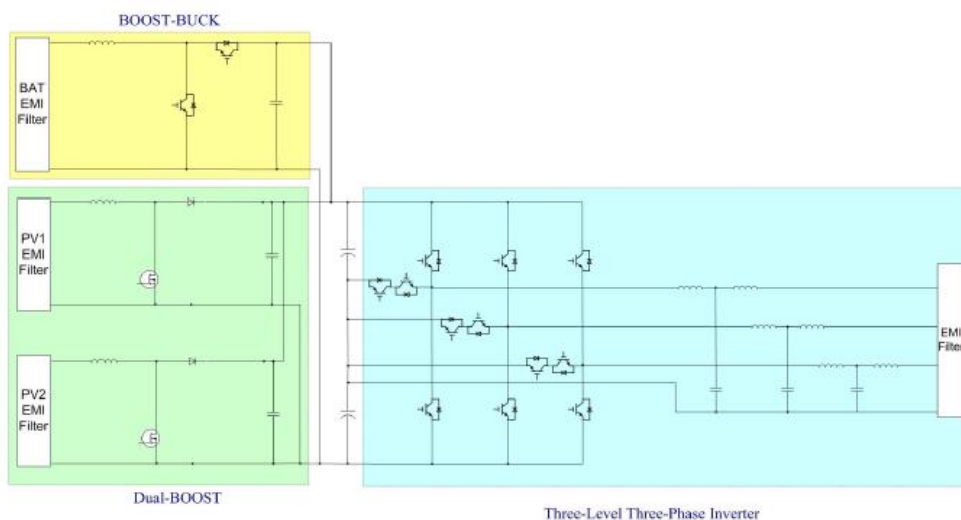
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**Type Approval and declaration of compliance with the requirements of EN 50438.**

<b>Manufacturer / applicant:</b>	SolaX Power Network Technology (Zhe jiang) Co., Ltd. No. 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing District 311500, Tonglu City, Zhejiang Province China				
<b>Micro-generator Type</b>	Grid-tied photovoltaic inverter				
<b>Rated values</b>	X3-Hybrid-5.0-D-C, X3-Hybrid-5.0-N-C	X3-Hybrid-5.0-D-E, X3-Hybrid-5.0-N-E	X3-Hybrid-6.0-D-C, X3-Hybrid-6.0-N-C	X3-Hybrid-6.0-D-E, X3-Hybrid-6.0-N-E	X3-Hybrid-8.0-D-C, X3-Hybrid-8.0-N-C
<b>Maximum rated capacity</b>	5 kW	5 kW	6 kW	6 kW	8 kW
<b>Rated voltage</b>	230V / 400 N,PE	230V / 400 N,PE	230V / 400 N,PE	230V / 400 N,PE	230V / 400 N,PE
<b>Rated values</b>	X3-Hybrid-8.0-D-E, X3-Hybrid-8.0-N-E	X3-Hybrid-10.0-D-C, X3-Hybrid-10.0-N-C	X3-Hybrid-10.0-D-E, X3-Hybrid-10.0-N-E	X3-Fit-8.0C, X3-Fit-8.0E	X3-Fit-10.0C, X3-Fit-10.0E
<b>Maximum rated capacity</b>	8 kW	10 kW	10 kW	8 kW	10 kW
<b>Rated voltage</b>	230V / 400 N,PE	230V / 400 N,PE	230V / 400 N,PE	230V / 400 N,PE	230V / 400 N,PE
<b>Firmware version</b>	Manager: V1.00 Master DSP: V3.08 Slave DSP: V1.03				
<b>Measurement period:</b>	2018-03-14 to 2018-07-26, 2018-09-19 to 2018-09-27				

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

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on two series-connected relays in line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.



**Figure 1 – Schematic structure of the power generation unit**

The above stated micro-generators are tested according to the requirements in the EN 50438. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the EN 50438.

