Verklaring van geen bezwaar

Aanvrager:	**SolaX power Co.,Ltd.** No. 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing District 311500, Tonglu City, Zhejiang Province **China**
Product:	**Fotovoltaïsche Omvormers**
Model:	**X1-1.1-S-D, X1-1.1-S-N,** **X1-1.5-S-D, X1-1.5-S-N,** **X1-2.0-S-D, X1-2.0-S-N,** **X1-2.5-S-D, X1-2.5-S-N,** **X1-3.0-S-D, X1-3.0-S-N,** **X1-3.3-S-D, X1-3.3-S-N**

Reglementair voorgeschreven gebruik:

Automatisch schakelstation met enkelfasige 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 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 netparallelle zelfopwekinstallatie en het openbare laagspanningsnet

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:	**SXP-16JA0324FTSP**
Certificaatnummer:	**U16-0443**
Datum:	**2016-08-03**

Certificatie-instelling

Dieter Zitzmann

DAkkS Deutsche Akkreditierungsstelle D-ZE-12024-01-00

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	**Nr. SXP-16JA0324FTSP**

Type Approval and declaration of compliance with the requirements of EN 50438.			
Manufacturer / applicant:	SolaX power Co.,Ltd. No. 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing District 311500, Tonglu City, Zhejiang Province China		
Micro-generator Type	Grid-tied photovoltaic inverter		
Rated values	X1-1.1-S-D, X1-1.1-S-N	X1-1.5-S-D, X1-1.5-S-N	X1-2.0-S-D, X1-2.0-S-N
Maximum rated capacity	1100 VA	1500 VA	2000 VA
Rated voltage	220/230/240 Vac, 50/60Hz		
Rated values	X1-2.5-S-D, X1-2.5-S-N	X1-3.0-S-D, X1-3.0-S-N	X1-3.3-S-D, X1-3.3-S-N
Maximum rated capacity	2500 VA	3000 VA	3300 VA
Rated voltage	220/230/240 Vac, 50/60Hz		
Firmware version	V 3.08		
* The tests were performed with Firmwareversion 0-00. Changes in the Firmwareversion on position 0-0x has no effect on the required electrical properties. x = could be any number or sign			
Measurement period:	2016-03-01 to 2016-06-15		

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 (HF/LF transformer). 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.

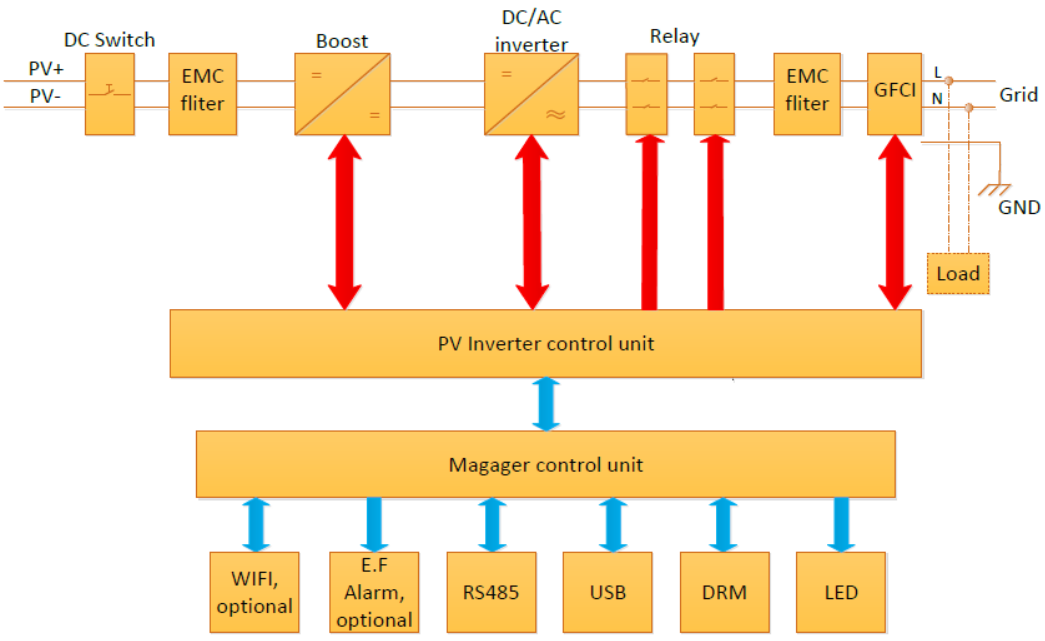


Figure 1 – Schematic structure of the power generation unit

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 **Nr. SXP-16JA0324FTSP**

Type testing of the interface protection

Over-/under-voltage tests						
X1-2.0-S-D						
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	253,2	1,642
Under-voltage stage 1	184,0	2,0	184,0	2,0	182,6	1,650
X1-3.3-S-D						
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	251,5	1,648
Under-voltage stage 1	184,0	2,0	184,0	2,0	182,1	1,658

