# Świadectwo zgodności

| | |
|---|---|
| **Zgłaszający:** | **SolaX power Co., Ltd.**<br>No. 288 Shizhu Road, Tonglu Economic Development Zone,<br>Dongxing District 311500, Tonglu City, Zhejiang Province,<br>**China** |
| **Produkt:** | **Siatka wiązanej fotowoltaicznych (PV) falownik** |
| **Model:** | **X1-1.1-S-D, X1-1.1-S-N, X1-1.5-S-D, X1-1.5-S-N,<br>X1-2.0-S-D, X1-2.0-S-N, X1-2.5-S-D, X1-2.5-S-N,<br>X1-3.0-S-D, X1-3.0-S-N, X1-3.3-S-D, X1-3.3-S-N** |

## Zastosowanie zgodnie z przepisami:

Automatyczne urządzenie wyłączające, monitorujące sieć jednofazową w systemach fotowoltaicznych z obwodem równoległym jednofazową 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 przyłączania 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-16JY2393FTSP** |
| **Numer świadectwa:** | **U17-0085** |
| **Data wydania:** | **2017-03-14** |

**Instytut certyfikacji**

Heinz-Jürgen Zeiger

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

Instytut certyfikacji 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** **Nr. SXP-16JY2393FTSP**

| **Type Approval and declaration of compliance with the requirements of EN 50438.** | | | | | | |
|---|---|---|---|---|---|---|
| **Manufacturer / applicant:** | SolaX power Co., Ltd.<br>No. 288 Shizhu Road, Tonglu Economic Development Zone,<br>Dongxing District 311500, Tonglu City, Zhejiang Province,<br>China | | | | | |
| **Micro-generator Type** | Grid-tied photovoltaic inverter | | | | | |
| **Rated values** | X1-1.1-S-D,<br>X1-1.1-S-N | X1-1.5-S-D,<br>X1-1.5-S-N | X1-2.0-S-D,<br>X1-2.0-S-N | X1-2.5-S-D,<br>X1-2.5-S-N | X1-3.0-S-D,<br>X1-3.0-S-N | X1-3.3-S-D,<br>X1-3.3-S-N |
| **Maximum rated capacity** | 1100 VA | 1500 VA | 2000 VA | 2500 VA | 3000 VA | 3300 VA |
| **Rated voltage** | 220/230/240 Vac, 50/60Hz | | | | | |
| **Firmware version** | V 3.08 | | | | | |
| **Measurement period:** | 2016-12-29 to 2017-02-20 | | | | | |

