



**BUREAU
VERITAS**

Verklaring van geen bezwaar

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

Product: Fotovoltaïsche Omvormers

Model: X1-0.7-S-D, X1-0.7-S-N
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 netparallele 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
SXP-16JA0324FTSP-A1

Certificaatnummer: U18-0051

Datum: 2018-02-14

Certificatie-instelling



Holger Schaffer



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

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

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

| | | | | |
|----------------------------------|---|---------------------------|---------------------------|---------------------------|
| Manufacturer / applicant: | SolaX Power Network Technology (Zhe jiang) 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 | X1-0.7-S-D, X1-0.7-S-N | 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 | 700 VA | 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 | DSP Master V 3.18 Slave V1.08 ARM V1.09 | | | |
| Measurement period: | 2016-03-01 to 2016-06-15 2018-01-08 to 2018-01-10 | | | |

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.

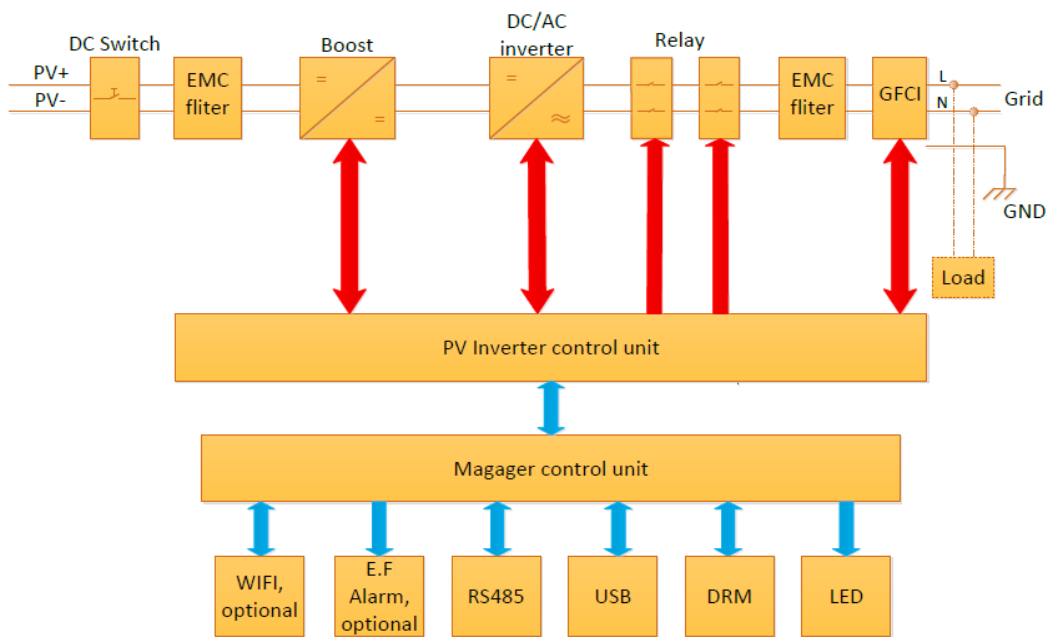


Figure 1 – Schematic structure of the power generation unit

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.

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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 |

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| 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 |

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Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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% P_n | | | | | | | |
| 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% P_n | | | | | | | |
| 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/P _{1min} : | + 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% P_n | | | | | | | |
| 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% P_n | | | | | | | |
| 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/P _{1min} : | + 10 % of P _M | | | | | | |

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Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| Reactive power | | | |
|-------------------------------|--------|--------|--------|
| Uncontrollable reactive power | | | |
| X1-0.7-S-D | | | |
| Test Voltage | 211,6V | 230V | 248,4V |
| Output power | | | |
| 25% PN | 0,9640 | 0,9620 | 0,9544 |
| 50% PN | 0,9915 | 0,9910 | 0,9890 |
| 75% PN | 0,9961 | 0,9960 | 0,9951 |
| 100% PN | 0,9974 | 0,9975 | 0,9965 |
| Limit | >0,95 | >0,95 | >0,95 |
| X1-1.1-S-D | | | |
| Test Voltage | 211,6V | 230V | 248,4V |
| Output power | | | |
| 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 | 211,6V | 230V | 248,4V |
| Output power | | | |
| 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 | 211,6V | 230V | 248,4V |
| Output power | | | |
| 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 | 211,6V | 230V | 248,4V |
| Output power | | | |
| 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 |