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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**Type testing of the interface protection**

Over-/under-voltage tests						
Model: X3-Hybrid-10.0-D-E 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*	251,8	0,145 / 480,6*
Over-voltage stage 2	264,5	0,2	264,5	0,2	264,1	0,135
Under-voltage stage 1	195,5	1,5	195,5	1,5	195,5	1,345
Model: X3-Hybrid-10.0-D-E 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*	251,8	0,135 / 479,7*
Over-voltage stage 2	264,5	0,2	264,5	0,2	264,1	0,135
Under-voltage stage 1	195,5	1,5	195,5	1,5	195,5	1,335
Model: X3-Hybrid-10.0-D-E 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*	251,8	0,140 / 481,5*
Over-voltage stage 2	264,5	0,2	264,5	0,2	264,1	0,150
Under-voltage stage 1	195,5	1,5	195,5	1,5	195,5	1,330

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.

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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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]
<b>Over-frequency</b>	52,00	0,5	52,00	0,5	52,00	0,380
<b>Under-frequency</b>	47,50	0,5	47,50	0,5	47,49	0,385

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

LoM test						
Model: X3-Hybrid-10.0-D-E						
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]	685,0	205,0	105,0	670,0	115,0	105,0
Trip time. Phase 2 fuse removed [ms]	685,0	205,0	105,0	670,0	115,0	105,0
Trip time. Phase 3 fuse removed [ms]	685,0	205,0	105,0	670,0	115,0	105,0

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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**Type testing of a micro-generator**

**Operating range**

Model: X3-Hybrid-10.0-D-E

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	195,53	47,5	8808,3	0,9991
2	253,20	51,5	9995,9	0,9989

**Active power at under-frequency**

Model: X3-Hybrid-10.0-D-E

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]:	9,838	9,827	9,818
ΔP/PM [%] per 1 Hz:			0,76

**Power response to over-frequency**

Model: X3-Hybrid-10.0-D-E

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
<b>1. Measurement a) to g): Active power output &gt; 80% P<sub>n</sub></b>							
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]:	9,875	9,589	7,796	6,052	7,816	9,580	9,841
ΔPE60/PM [%]:	N/A	2,11	2,04	1,48	1,84	2,20	N/A
<b>2. Measurement a) to g): Active power output 40% and 60% after freezing &gt; 80% P<sub>n</sub></b>							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	4,90	4,00	3,10	4,00	4,90	N/A
PE60 [kW]:	5,016	4,999	4,074	3,148	4,023	4,928	5,023
ΔPE60/PM [%]:	N/A	1,98	1,48	0,96	0,46	0,56	N/A
Limit ΔP/P <sub>1min</sub> :	+ 10 % of P <sub>M</sub>						

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Reactive power			
Uncontrollable reactive power			
Model: X3-Hybrid-10.0-D-E			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9987i	0,9984i	0,9982i
50% PN	0,9995i	0,9994i	0,9993i
75% PN	0,9996i	0,9995i	0,9994i
100% PN	0,9995i	0,9995i	0,9994i
Limit	>0,95	>0,95	>0,95
Reactive power			
Model: X3-Hybrid-8.0-D-E			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9979i	0,9974i	0,9976i
50% PN	0,9994i	0,9992i	0,9991i
75% PN	0,9996i	0,9995i	0,9994i
100% PN	0,9996i	0,9995i	0,9995i
Limit	>0,95	>0,95	>0,95
Reactive power			
Model: X3-Hybrid-6.0-D-E			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9964i	0,9957i	0,9940i
50% PN	0,9990i	0,9989i	0,9986i
75% PN	0,9995i	0,9993i	0,9992i
100% PN	0,9996i	0,9995i	0,9994i
Limit	>0,95	>0,95	>0,95
Reactive power			
Model: X3-Hybrid-5.0-D-E			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9941i	0,9932i	0,9914i
50% PN	0,9986i	0,9986i	0,9980i
75% PN	0,9993i	0,9991i	0,9990i
100% PN	0,9995i	0,9994i	0,9993i
Limit	>0,95	>0,95	>0,95