**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.

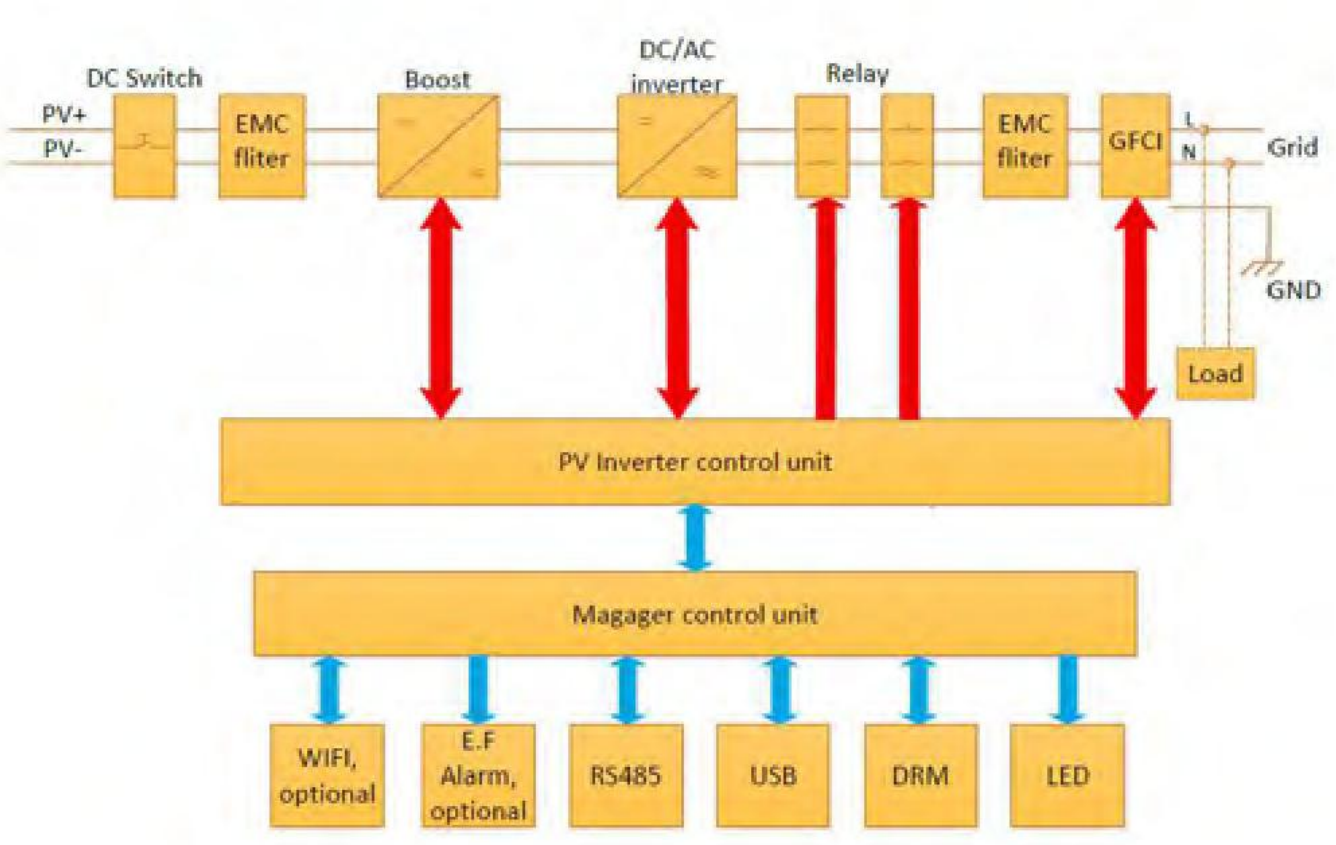



**Figure 1 – Schematic structure of the power generation unit**

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** **Nr. SXP-16JY2393FTSP**

**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 | 3,0 | 253,0 | 3,0 | 251,5 | 1,351 |
| Over-voltage stage 2 | 264,5 | 0,2 | 264,5 | 0,2 | 264,8 | 0,174 |
| Under-voltage stage 1 | 195,5 | 1,5 | 195,5 | 1,5 | 195,3 | 1,356 |

**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 | 3,0 | 253,0 | 3,0 | 254,6 | 1,350 |
| Over-voltage stage 2 | 264,5 | 0,2 | 264,5 | 0,2 | 263,2 | 0,178 |
| Under-voltage stage 1 | 195,5 | 1,5 | 195,5 | 1,5 | 194,0 | 1,354 |

Note.
Minimum operation time according to default interface protection:
Over-voltage stage 1 -
Over-voltage stage 2 0,1s
Under-voltage 1,2s

**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

| 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** | 52,0 | 0,5 | 52,0 | 0,5 | 52,01 | 0,424 |
| **Under-frequency** | 47,5 | 0,5 | 47,5 | 0,5 | 47,51 | 0,420 |
| **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** | 52,0 | 0,5 | 52,0 | 0,5 | 52,01 | 0,428 |
| **Under-frequency** | 47,5 | 0,5 | 47,5 | 0,5 | 47,50 | 0,420 |
| Note.<br>Minimum operation time according to default interface protection:<br>Over-frequency 0,5 s<br>Under-frequency 0,5 s | | | | | | |

| 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 [ms]** | 244,7 | 276,7 | 300,7 | 180,7 | 168,7 | 228,7 |
| **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 [ms]** | 209,0 | 207,5 | 198,0 | 170,0 | 135,5 | 158,0 |
| Indicate additional shut down time included in above results.<br>(Integrated interface switch) | | | | Type of switching equipment 1: Relay<br>Type of switching equipment 2: Relay | | |

| Appendix E Type Verification Test Report | |
|---|---|
| Extract from test report according to EN 50438 | Nr. SXP-16JY2393FTSP |