Over-/under-frequency tests						
X1-2.0-S-D						
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	51,00	1,349
Under-frequency	48,00	2,0	48,00	2,0	48,01	1,352
X1-3.3-S-D						
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	51,00	1,340
Under-frequency	48,00	2,0	48,00	2,0	48,01	1,340

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

LoM test						
X1-2.0-S-D						
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	244,7ms	276,7ms	300,7ms	180,7ms	168,7ms	228,7ms
X1-3.3-S-D						
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	209,0ms	207,5ms	198,0ms	170,0ms	135,5ms	158,0ms

Type testing of a micro-generator

Operating range

X1-2.0-S-D

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	195,4	47,5	1,998	0,998
2	253,1	51,5	1,996	0,998

X1-3.3-S-D

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	195,6	47,5	2,971	0,999
2	253,1	51,5	3,285	0,999

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Active power at under-frequency			
X1-2.0-S-D			
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	49,50	47,55
Active power [kW]:	1,985	1,979	1,977
ΔP/PM [%] per 1 Hz:			0
X1-3.3-S-D			
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	49,50	47,55
Active power [kW]:	3,266	3,207	3,199
ΔP/PM [%] per 1 Hz:			2,03

Power response to over-frequency							
X1-2.0-S-D							
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% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	1,960	1,600	1,240	1,600	1,960	N/A
PE60 [kW]:	2,018	1,971	1,563	1,219	1,564	1,910	2,008
ΔPE60/PM [%]:	N/A	+0,56	-2,31	-1,69	-2,25	-2,55	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	50,15	50,70	50,25	50,00
PM [kW]:	N/A	0,980	0,800	0,620	0,800	0,980	N/A
PE60 [kW]:	1,013	0,950	0,806	0,633	0,779	0,952	1,013
ΔPE60/PM [%]:	N/A	-3,00	+0,60	+1,30	-0,10	-2,8	N/A
Limit ΔP/P1min:	+ 10 % of P_M						
X1-3.3-S-D							
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% Pn							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [kW]:	N/A	3,234	2,640	2,046	2,640	3,234	N/A
PE60 [kW]:	3,214	3,145	2,551	1,961	2,541	3,145	3,214
ΔPE60/PM [%]:	N/A	-2,69	-2,70	-2,58	-3,00	-2,70	N/A
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% Pn							
Frequency [Hz]:	50,00	50,25	50,70	50,15	50,70	50,25	50,00
PM [kW]:	N/A	1,617	1,320	1,023	1,320	1,617	N/A
PE60 [kW]:	1,623	1,558	1,295	1,003	1,285	1,524	1,623
ΔPE60/PM [%]:	N/A	-3,58	+1,52	+1,21	-2,12	-5,64	N/A
Limit ΔP/P1min:	+ 10 % of P_M						

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Reactive power			
Uncontrollable reactive power			
X1-1.1-S-D			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,9764	0,9762	0,9764
50% PN	0,9953	0,9944	0,9942
75% PN	0,9971	0,9973	0,9970
100% PN	0,9983	0,9980	0,9985
Limit	**>0,95**	**>0,95**	**>0,95**
X1-1.5-S-D			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,9897	0,9896	0,9897
50% PN	0,9973	0,9972	0,9973
75% PN	0,9985	0,9980	0,9986
100% PN	0,9989	0,9988	0,9984
Limit	**>0,95**	**>0,95**	**>0,95**
X1-2.0-S-D			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,9939	0,9928	0,9920
50% PN	0,9979	0,9976	0,9976
75% PN	0,9986	0,9982	0,9986
100% PN	0,9987	0,9984	0,9988
Limit	**>0,95**	**>0,95**	**>0,95**
X1-2.5-S-D			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,9961	0,9962	0,9964
50% PN	0,9989	0,9984	0,9979
75% PN	0,9991	0,9993	0,9989
100% PN	0,9993	0,9998	0,9990
Limit	**>0,95**	**>0,95**	**>0,95**
X1-3.0-S-D			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,9899	0,9990	0,9897
50% PN	0,9989	0,9992	0,9993
75% PN	0,9989	0,9998	0,9989
100% PN	0,9992	0,9998	0,9998
Limit	**>0,95**	**>0,95**	**>0,95**
X1-3.3-S-D			
Test Voltage / Output power	**211,6V**	**230V**	**248,4V**
25% PN	0,9981	0,9981	0,9975
50% PN	0,9996	0,9995	0,9994
75% PN	0,9998	0,9998	0,9997
100% PN	0,9998	0,9998	0,9998
Limit	**>0,95**	**>0,95**	**>0,95**