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Controllable reactive power				
Inductive (supply reactive power)				
Model: X3-Hybrid-10.0-D-C				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	428,6	-163,6	0,9198	230,0
10% - 20%	1454,9	-637,2	0,9141	230,6
20% - 30%	2484,4	-1127,7	0,9098	230,7
30% - 40%	3511,3	-1624,9	0,9071	230,8
40% - 50%	4531,6	-2123,4	0,9051	230,5
50% - 60%	5551,7	-2625,7	0,9039	230,9
60% - 70%	6568,8	-3124,7	0,9030	230,6
70% - 80%	7581,5	-3623,3	0,9024	230,7
80% - 90%	8589,8	-4121,7	0,9017	230,4
90% - 100%	9595,4	-4617,5	0,9013	230,7
Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	432,9	206,8	0,8032	230,5
10% - 20%	1447,1	746,5	0,8887	230,1
20% - 30%	2478,3	1206,7	0,8993	230,7
30% - 40%	3502,6	1767,7	0,8932	230,2
40% - 50%	4524,9	2262,0	0,8949	230,7
50% - 60%	5544,2	2747,2	0,8964	230,3
60% - 70%	6560,9	3235,2	0,8972	230,8
70% - 80%	7572,5	3722,9	0,8978	230,9
80% - 90%	8578,1	4210,0	0,8980	230,7
90% - 100%	9582,3	4697,6	0,8982	230,4
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%	424,2	166,2	0,9197	230,5
10% - 20%	1451,5	144,1	0,9952	230,1
20% - 30%	2488,5	140,0	0,9984	230,7
30% - 40%	3518,5	156,2	0,9991	230,8
40% - 50%	4543,7	175,5	0,9993	230,7
50% - 60%	5567,1	191,5	0,9994	230,3
60% - 70%	6588,8	212,3	0,9995	230,9
70% - 80%	7607,7	239,2	0,9995	230,9
80% - 90%	8621,9	271,9	0,9995	230,8
90% - 100%	9631,6	307,7	0,9995	230,5

Q adjustment				
Model: X3-Hybrid-10.0-D-C				
	Reactive power set point Q [kVar]	Measured reactive power Q [kVar]	Measured cos φ	Deviation compared to setpoint ΔQ / PN [%]
- Qmin	-4,843	-4,618	0,9013	2,25
0	0	0,308	0,9995	3,08
+ Qmax	4,843	4,698	0,8982	1,45

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Extract from test report according to EN 50438

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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	14,2	246,6	-148,8	≈0(<±2.5%Pn)	1,48
< 20%	1,09Vn	13,9	250,7	-154,2	≈0(<±2.5%Pn)	1,54
< 20%-30%	1,09Vn	23,5	250,9	-2633,9	-0,5 Qmin	2,12
40%	1,09Vn	38,9	251,0	-2633,2	-0,5 Qmin	2,12
50%	1,09Vn	48,84	251,1	-2637,9	-0,5 Qmin	2,16
60%	1,09Vn	58,83	251,2	-2637,4	-0,5 Qmin	2,16
70%	1,09Vn	68,81	251,3	-2640,3	-0,5 Qmin	2,19
80%	1,09Vn	78,75	251,4	-2647,5	-0,5 Qmin	2,25
90%	1,09Vn	88,63	251,5	-2646,4	-0,5 Qmin	2,25
100%	1,09Vn	97,03	250,9	-2651,2	-0,5 Qmin	2,29
100%	1,1Vn	96,73	253,4	-5168,6	-Qmin	3,26
100%-10%	1,1Vn	48,42	253,2	-5157,6	-Qmin	3,15
10%→ ≤5%	1,1Vn	6,08	253,5	-174,3	≈0(<±2.5%Pn)	1,74
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	9,07	213,9	108,9	≈0(<±2.5%Pn)	1,09
< 20%	0,91Vn	9,07	209,8	108,7	≈0(<±2.5%Pn)	1,09
< 20%-30%	0,91Vn	23,68	209,6	2450,9	-0,5 Qmin	0,29
40%	0,91Vn	38,37	209,7	2499,2	-0,5 Qmin	0,28
50%	0,91Vn	48,08	209,8	2450,7	-0,5 Qmin	0,29
60%	0,91Vn	57,81	209,9	2456,4	-0,5 Qmin	0,35
70%	0,91Vn	67,42	209,8	2457,1	-0,5 Qmin	0,36
80%	0,91Vn	77,17	210,0	2461,2	-0,5 Qmin	0,39
90%	0,91Vn	86,81	209,9	2464,8	-0,5 Qmin	0,43
100%	0,91Vn	94,72	210,1	2466,5	-0,5 Qmin	0,45
100%	0,90Vn	92,01	205,8	4975,4	-Qmin	1,32
100%-10%	0,90Vn	76,73	205,7	4974,1	-Qmin	1,31
10%→ ≤5%	0,90Vn	5,10	205,8	180,8	≈0(<±2.5%Pn)	1,81