**Type testing of a micro-generator**

**Operating range**

**Test 1: U = 195,5 V; f = 47,5 Hz; P = 1,00 Sn; cosφ = 1**
**Test 2: U = 253,0 V; f = 51,5 Hz; P = 1,00 Sn; cosφ = 1**

**X1-2.0-S-D**

| 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 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 |

**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 |

**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

| **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 |
| **∆PE60/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 |
| **∆PE60/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 |
| **∆PE60/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 |
| **∆PE60/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-16JY2393FTSP**

| **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**

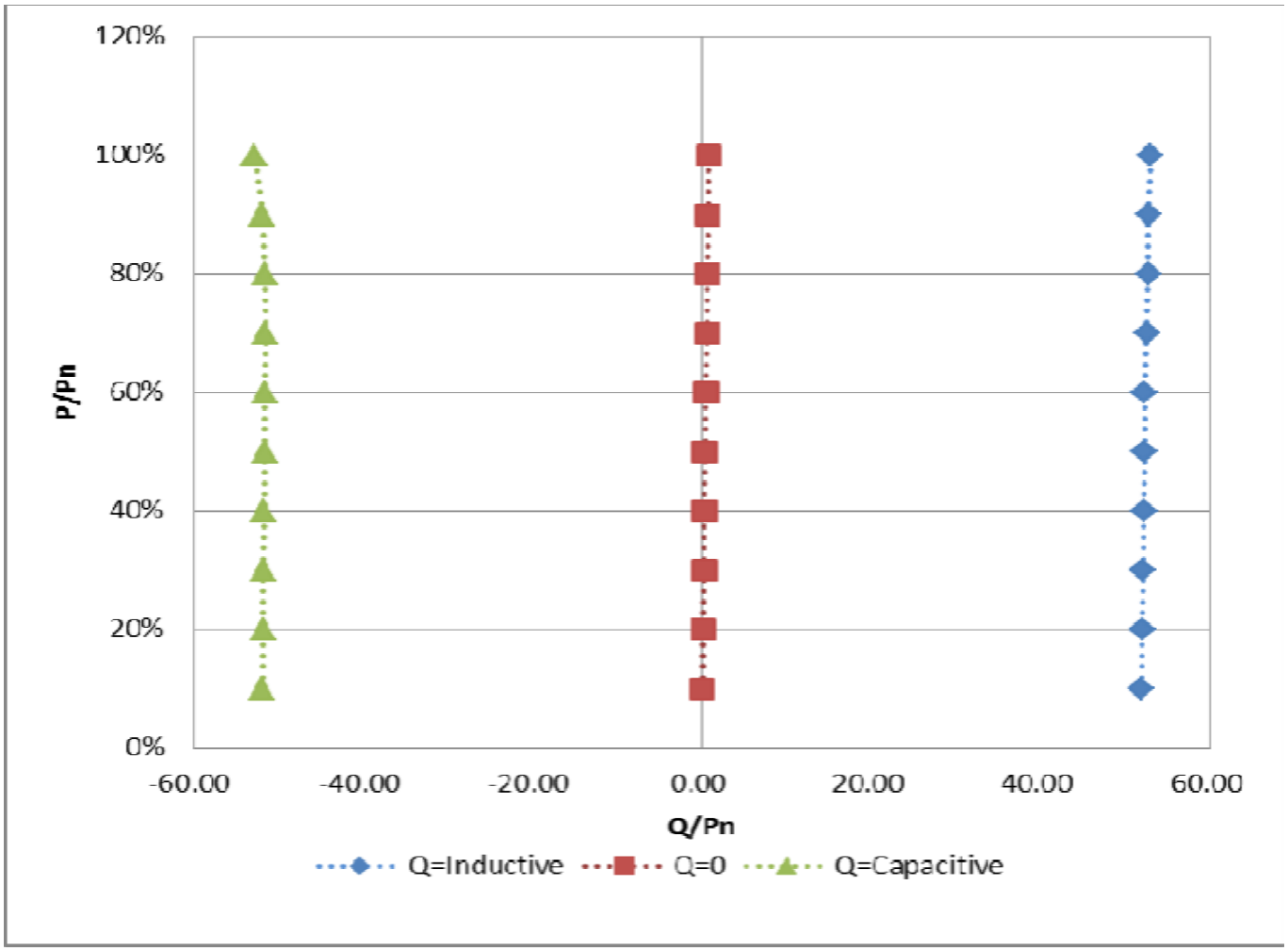
**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

| Controllable reactive power | | | | |
|---|---|---|---|---|
| **X1-2.0-S-D** | | | | |
| **Inductive (supply reactive power)** | | | | |
| **Power-BIN** | **Active power [W]** | **Reactive power [Var]** | **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-16JY2393FTSP**