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| X1-3.0-S-D | | | |
|---------------------|-----------------|-----------------|-----------------|
| Test Voltage | 211,6V | 230V | 248,4V |
| Output power | | | |
| 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 | 211,6V | 230V | 248,4V |
| Output power | | | |
| 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 |

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 |

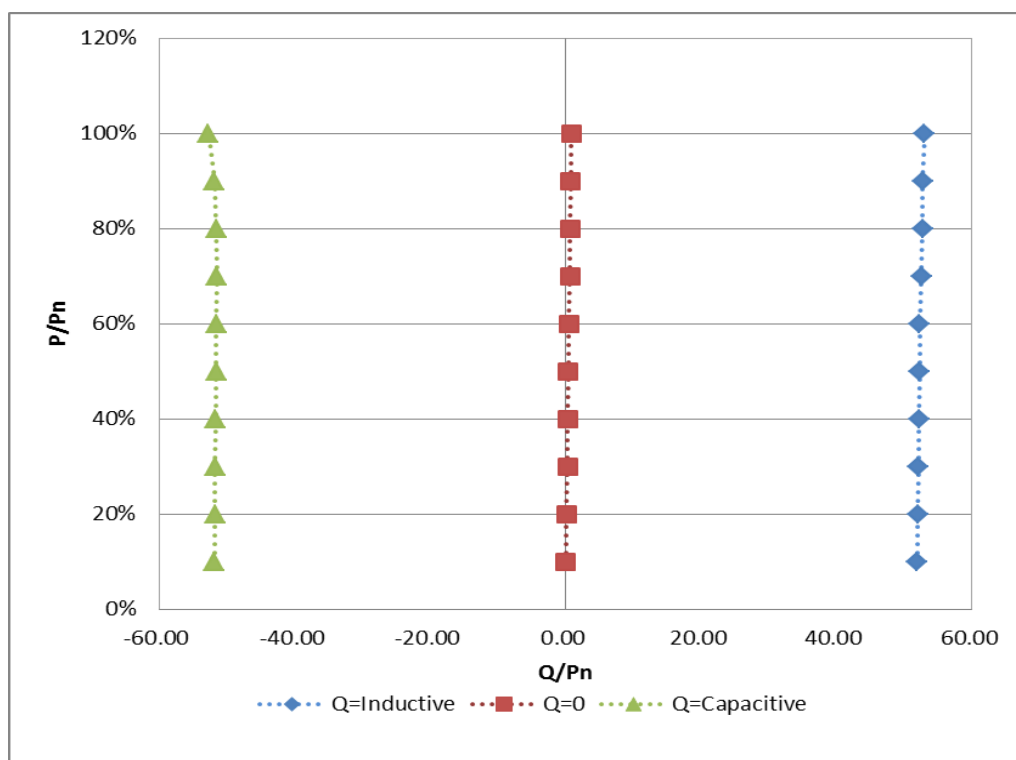
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Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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 |

Diagram of inductive reactive power absorption



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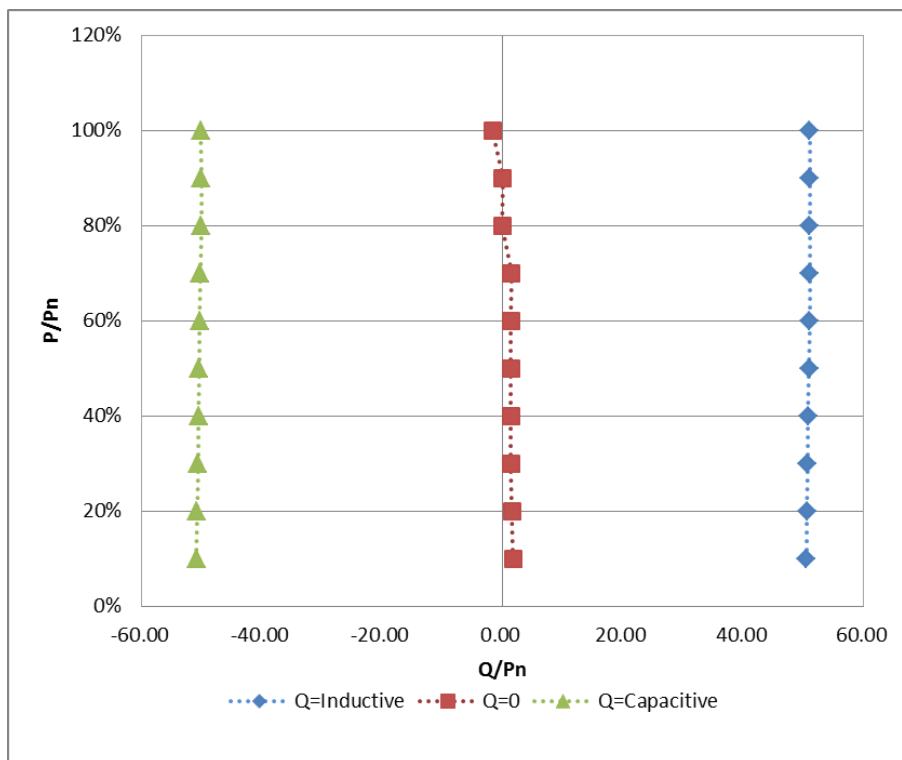
| Controllable reactive power | | | | |
|--|-------------------|-----------------------|-------------------------------|----------------|
| X1-3.3-S-D | | | | |
| Inductive (supply reactive power) | | | | |
| Power-BIN | Active power [kW] | Reactive power [kVar] | Power factor (cos φ) | AC voltage [V] |
| 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 |