**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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Connection and starting to generate electrical power		
Model: X3-Hybrid-10.0-D-C		
Test according EN 50438 with standard setting	Min. voltage for connection to grid:	193,2V
	Max. voltage for connection to grid:	255,3V
	Min. frequency for connection to grid:	47,45Hz
	Max. frequency for connection to grid:	50,15Hz
	Observation time ( $\geq 60s$ )	60s
Connection and starting to generate electrical power		
<b>Voltage conditions</b>		
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]	128,0	128,5
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	$\geq 84\% U_n$ for twice of setting observation time	$\leq 111\% U_n$ for twice of setting observation time
Reconnection time [s]	128,0	128,0
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.	
<b>Frequency conditions</b>		
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	$\geq 47,45$ Hz within twice of setting observation time	$\leq 51,15$ Hz within twice of setting observation time
Reconnection time [s]	256,0	123,5
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%Pn/min.	
f) In frequency range after frequency failure	$\geq 47,45$ Hz for twice of setting observation time	$\leq 51,15$ Hz for twice of setting observation time
Reconnection time [s]	128,5	124,0
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					
Model: X3-Hybrid-10.0-D-C 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	15,99V	2,77A
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
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	0,001	In seconds

Short-circuit current contribution					
Short-circuit current parameters					
Model: X3-Hybrid-10.0-D-C 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	178,8V	0,057A
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
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	0,001	In seconds

Short-circuit current contribution					
Short-circuit current parameters					
Model: X3-Hybrid-10.0-D-C 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	225,5V	5,08A
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
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	0,001	In seconds

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Power Quality. Harmonic current emission				
micro-generator		X3-Hybrid-10.0-D-E		
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	14,106	--	Phase 1	-
2nd	0,149	1,057	Phase 1	1,080
3rd	0,400	2,838	Phase 1	2,300
4th	0,021	0,152	Phase 1	0,430
5th	0,086	0,612	Phase 1	1,140
6th	0,007	0,051	Phase 1	0,300
7th	0,027	0,190	Phase 1	0,770
8th	0,007	0,048	Phase 1	0,230
9th	0,019	0,135	Phase 1	0,400
10th	0,006	0,039	Phase 1	0,184
11th	0,022	0,156	Phase 1	0,330
12th	0,005	0,033	Phase 1	0,153
13th	0,017	0,123	Phase 1	0,210
14th	0,004	0,028	Phase 1	0,131
15th	0,014	0,103	Phase 1	0,150
16th	0,004	0,030	Phase 1	0,115
17th	0,013	0,091	Phase 1	0,132
18th	0,004	0,025	Phase 1	0,102
19th	0,011	0,077	Phase 1	0,118
20th	0,003	0,022	Phase 1	0,092
21th	0,011	0,075	Phase 1	0,107
22th	0,004	0,029	Phase 1	0,084
23th	0,009	0,064	Phase 1	0,098
24th	0,003	0,024	Phase 1	0,077
25th	0,008	0,056	Phase 1	0,090
26th	0,003	0,022	Phase 1	0,071
27th	0,007	0,052	Phase 1	0,083
28th	0,003	0,021	Phase 1	0,066
29th	0,007	0,050	Phase 1	0,078
30th	0,003	0,023	Phase 1	0,061
31th	0,006	0,044	Phase 1	0,073
32th	0,003	0,019	Phase 1	0,058
33th	0,007	0,047	Phase 1	0,068
34th	0,003	0,020	Phase 1	0,054
35th	0,006	0,041	Phase 1	0,064
36th	0,003	0,022	Phase 1	0,051
37th	0,005	0,039	Phase 1	0,061
38th	0,003	0,020	Phase 1	0,048
39th	0,006	0,043	Phase 1	0,058
40th	0,003	0,019	Phase 1	0,046