Appendix E Type Verification Test Report

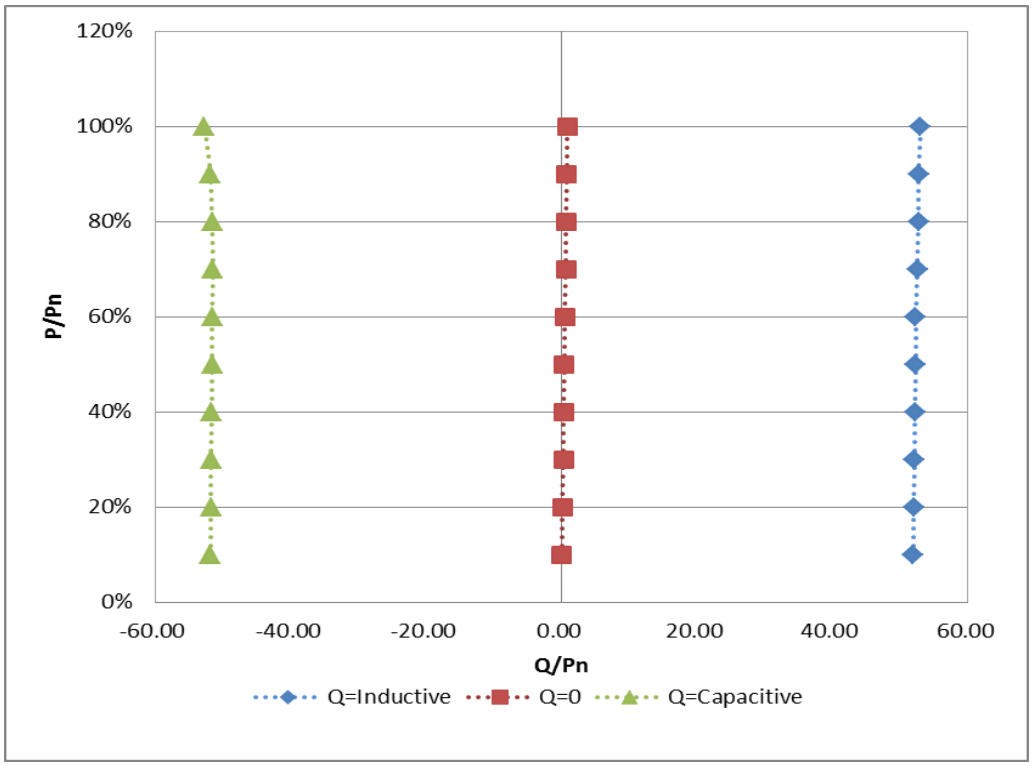
Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Controllable reactive power				
X1-2.0-S-D				
Inductive (supply reactive power)				
Power-BIN	**Active power [kW]**	**Reactive power [kVar]**	**Power factor (cos φ)**	**AC voltage [V]**
0% - 10%	0,176	-1,038	0,167	230,16
10% - 20%	0,383	-1,037	0,346	230,09
20% - 30%	0,594	-1,036	0,497	230,35
30% - 40%	0,793	-1,034	0,609	230,09
40% - 50%	0,997	-1,033	0,694	230,39
50% - 60%	1,208	-1,033	0,760	230,42
60% - 70%	1,403	-1,031	0,806	230,57
70% - 80%	1,595	-1,033	0,840	230,61
80% - 90%	1,805	-1,038	0,867	230,77
90% - 100%	1,934	-1,056	0,878	230,85
Capacitive (supply reactive power)				
Power-BIN	**Active power [W]**	**Reactive power [Var]**	**Power factor (cos φ)**	**AC voltage [V]**
0% - 10%	0,179	1,039	0,169	230,01
10% - 20%	0,390	1,040	0,351	230,28
20% - 30%	0,596	1,042	0,496	230,37
30% - 40%	0,804	1,045	0,610	230,24
40% - 50%	1,006	1,046	0,693	230,48
50% - 60%	1,206	1,047	0,755	230,31
60% - 70%	1,411	1,052	0,802	230,73
70% - 80%	1,593	1,054	0,834	230,51
80% - 90%	1,806	1,055	0,863	230,57
90% - 100%	2,009	1,061	0,884	230,87
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%	0,194	0,000	0,999	230,02
10% - 20%	0,400	0,003	0,999	230,12
20% - 30%	0,604	0,005	0,999	230,24
30% - 40%	0,809	0,006	0,999	230,35
40% - 50%	1,010	0,008	0,999	230,32
50% - 60%	1,216	0,010	0,999	230,39
60% - 70%	1,419	0,013	0,999	230,52
70% - 80%	1,618	0,014	0,999	230,71
80% - 90%	1,820	0,016	0,999	230,82
90% - 100%	2,016	0,017	0,999	230,92

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Diagram of inductive reactive power absorption



Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Controllable reactive power

X1-3.3-S-D

Inductive (supply reactive power)

Power-BIN	Active power [kW]	Reactive power [kVar]	Power factor (cos φ)	AC voltage [V]
0% - 10%	0,292	-1,680	0,171	229,75
10% - 20%	0,628	-1,676	0,351	229,79
20% - 30%	0,961	-1,672	0,498	229,95
30% - 40%	1,294	-1,669	0,613	230,11
40% - 50%	1,625	-1,665	0,699	230,25
50% - 60%	1,955	-1,663	0,762	230,40
60% - 70%	2,288	-1,658	0,810	230,54
70% - 80%	2,610	-1,655	0,845	230,69
80% - 90%	2,927	-1,653	0,871	230,84
90% - 100%	3,202	-1,655	0,873	231,02