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Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

Diagram of inductive reactive power absorption



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Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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 $\Delta Q / PN$ [%] |
| - 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 $\Delta Q / PN$ [%] |
| - 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 $\Delta Q / PN$ [%] |
| - 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 $\Delta Q / PN$ [%] |
| - 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 / SXP-16JA0324FTSP-A1

| 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 ($\geq 60s$) | 60 |
| Test | | |
| | Voltage conditions | |
| a) Start up for voltage range | <84% U_n for twice of observation time | >111% U_n for twice of observation time |
| Connection: | No connection | No connection |
| Limit: | No connection allowed | |
| b) In voltage range at start-up | $\geq 84\% U_n$ within twice setting observation time | $\leq 111\% U_n$ within twice setting observation time |
| Reconnection time [s] | 80 | 80 |
| Limit: | Connected after setting observation time ($\geq 60s$) | |
| Gradient: | For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%P _n /min. For recorded gradient see diagram below. | |
| 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] | 81 | 80 |
| Limit: | Reconnection after setting observation time ($\geq 60s$) | |
| Gradient: | For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%P _n /min. 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 | $\geq 47,95$ Hz within twice of setting observation time | $\leq 50,15$ Hz within twice of setting observation time |
| Reconnection time [s] | 80 | 81 |
| Limit: | Connected after setting delay time ($\geq 60s$) | |
| Gradient: | For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10%P _n /min. For recorded gradient see diagram below. | |

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 ($\geq 60s$) | 60 |
| Test | | |
| | Voltage conditions | |
| a) Start up for voltage range | <84% U_n for twice of observation time | >111% U_n for twice of observation time |
| Connection: | No connection | No connection |
| Limit: | No connection allowed | |
| b) In voltage range at start-up | $\geq 84\% U_n$ within twice setting observation time | $\leq 111\% U_n$ within twice setting observation time |
| Reconnection time [s] | 86 | 83 |
| Limit: | Connected after setting observation time ($\geq 60s$) | |
| Gradient: | For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min. For recorded gradient see diagram below. | |
| 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] | 85 | 86 |
| Limit: | Reconnection after setting observation time ($\geq 60s$) | |
| Gradient: | For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min. 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 | $\geq 47,95$ Hz within twice of setting observation time | $\leq 50,15$ Hz within twice of setting observation time |
| Reconnection time [s] | 85 | 80 |
| Limit: | Connected after setting delay time ($\geq 60s$) | |
| Gradient: | For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% P_n /min. For recorded gradient see diagram below. | |