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

Nr. SXP-18MA0125FCSP-R1

Power Quality. Harmonic current emission				
micro-generator		X3-Hybrid-10.0-D-E		
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	14,155	--	Phase 2	-
2nd	0,105	0,742	Phase 2	1,080
3rd	0,404	2,857	Phase 2	2,300
4th	0,022	0,153	Phase 2	0,430
5th	0,079	0,557	Phase 2	1,140
6th	0,009	0,064	Phase 2	0,300
7th	0,033	0,236	Phase 2	0,770
8th	0,007	0,049	Phase 2	0,230
9th	0,021	0,145	Phase 2	0,400
10th	0,005	0,035	Phase 2	0,184
11th	0,024	0,167	Phase 2	0,330
12th	0,006	0,040	Phase 2	0,153
13th	0,017	0,118	Phase 2	0,210
14th	0,005	0,034	Phase 2	0,131
15th	0,014	0,100	Phase 2	0,150
16th	0,004	0,029	Phase 2	0,115
17th	0,013	0,089	Phase 2	0,132
18th	0,004	0,026	Phase 2	0,102
19th	0,011	0,078	Phase 2	0,118
20th	0,003	0,024	Phase 2	0,092
21th	0,010	0,074	Phase 2	0,107
22th	0,004	0,029	Phase 2	0,084
23th	0,009	0,063	Phase 2	0,098
24th	0,003	0,021	Phase 2	0,077
25th	0,008	0,057	Phase 2	0,090
26th	0,003	0,020	Phase 2	0,071
27th	0,008	0,057	Phase 2	0,083
28th	0,002	0,018	Phase 2	0,066
29th	0,007	0,048	Phase 2	0,078
30th	0,002	0,018	Phase 2	0,061
31th	0,006	0,045	Phase 2	0,073
32th	0,002	0,016	Phase 2	0,058
33th	0,007	0,047	Phase 2	0,068
34th	0,002	0,016	Phase 2	0,054
35th	0,006	0,041	Phase 2	0,064
36th	0,002	0,016	Phase 2	0,051
37th	0,005	0,037	Phase 2	0,061
38th	0,002	0,014	Phase 2	0,048
39th	0,006	0,043	Phase 2	0,058
40th	0,002	0,014	Phase 2	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-18MA0125FCSP-R1