Capacitive (supply reactive power)

Power-BIN	Active power [kW]	Reactive power [kVar]	Power factor (cos φ)	AC voltage [V]
0% - 10%	0,296	1,667	0,175	229,83
10% - 20%	0,635	1,670	0,355	229,88
20% - 30%	0,971	1,673	0,502	230,06
30% - 40%	1,300	1,677	0,613	230,21
40% - 50%	1,629	1,680	0,696	230,41
50% - 60%	1,961	1,684	0,759	230,57
60% - 70%	2,283	1,686	0,804	230,70
70% - 80%	2,616	1,684	0,805	230,86
80% - 90%	2,910	1,685	0,805	230,86
90% - 100%	3,217	1,685	0,876	230,86

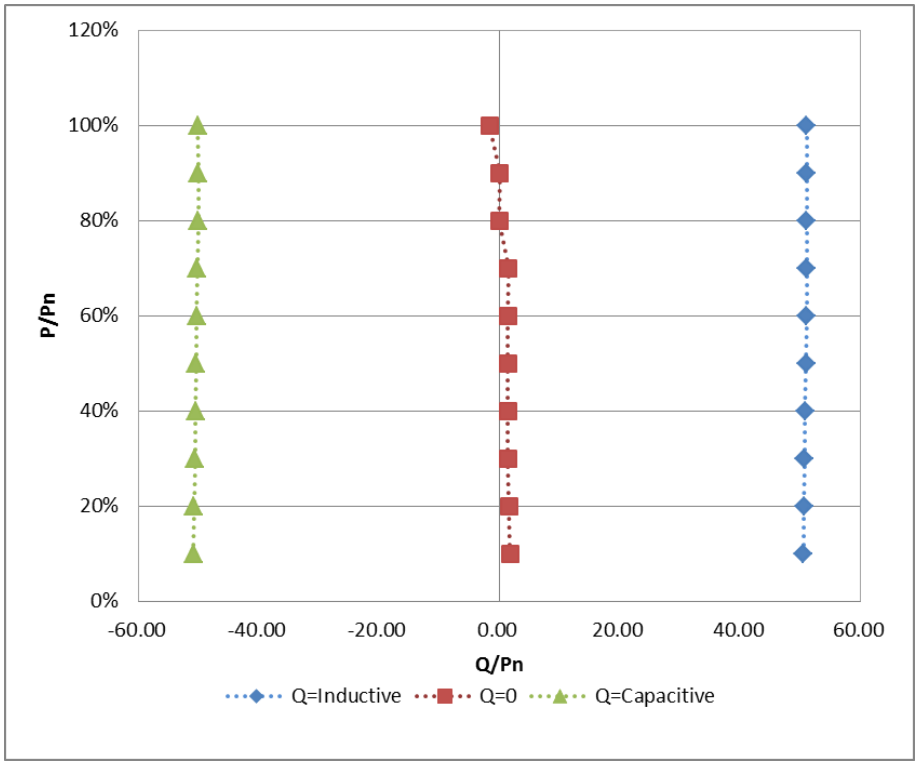
Reactive power supply with set point Q=0

Power-BIN	Active power [kW]	Reactive power [kVar]	Power factor (cos φ)	AC voltage [V]
0% - 10%	0,316	0,056	0,985	229,85
10% - 20%	0,652	0,050	0,997	230,04
20% - 30%	0,985	0,047	0,999	230,02
30% - 40%	1,319	0,046	0,999	230,19
40% - 50%	1,642	0,044	0,999	230,33
50% - 60%	1,962	0,046	0,999	230,48
60% - 70%	2,325	0,049	0,999	230,60
70% - 80%	2,660	-0,001	0,999	231,06
80% - 90%	2,941	0,001	0,999	231,27
90% - 100%	3,194	-0,054	0,999	231,09

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Diagram of inductive reactive power absorption



Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Q adjustment				
X1-2.0-S-D				
100%Pn				
	Reactive power set point Q [kVar]	**Measured reactive power Q [kVar]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-1,000	-1,059	0,879	2,95
0	0	0,017	1,000	0,85
+ Qmax	1,000	1,061	0,884	3,05
50%Pn				
	Reactive power set point Q [kVar]	**Measured reactive power Q [kVar]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-1,000	-1,014	0,703	0,70
0	0	0,009	1,000	0,45
+ Qmax	1,000	1,026	0,699	1,30
X1-3.0-S-D				
100%Pn				
	Reactive power set point Q [kVar]	**Measured reactive power Q [kVar]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-1,650	-1,657	0,873	0,21
0	0	-0,055	0,999	1,67
+ Qmax	1,650	1,684	0,877	1,03
50%Pn				
	Reactive power set point Q [kVar]	**Measured reactive power Q [kVar]**	**Measured cos φ**	**Deviation compared to setpoint ΔQ / PN [%]**
- Qmin	-1,650	1,664	0,704	0,42
0	0	0,043	1,000	1,30
+ Qmax	1,650	1,680	0,702	0,91