**Diagram of inductive reactive power absorption**



**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

**Controllable reactive power**

**X1-3.3-S-D**

**Inductive (supply reactive power)**

| Power-BIN | Active power [W] | Reactive power [Var] | Power factor (cos φ) | DC power [W] |
|---|---|---|---|---|
| **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 [W] | Reactive power [Var] | Power factor (cos φ) | DC power [W] |
|---|---|---|---|---|
| **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 |

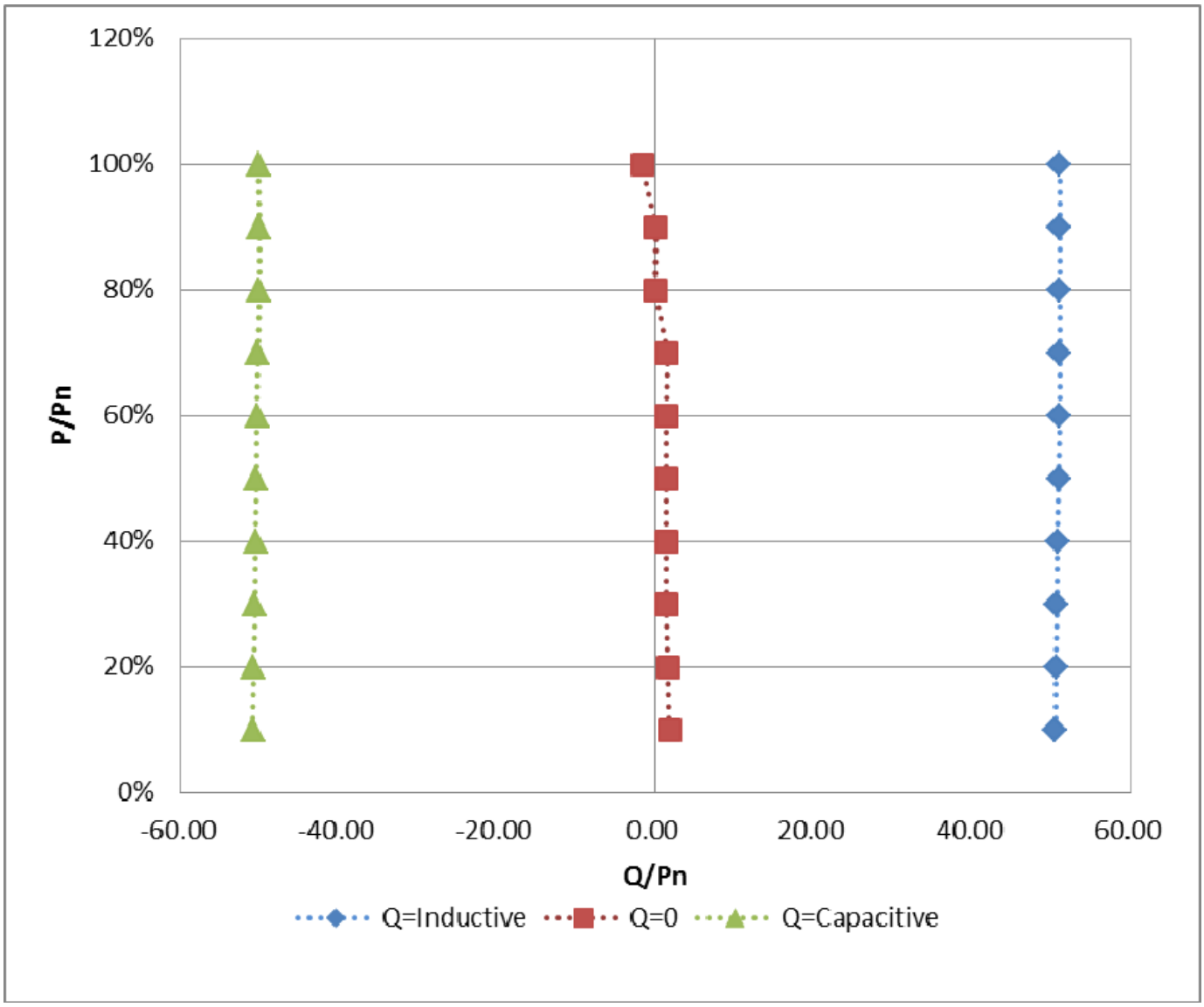
**Reactive power supply with set point Q=0**