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| Power Quality. Harmonic current emission | | | | |
|--|--|------------------|---------|--|
| micro-generator | | X1-0.7-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 | 2,900 | -- | Phase 1 | - |
| 2nd | 0,009 | 0,31 | Phase 1 | 1,080 |
| 3rd | 0,036 | 1,25 | Phase 1 | 2,300 |
| 4th | 0,005 | 0,16 | Phase 1 | 0,430 |
| 5th | 0,030 | 1,02 | Phase 1 | 1,140 |
| 6th | 0,004 | 0,14 | Phase 1 | 0,300 |
| 7th | 0,020 | 0,70 | Phase 1 | 0,770 |
| 8th | 0,003 | 0,10 | Phase 1 | 0,230 |
| 9th | 0,017 | 0,57 | Phase 1 | 0,400 |
| 10th | 0,002 | 0,07 | Phase 1 | 0,184 |
| 11th | 0,017 | 0,57 | Phase 1 | 0,330 |
| 12th | 0,001 | 0,03 | Phase 1 | 0,153 |
| 13th | 0,015 | 0,50 | Phase 1 | 0,210 |
| 14th | 0,001 | 0,04 | Phase 1 | 0,131 |
| 15th | 0,009 | 0,32 | Phase 1 | 0,150 |
| 16th | 0,001 | 0,04 | Phase 1 | 0,115 |
| 17th | 0,008 | 0,29 | Phase 1 | 0,132 |
| 18th | 0,001 | 0,04 | Phase 1 | 0,102 |
| 19th | 0,008 | 0,29 | Phase 1 | 0,118 |
| 20th | 0,001 | 0,02 | Phase 1 | 0,092 |
| 21th | 0,008 | 0,28 | Phase 1 | 0,107 |
| 22th | 0,001 | 0,03 | Phase 1 | 0,084 |
| 23th | 0,008 | 0,27 | Phase 1 | 0,098 |
| 24th | 0,001 | 0,03 | Phase 1 | 0,077 |
| 25th | 0,007 | 0,23 | Phase 1 | 0,090 |
| 26th | 0,001 | 0,02 | Phase 1 | 0,071 |
| 27th | 0,006 | 0,21 | Phase 1 | 0,083 |
| 28th | 0,001 | 0,03 | Phase 1 | 0,066 |
| 29th | 0,004 | 0,14 | Phase 1 | 0,078 |
| 30th | 0,001 | 0,02 | Phase 1 | 0,061 |
| 31th | 0,004 | 0,15 | Phase 1 | 0,073 |
| 32th | 0,001 | 0,03 | Phase 1 | 0,058 |
| 33th | 0,003 | 0,10 | Phase 1 | 0,068 |
| 34th | 0,001 | 0,03 | Phase 1 | 0,054 |
| 35th | 0,003 | 0,10 | Phase 1 | 0,064 |
| 36th | 0,001 | 0,03 | Phase 1 | 0,051 |
| 37th | 0,002 | 0,08 | Phase 1 | 0,061 |
| 38th | 0,001 | 0,04 | Phase 1 | 0,048 |
| 39th | 0,002 | 0,08 | Phase 1 | 0,058 |
| 40th | 0,001 | 0,04 | Phase 1 | 0,046 |

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

| 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 / SXP-16JA0324FTSP-A1

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 |
| 2 | 0.36 | Pass 0.41 | Pass 0 | Pass 0.08 |
| 3 | 0.36 | Pass 0.38 | Pass 0 | Pass 0.08 |
| 4 | 0.27 | Pass 0.37 | Pass 0 | Pass 0.08 |
| 5 | 0.30 | Pass 0.38 | Pass 0 | Pass 0.08 |
| 6 | 0.33 | Pass 0.37 | Pass 0 | Pass 0.08 |
| 7 | 0.31 | Pass 0.38 | Pass 0 | Pass 0.08 |
| 8 | 0.34 | Pass 0.39 | Pass 0 | Pass 0.08 |
| 9 | 0.29 | Pass 0.36 | Pass 0 | Pass 0.08 |
| 10 | 0.27 | Pass 0.37 | Pass 0 | Pass 0.08 |
| 11 | 0.30 | Pass 0.36 | Pass 0 | Pass 0.08 |
| 12 | 0.28 | Pass 0.36 | Pass 0 | Pass 0.08 |
| | | | | Pst |
| | | | | 0.08 Pass |

Appendix E Type Verification Test Report

Extract from test report according to EN 50438

Nr. SXP-16JA0324FTSP / SXP-16JA0324FTSP-A1

| 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 | | <Limit> | | |
| Model | : YOKOGAWA WT3000 | | dc | : 3.30% | |
| Element | : 1 | | dmax | : 4.00% | |
| Volt. Range | : 600.00V | | d(t) | : 500ms 3.30% | |
| Un U1 | : 231.24V | | Pst | : 1.00 | |
| Set Freq | : 50Hz | | Plt | : 0.65 N: 12 | |
| Frequency U1 | : 50.002Hz | | <Result> | | |
| Interval | : 10m0s | | 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 / SXP-16JA0324FTSP-A1

| DC-Injection. | | | | |
|----------------------|--|------|-------|-------|
| X1-0.7-S-D | | | | |
| Protection limit | Tested at four power levels, limit 0,5% of IAC _{nom} (15mA) | | | |
| Output power | ~20% | ~50% | 75% | ~100% |
| Max. test value [mA] | 11,1 | 12,2 | 7,8 | 8,7 |
| 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 |