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Connection and starting to generate electrical power			
X1-2.0-S-D			
Test according to EN 50438 with setting	**Min. voltage for connection to grid:**	195,5	
	Max. voltage for connection to grid:	253,0	
	Min. frequency for connection to grid:	48,0	
	Max. frequency for connection to grid:	50,15	
	Observation time (≥60s)	60	
Test			
	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]	80	80	
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]	81	80	
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	**<47,95 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	**≥47,95 Hz within twice of setting observation time**	**≤50,15 Hz within twice of setting observation time**	
Reconnection time [s]	80	81	
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.		

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

f) In frequency range after frequency failure	**≥47,95 Hz for twice of setting observation time**	**≤50,15 Hz for twice of setting observation time**
Reconnection time [s]	80	82
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.	

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Connection and starting to generate electrical power			
X1-3.3-S-D			
Test according to EN 50438 with setting	**Min. voltage for connection to grid:**	195,5	
	Max. voltage for connection to grid:	253,0	
	Min. frequency for connection to grid:	48,0	
	Max. frequency for connection to grid:	50,15	
	Observation time (≥60s)	60	
Test			
	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]	86	83	
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]	85	86	
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	**<47,95 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	**≥47,95 Hz within twice of setting observation time**	**≤50,15 Hz within twice of setting observation time**	
Reconnection time [s]	85	80	
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.		

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

f) In frequency range after frequency failure	**≥47,95 Hz for twice of setting observation time**	**≤50,15 Hz for twice of setting observation time**
Reconnection time [s]	85	78
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.	

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Short-circuit current contribution					
Short-circuit current parameters					
X1-2.0-S-D					
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	159	3,02
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**	8,7ms	In seconds
X1-3.3-S-D					
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	165	9,81
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**	0,38ms	In seconds