Power Quality. Harmonic current emission				
micro-generator		X3-Hybrid-10.0-D-E		
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	14,294	--	Phase 3	-
2nd	0,083	0,577	Phase 3	1,080
3rd	0,408	2,857	Phase 3	2,300
4th	0,015	0,104	Phase 3	0,430
5th	0,081	0,565	Phase 3	1,140
6th	0,006	0,041	Phase 3	0,300
7th	0,030	0,213	Phase 3	0,770
8th	0,007	0,050	Phase 3	0,230
9th	0,018	0,123	Phase 3	0,400
10th	0,004	0,029	Phase 3	0,184
11th	0,020	0,137	Phase 3	0,330
12th	0,003	0,023	Phase 3	0,153
13th	0,020	0,140	Phase 3	0,210
14th	0,003	0,020	Phase 3	0,131
15th	0,007	0,051	Phase 3	0,150
16th	0,003	0,018	Phase 3	0,115
17th	0,015	0,104	Phase 3	0,132
18th	0,003	0,019	Phase 3	0,102
19th	0,008	0,058	Phase 3	0,118
20th	0,003	0,018	Phase 3	0,092
21th	0,011	0,076	Phase 3	0,107
22th	0,003	0,019	Phase 3	0,084
23th	0,007	0,046	Phase 3	0,098
24th	0,003	0,018	Phase 3	0,077
25th	0,009	0,064	Phase 3	0,090
26th	0,001	0,008	Phase 3	0,071
27th	0,006	0,045	Phase 3	0,083
28th	0,001	0,009	Phase 3	0,066
29th	0,007	0,051	Phase 3	0,078
30th	0,002	0,012	Phase 3	0,061
31th	0,006	0,039	Phase 3	0,073
32th	0,001	0,009	Phase 3	0,058
33th	0,008	0,053	Phase 3	0,068
34th	0,002	0,011	Phase 3	0,054
35th	0,005	0,038	Phase 3	0,064
36th	0,002	0,012	Phase 3	0,051
37th	0,006	0,041	Phase 3	0,061
38th	0,001	0,009	Phase 3	0,048
39th	0,006	0,041	Phase 3	0,058
40th	0,002	0,011	Phase 3	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-18MA0125FCSP-R1

Power Quality. Harmonic current emission				
micro-generator		X3-Hybrid-5.0-D-E		
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	7,255	--	Phase 1	-
2nd	0,095	1,313	Phase 1	1,080
3rd	0,176	2,424	Phase 1	2,300
4th	0,014	0,192	Phase 1	0,430
5th	0,027	0,370	Phase 1	1,140
6th	0,006	0,087	Phase 1	0,300
7th	0,025	0,344	Phase 1	0,770
8th	0,006	0,086	Phase 1	0,230
9th	0,014	0,198	Phase 1	0,400
10th	0,006	0,076	Phase 1	0,184
11th	0,014	0,188	Phase 1	0,330
12th	0,005	0,067	Phase 1	0,153
13th	0,012	0,169	Phase 1	0,210
14th	0,004	0,058	Phase 1	0,131
15th	0,010	0,134	Phase 1	0,150
16th	0,005	0,072	Phase 1	0,115
17th	0,009	0,118	Phase 1	0,132
18th	0,005	0,072	Phase 1	0,102
19th	0,008	0,109	Phase 1	0,118
20th	0,004	0,059	Phase 1	0,092
21th	0,006	0,086	Phase 1	0,107
22th	0,004	0,061	Phase 1	0,084
23th	0,005	0,074	Phase 1	0,098
24th	0,004	0,055	Phase 1	0,077
25th	0,006	0,078	Phase 1	0,090
26th	0,004	0,049	Phase 1	0,071
27th	0,005	0,063	Phase 1	0,083
28th	0,004	0,051	Phase 1	0,066
29th	0,003	0,046	Phase 1	0,078
30th	0,004	0,053	Phase 1	0,061
31th	0,003	0,044	Phase 1	0,073
32th	0,004	0,050	Phase 1	0,058
33th	0,003	0,042	Phase 1	0,068
34th	0,003	0,046	Phase 1	0,054
35th	0,002	0,034	Phase 1	0,064
36th	0,004	0,051	Phase 1	0,051
37th	0,002	0,031	Phase 1	0,061
38th	0,003	0,043	Phase 1	0,048
39th	0,002	0,031	Phase 1	0,058
40th	0,003	0,044	Phase 1	0,046