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Power Quality. Harmonic current emission				
micro-generator		X1-1.1-S-D		
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	4,380	--	Phase 1	-
2nd	0,028	0,639	Phase 1	1,080
3rd	0,026	0,595	Phase 1	2,300
4th	0,003	0,068	Phase 1	0,430
5th	0,012	0,269	Phase 1	1,140
6th	0,001	0,030	Phase 1	0,300
7th	0,012	0,282	Phase 1	0,770
8th	0,001	0,026	Phase 1	0,230
9th	0,012	0,279	Phase 1	0,400
10th	0,001	0,024	Phase 1	0,184
11th	0,009	0,214	Phase 1	0,330
12th	0,002	0,036	Phase 1	0,153
13th	0,010	0,223	Phase 1	0,210
14th	0,001	0,020	Phase 1	0,131
15th	0,010	0,230	Phase 1	0,150
16th	0,001	0,023	Phase 1	0,115
17th	0,012	0,273	Phase 1	0,132
18th	0,002	0,036	Phase 1	0,102
19th	0,011	0,254	Phase 1	0,118
20th	0,001	0,022	Phase 1	0,092
21th	0,010	0,238	Phase 1	0,107
22th	0,001	0,023	Phase 1	0,084
23th	0,008	0,176	Phase 1	0,098
24th	0,001	0,028	Phase 1	0,077
25th	0,008	0,192	Phase 1	0,090
26th	0,001	0,019	Phase 1	0,071
27th	0,006	0,140	Phase 1	0,083
28th	0,000	0,011	Phase 1	0,066
29th	0,005	0,121	Phase 1	0,078
30th	0,000	0,008	Phase 1	0,061
31th	0,005	0,108	Phase 1	0,073
32th	0,000	0,007	Phase 1	0,058
33th	0,004	0,087	Phase 1	0,068
34th	0,000	0,009	Phase 1	0,054
35th	0,004	0,088	Phase 1	0,064
36th	0,000	0,007	Phase 1	0,051
37th	0,003	0,071	Phase 1	0,061
38th	0,000	0,011	Phase 1	0,048
39th	0,003	0,064	Phase 1	0,058
40th	0,001	0,014	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Power Quality. Harmonic current emission				
micro-generator		X1-1.5-S-D		
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	6,482	--	Phase 1	-
2nd	0,037	0,574	Phase 1	1,080
3rd	0,053	0,814	Phase 1	2,300
4th	0,005	0,070	Phase 1	0,430
5th	0,020	0,311	Phase 1	1,140
6th	0,001	0,021	Phase 1	0,300
7th	0,011	0,165	Phase 1	0,770
8th	0,001	0,016	Phase 1	0,230
9th	0,007	0,110	Phase 1	0,400
10th	0,001	0,014	Phase 1	0,184
11th	0,005	0,078	Phase 1	0,330
12th	0,002	0,025	Phase 1	0,153
13th	0,006	0,096	Phase 1	0,210
14th	0,001	0,012	Phase 1	0,131
15th	0,008	0,127	Phase 1	0,150
16th	0,001	0,011	Phase 1	0,115
17th	0,007	0,113	Phase 1	0,132
18th	0,002	0,034	Phase 1	0,102
19th	0,006	0,100	Phase 1	0,118
20th	0,001	0,016	Phase 1	0,092
21th	0,006	0,089	Phase 1	0,107
22th	0,002	0,028	Phase 1	0,084
23th	0,008	0,122	Phase 1	0,098
24th	0,001	0,022	Phase 1	0,077
25th	0,005	0,074	Phase 1	0,090
26th	0,002	0,023	Phase 1	0,071
27th	0,003	0,051	Phase 1	0,083
28th	0,001	0,012	Phase 1	0,066
29th	0,004	0,065	Phase 1	0,078
30th	0,001	0,009	Phase 1	0,061
31th	0,002	0,038	Phase 1	0,073
32th	0,000	0,007	Phase 1	0,058
33th	0,003	0,049	Phase 1	0,068
34th	0,000	0,007	Phase 1	0,054
35th	0,002	0,036	Phase 1	0,064
36th	0,001	0,011	Phase 1	0,051
37th	0,003	0,043	Phase 1	0,061
38th	0,001	0,009	Phase 1	0,048
39th	0,001	0,021	Phase 1	0,058
40th	0,001	0,014	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Power Quality. Harmonic current emission				
micro-generator		X1-2.0-S-D		
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	8,156	--	Phase 1	-
2nd	0,117	1,430	Phase 1	1,080
3rd	0,119	1,463	Phase 1	2,300
4th	0,009	0,112	Phase 1	0,430
5th	0,029	0,353	Phase 1	1,140
6th	0,002	0,025	Phase 1	0,300
7th	0,018	0,217	Phase 1	0,770
8th	0,003	0,031	Phase 1	0,230
9th	0,009	0,107	Phase 1	0,400
10th	0,003	0,032	Phase 1	0,184
11th	0,008	0,094	Phase 1	0,330
12th	0,003	0,034	Phase 1	0,153
13th	0,008	0,097	Phase 1	0,210
14th	0,003	0,031	Phase 1	0,131
15th	0,012	0,153	Phase 1	0,150
16th	0,002	0,021	Phase 1	0,115
17th	0,009	0,113	Phase 1	0,132
18th	0,004	0,044	Phase 1	0,102
19th	0,012	0,151	Phase 1	0,118
20th	0,002	0,030	Phase 1	0,092
21th	0,009	0,107	Phase 1	0,107
22th	0,003	0,042	Phase 1	0,084
23th	0,005	0,067	Phase 1	0,098
24th	0,002	0,024	Phase 1	0,077
25th	0,004	0,048	Phase 1	0,090
26th	0,002	0,024	Phase 1	0,071
27th	0,004	0,048	Phase 1	0,083
28th	0,002	0,030	Phase 1	0,066
29th	0,004	0,048	Phase 1	0,078
30th	0,001	0,010	Phase 1	0,061
31th	0,003	0,040	Phase 1	0,073
32th	0,001	0,015	Phase 1	0,058
33th	0,003	0,043	Phase 1	0,068
34th	0,001	0,011	Phase 1	0,054
35th	0,002	0,026	Phase 1	0,064
36th	0,001	0,013	Phase 1	0,051
37th	0,003	0,033	Phase 1	0,061
38th	0,001	0,015	Phase 1	0,048
39th	0,002	0,022	Phase 1	0,058
40th	0,002	0,020	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Power Quality. Harmonic current emission				
micro-generator		X1-2.5-S-D		
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	10,707	--	Phase 1	-
2nd	0,006	0,055	Phase 1	1,080
3rd	0,019	0,178	Phase 1	2,300
4th	0,003	0,025	Phase 1	0,430
5th	0,014	0,131	Phase 1	1,140
6th	0,001	0,009	Phase 1	0,300
7th	0,007	0,062	Phase 1	0,770
8th	0,002	0,015	Phase 1	0,230
9th	0,003	0,028	Phase 1	0,400
10th	0,001	0,013	Phase 1	0,184
11th	0,001	0,009	Phase 1	0,330
12th	0,002	0,018	Phase 1	0,153
13th	0,005	0,045	Phase 1	0,210
14th	0,001	0,010	Phase 1	0,131
15th	0,007	0,062	Phase 1	0,150
16th	0,001	0,013	Phase 1	0,115
17th	0,010	0,098	Phase 1	0,132
18th	0,003	0,027	Phase 1	0,102
19th	0,004	0,035	Phase 1	0,118
20th	0,001	0,012	Phase 1	0,092
21th	0,004	0,039	Phase 1	0,107
22th	0,002	0,021	Phase 1	0,084
23th	0,006	0,053	Phase 1	0,098
24th	0,001	0,013	Phase 1	0,077
25th	0,004	0,040	Phase 1	0,090
26th	0,002	0,020	Phase 1	0,071
27th	0,004	0,039	Phase 1	0,083
28th	0,002	0,023	Phase 1	0,066
29th	0,005	0,047	Phase 1	0,078
30th	0,003	0,025	Phase 1	0,061
31th	0,004	0,036	Phase 1	0,073
32th	0,001	0,011	Phase 1	0,058
33th	0,004	0,042	Phase 1	0,068
34th	0,001	0,011	Phase 1	0,054
35th	0,003	0,031	Phase 1	0,064
36th	0,001	0,009	Phase 1	0,051
37th	0,004	0,038	Phase 1	0,061
38th	0,001	0,009	Phase 1	0,048
39th	0,003	0,030	Phase 1	0,058
40th	0,001	0,009	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Power Quality. Harmonic current emission				
micro-generator		X1-3.0-S-D		
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	12,838	--	Phase 1	-
2nd	0,007	0,051	Phase 1	1,080
3rd	0,028	0,218	Phase 1	2,300
4th	0,006	0,043	Phase 1	0,430
5th	0,019	0,146	Phase 1	1,140
6th	0,001	0,011	Phase 1	0,300
7th	0,006	0,048	Phase 1	0,770
8th	0,002	0,015	Phase 1	0,230
9th	0,001	0,010	Phase 1	0,400
10th	0,002	0,014	Phase 1	0,184
11th	0,004	0,029	Phase 1	0,330
12th	0,002	0,016	Phase 1	0,153
13th	0,003	0,025	Phase 1	0,210
14th	0,001	0,009	Phase 1	0,131
15th	0,002	0,018	Phase 1	0,150
16th	0,001	0,010	Phase 1	0,115
17th	0,005	0,042	Phase 1	0,132
18th	0,002	0,017	Phase 1	0,102
19th	0,006	0,048	Phase 1	0,118
20th	0,001	0,010	Phase 1	0,092
21th	0,006	0,047	Phase 1	0,107
22th	0,002	0,019	Phase 1	0,084
23th	0,007	0,057	Phase 1	0,098
24th	0,002	0,012	Phase 1	0,077
25th	0,006	0,044	Phase 1	0,090
26th	0,002	0,017	Phase 1	0,071
27th	0,006	0,043	Phase 1	0,083
28th	0,004	0,029	Phase 1	0,066
29th	0,006	0,044	Phase 1	0,078
30th	0,003	0,020	Phase 1	0,061
31th	0,005	0,040	Phase 1	0,073
32th	0,002	0,013	Phase 1	0,058
33th	0,005	0,039	Phase 1	0,068
34th	0,002	0,013	Phase 1	0,054
35th	0,003	0,027	Phase 1	0,064
36th	0,001	0,011	Phase 1	0,051
37th	0,005	0,036	Phase 1	0,061
38th	0,001	0,010	Phase 1	0,048
39th	0,003	0,027	Phase 1	0,058
40th	0,001	0,010	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Power Quality. Harmonic current emission				
micro-generator		X1-3.3-S-D		
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	13,883	--	Phase 1	-
2nd	0,006	0,046	Phase 1	1,080
3rd	0,040	0,288	Phase 1	2,300
4th	0,007	0,051	Phase 1	0,430
5th	0,017	0,123	Phase 1	1,140
6th	0,001	0,010	Phase 1	0,300
7th	0,005	0,034	Phase 1	0,770
8th	0,002	0,016	Phase 1	0,230
9th	0,001	0,009	Phase 1	0,400
10th	0,002	0,014	Phase 1	0,184
11th	0,004	0,031	Phase 1	0,330
12th	0,002	0,013	Phase 1	0,153
13th	0,004	0,030	Phase 1	0,210
14th	0,001	0,008	Phase 1	0,131
15th	0,004	0,026	Phase 1	0,150
16th	0,001	0,010	Phase 1	0,115
17th	0,006	0,043	Phase 1	0,132
18th	0,002	0,018	Phase 1	0,102
19th	0,006	0,046	Phase 1	0,118
20th	0,001	0,009	Phase 1	0,092
21th	0,007	0,053	Phase 1	0,107
22th	0,002	0,014	Phase 1	0,084
23th	0,008	0,059	Phase 1	0,098
24th	0,002	0,012	Phase 1	0,077
25th	0,007	0,051	Phase 1	0,090
26th	0,002	0,014	Phase 1	0,071
27th	0,007	0,049	Phase 1	0,083
28th	0,005	0,035	Phase 1	0,066
29th	0,005	0,036	Phase 1	0,078
30th	0,002	0,017	Phase 1	0,061
31th	0,006	0,047	Phase 1	0,073
32th	0,002	0,014	Phase 1	0,058
33th	0,006	0,042	Phase 1	0,068
34th	0,003	0,023	Phase 1	0,054
35th	0,006	0,043	Phase 1	0,064
36th	0,004	0,025	Phase 1	0,051
37th	0,004	0,029	Phase 1	0,061
38th	0,003	0,019	Phase 1	0,048
39th	0,004	0,030	Phase 1	0,058
40th	0,001	0,010	Phase 1	0,046