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

Nr. SXP-18MA0125FCSP-R1

Power Quality. Harmonic current emission				
micro-generator		X3-Hybrid-5.0-D-E		
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	7,299	--	Phase 2	-
2nd	0,069	0,949	Phase 2	1,080
3rd	0,189	2,588	Phase 2	2,300
4th	0,016	0,218	Phase 2	0,430
5th	0,028	0,383	Phase 2	1,140
6th	0,008	0,116	Phase 2	0,300
7th	0,024	0,335	Phase 2	0,770
8th	0,007	0,096	Phase 2	0,230
9th	0,016	0,215	Phase 2	0,400
10th	0,005	0,066	Phase 2	0,184
11th	0,014	0,190	Phase 2	0,330
12th	0,005	0,069	Phase 2	0,153
13th	0,011	0,156	Phase 2	0,210
14th	0,004	0,060	Phase 2	0,131
15th	0,010	0,136	Phase 2	0,150
16th	0,005	0,066	Phase 2	0,115
17th	0,009	0,123	Phase 2	0,132
18th	0,005	0,067	Phase 2	0,102
19th	0,008	0,113	Phase 2	0,118
20th	0,004	0,062	Phase 2	0,092
21th	0,006	0,083	Phase 2	0,107
22th	0,004	0,060	Phase 2	0,084
23th	0,006	0,081	Phase 2	0,098
24th	0,004	0,056	Phase 2	0,077
25th	0,006	0,082	Phase 2	0,090
26th	0,004	0,051	Phase 2	0,071
27th	0,005	0,063	Phase 2	0,083
28th	0,003	0,048	Phase 2	0,066
29th	0,004	0,050	Phase 2	0,078
30th	0,004	0,055	Phase 2	0,061
31th	0,003	0,045	Phase 2	0,073
32th	0,004	0,049	Phase 2	0,058
33th	0,003	0,046	Phase 2	0,068
34th	0,003	0,046	Phase 2	0,054
35th	0,003	0,035	Phase 2	0,064
36th	0,004	0,051	Phase 2	0,051
37th	0,002	0,031	Phase 2	0,061
38th	0,003	0,045	Phase 2	0,048
39th	0,002	0,032	Phase 2	0,058
40th	0,003	0,046	Phase 2	0,046

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

Nr. SXP-18MA0125FCSP-R1

Power Quality. Harmonic current emission				
micro-generator		X3-Hybrid-5.0-D-E		
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	7,369	--	Phase 3	-
2nd	0,061	0,830	Phase 3	1,080
3rd	0,184	2,501	Phase 3	2,300
4th	0,014	0,189	Phase 3	0,430
5th	0,034	0,464	Phase 3	1,140
6th	0,005	0,072	Phase 3	0,300
7th	0,023	0,308	Phase 3	0,770
8th	0,009	0,127	Phase 3	0,230
9th	0,024	0,332	Phase 3	0,400
10th	0,004	0,050	Phase 3	0,184
11th	0,013	0,173	Phase 3	0,330
12th	0,005	0,068	Phase 3	0,153
13th	0,016	0,214	Phase 3	0,210
14th	0,005	0,068	Phase 3	0,131
15th	0,012	0,169	Phase 3	0,150
16th	0,003	0,045	Phase 3	0,115
17th	0,012	0,163	Phase 3	0,132
18th	0,005	0,066	Phase 3	0,102
19th	0,008	0,107	Phase 3	0,118
20th	0,003	0,043	Phase 3	0,092
21th	0,008	0,112	Phase 3	0,107
22th	0,004	0,050	Phase 3	0,084
23th	0,006	0,083	Phase 3	0,098
24th	0,003	0,045	Phase 3	0,077
25th	0,007	0,096	Phase 3	0,090
26th	0,003	0,039	Phase 3	0,071
27th	0,005	0,064	Phase 3	0,083
28th	0,003	0,039	Phase 3	0,066
29th	0,005	0,070	Phase 3	0,078
30th	0,003	0,037	Phase 3	0,061
31th	0,003	0,045	Phase 3	0,073
32th	0,002	0,032	Phase 3	0,058
33th	0,004	0,053	Phase 3	0,068
34th	0,002	0,033	Phase 3	0,054
35th	0,003	0,039	Phase 3	0,064
36th	0,002	0,033	Phase 3	0,051
37th	0,003	0,036	Phase 3	0,061
38th	0,002	0,033	Phase 3	0,048
39th	0,002	0,033	Phase 3	0,058
40th	0,002	0,026	Phase 3	0,046



**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

Nr. SXP-18MA0125FCSP-R1

Voltage fluctuation and Flicker.					
<b>X3-Hybrid-10.0-D-C Phase 1</b>	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
<b>Value</b>	<b>Pst</b>	<b>Plt 2 hours</b>	<b>d(t)<sub>500ms</sub></b>	<b>dc</b>	<b>dmax</b>
<b>Limit</b>	1,0	0,65	3,3%	3,3%	4%
<b>Test value</b>	0,08	0,08	0,00%	0,20%	0,21%
<b>X3-Hybrid-10.0-D-C Phase 2</b>	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
<b>Value</b>	<b>Pst</b>	<b>Plt 2 hours</b>	<b>d(t)<sub>500ms</sub></b>	<b>dc</b>	<b>dmax</b>
<b>Limit</b>	1,0	0,65	3,3%	3,3%	4%
<b>Test value</b>	0,18	0,10	0,00%	0,26%	0,29%
<b>X3-Hybrid-10.0-D-C Phase 3</b>	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
<b>Value</b>	<b>Pst</b>	<b>Plt 2 hours</b>	<b>d(t)<sub>500ms</sub></b>	<b>dc</b>	<b>dmax</b>
<b>Limit</b>	1,0	0,65	3,3%	3,3%	4%
<b>Test value</b>	0,09	0,08	0,00%	0,29%	0,35%

DC-Injection.				
<b>Model: X3-Hybrid-10.0-D-E</b>				
<b>Protection limit</b>	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (72,5mA)			
<b>Output power</b>	<b>~20%</b>	<b>~50%</b>	<b>75%</b>	<b>~100%</b>
<b>Max. test value (phase L1) [mA]</b>	42,8	39,0	46,3	6,7
<b>Max. test value (phase L2) [mA]</b>	20,2	20,8	34,9	34,4
<b>Max. test value (phase L3) [mA]</b>	13,0	13,2	26,6	32,8
<b>Model: X3-Hybrid-8.0-D-E</b>				
<b>Protection limit</b>	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (58,0mA)			
<b>Output power</b>	<b>~20%</b>	<b>~50%</b>	<b>75%</b>	<b>~100%</b>
<b>Max. test value (phase L1) [mA]</b>	38,1	38,4	45,3	48,7
<b>Max. test value (phase L2) [mA]</b>	19,9	22,9	26,0	34,6
<b>Max. test value (phase L3) [mA]</b>	15,2	13,0	20,6	30,5
<b>Model: X3-Hybrid-6.0-D-E</b>				
<b>Protection limit</b>	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (43,5mA)			
<b>Output power</b>	<b>~20%</b>	<b>~50%</b>	<b>75%</b>	<b>~100%</b>
<b>Max. test value (phase L1) [mA]</b>	42,5	43,0	38,2	18,7
<b>Max. test value (phase L2) [mA]</b>	42,3	29,2	36,2	40,2
<b>Max. test value (phase L3) [mA]</b>	40,1	34,5	26,4	30,9
<b>Model: X3-Hybrid-5.0-D-E</b>				
<b>Protection limit</b>	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (36,2mA)			
<b>Output power</b>	<b>~20%</b>	<b>~50%</b>	<b>75%</b>	<b>~100%</b>
<b>Max. test value (phase L1) [mA]</b>	23,4	35,6	35,9	24,5
<b>Max. test value (phase L2) [mA]</b>	21,6	24,5	26,4	31,5
<b>Max. test value (phase L3) [mA]</b>	35,9	35,6	23,2	15,4