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Voltage fluctuation and Flicker.					
X1-2.0-S-D	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	**Pst**	**Plt 2 hours**	**d(t) 500ms**	**dc**	**dmax**
Limit	1,0	0,65	3,3%	3,3%	4%

X1-2.0-S-D

Date : Apr. 12, 2016
Comment :
Regulation : IEC61000-3-3 Ed1.1
Model : YOKOGAWA WT3000

Element : 1
Volt. Range : 600.00V
Un U1 : 231.24V
Set Freq : 50Hz
Frequency U1 : 50.000Hz
Interval : 10m0s

<Limit>
dc : 3.30%
dmax : 4.00%
d(t) : 500ms 3.30%
Pst : 1.00
Plt : 0.65 N: 12
<Result>
Element Judgement: **Pass**

Total Judgement: **Pass**

(Element 1)

Data List

No.	dc[%]		dmax[%]		d(t)[ms]		Pst	
1	0.43	Pass	0.48	Pass	0	Pass	0.08	Pass
2	0.36	Pass	0.41	Pass	0	Pass	0.08	Pass
3	0.36	Pass	0.38	Pass	0	Pass	0.08	Pass
4	0.27	Pass	0.37	Pass	0	Pass	0.08	Pass
5	0.30	Pass	0.38	Pass	0	Pass	0.08	Pass
6	0.33	Pass	0.37	Pass	0	Pass	0.08	Pass
7	0.31	Pass	0.38	Pass	0	Pass	0.08	Pass
8	0.34	Pass	0.39	Pass	0	Pass	0.08	Pass
9	0.29	Pass	0.36	Pass	0	Pass	0.08	Pass
10	0.27	Pass	0.37	Pass	0	Pass	0.08	Pass
11	0.30	Pass	0.36	Pass	0	Pass	0.08	Pass
12	0.28	Pass	0.36	Pass	0	Pass	0.08	Pass

Plt	
0.08	Pass

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

Voltage fluctuation and Flicker.					
X1-3.3-S-D	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	**Pst**	**Plt 2 hours**	**d(t) $_{500ms}$**	**dc**	**dmax**
Limit	1,0	0,65	3,3%	3,3%	4%

X1-3.3-S-D

Date : Jun. 12, 2016
Comment :
Regulation : IEC61000-3-3 Ed1.1
Model : YOKOGAWA WT3000

Element : 1
Volt. Range : 600.00V
Un U1 : 231.24V
Set Freq : 50Hz
Frequency U1 : 50.002Hz
Interval : 10m0s

<Limit>
dc : 3.30%
dmax : 4.00%
d(t) : 500ms 3.30%
Pst : 1.00
Plt : 0.65 N: 12
<Result>
Element Judgement : **Pass**

Total Judgement : **Pass**

(Element 1)

Data List

No.	dc[%]		dmax[%]		d(t)[ms]		Pst	
1	0.88	Pass	0.89	Pass	0	Pass	0.14	Pass
2	0.81	Pass	0.88	Pass	0	Pass	0.14	Pass
3	0.86	Pass	0.96	Pass	0	Pass	0.14	Pass
4	0.81	Pass	0.88	Pass	0	Pass	0.14	Pass
5	0.85	Pass	0.89	Pass	0	Pass	0.17	Pass
6	0.79	Pass	0.88	Pass	0	Pass	0.18	Pass
7	0.79	Pass	0.87	Pass	0	Pass	0.18	Pass
8	0.79	Pass	0.87	Pass	0	Pass	0.18	Pass
9	0.86	Pass	0.90	Pass	0	Pass	0.18	Pass
10	0.87	Pass	0.94	Pass	0	Pass	0.18	Pass
11	0.88	Pass	0.89	Pass	0	Pass	0.17	Pass
12	0.85	Pass	0.92	Pass	0	Pass	0.13	Pass

Plt
0.16 Pass

Appendix E Type Verification Test Report

Extract from test report according to EN 50438 **Nr. SXP-16JA0324FTSP**

DC-Injection.				
X1-1.1-S-D				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (24mA)			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value [mA]	14,3	20,4	20,2	12,2
X1-1.5-S-D				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (33mA)			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value [mA]	12,3	11,1	8,5	6,5
X1-2.0-S-D				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (43mA)			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value [mA]	6,6	8,6	-3,0	15,7
X1-2.5-S-D				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (54mA)			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value [mA]	16,5	11,8	-5,5	-14,0
X1-3.0-S-D				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (65mA)			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value [mA]	16,4	11,7	-9,2	-17,1
X1-3.3-S-D				
Protection limit	Tested at four power levels, limit 0,5% of IAC_{nom} (72mA)			
Output power	**~20%**	**~50%**	**75%**	**~100%**
Max. test value [mA]	14,8	7,7	-10,4	3,7