| Power-BIN | Active power [W] | Reactive power [Var] | Power factor (cos φ) | DC power [W] |
|---|---|---|---|---|
| **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-16JY2393FTSP**

**Diagram of inductive reactive power absorption**




| Q adjustment | | | | |
|---|---|---|---|---|
| **X1-2.0-S-D** | **Reactive power set point Q [Var]** | **Measured reactive power Q [Var]** | **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 |
| **Q adjustment** | | | | |
| **X1-3.0-S-D** | **Reactive power set point Q [Var]** | **Measured reactive power Q [Var]** | **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 |

**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

**Standard curve Q(f)**
**X1-2.0-S-D**

**Qmin reactive power in accordance to standard characteristic curve Q=f(V)**

| P/Pn | Vac [V] Set point | P/Pn [%] | Vac [V] measured | Q [Var] measured | Q [Var] expected | ΔQ [%] |
|---|---|---|---|---|---|---|
| < 20% | 1,07Vn | 9,62 | 246,19 | -0,15 | ≈0(<±2.5%Pn) | 0,01 |
| < 20% | 1,09Vn | 9,58 | 250,74 | -0,35 | ≈0(<±2.5%Pn) | 0,02 |
| < 20%-30% | 1,09Vn | 29,97 | 250,73 | -467,85 | -0,5 Qmin | 1,61 |
| 40% | 1,09Vn | 40,30 | 250,72 | -478,75 | -0,5 Qmin | 1,06 |
| 50% | 1,09Vn | 50,44 | 250,74 | -505,80 | -0,5 Qmin | 0,29 |
| 60% | 1,09Vn | 60,65 | 250,73 | -475,65 | -0,5 Qmin | 1,22 |
| 70% | 1,09Vn | 70,69 | 250,71 | -485,85 | -0,5 Qmin | 0,71 |
| 80% | 1,09Vn | 80,74 | 250,71 | -501,45 | -0,5 Qmin | 0,07 |
| 90% | 1,09Vn | 90,83 | 250,72 | -468,90 | -0,5 Qmin | 1,56 |
| 100% | 1,09Vn | 100,86 | 250,73 | -502,90 | -0,5 Qmin | 0,15 |
| 100% | 1,1Vn | 100,51 | 253,04 | -977,65 | -Qmin | 1,12 |
| 100%-10% | 1,1Vn | 8,86 | 253,04 | -959,05 | -Qmin | 2,05 |
| 10%→ ≤5% | 1,1Vn | 2,40 | 252,98 | -1,40 | ≈0(<±2.5%Pn) | 0,07 |

**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 | 9,66 | 213,92 | -0,15 | ≈0(<±2.5%Pn) | 0,01 |
| < 20% | 0,91Vn | 9,71 | 209,34 | 0,20 | ≈0(<±2.5%Pn) | 0,01 |
| < 20%-30% | 0,91Vn | 30,19 | 209,48 | 525,20 | -0,5 Qmin | 1,26 |
| 40% | 0,91Vn | 40,30 | 209,35 | 530,80 | -0,5 Qmin | 1,54 |
| 50% | 0,91Vn | 50,40 | 209,36 | 530,80 | -0,5 Qmin | 1,54 |
| 60% | 0,91Vn | 60,41 | 209,37 | 530,50 | -0,5 Qmin | 1,53 |
| 70% | 0,91Vn | 70,51 | 209,38 | 529,75 | -0,5 Qmin | 1,49 |
| 80% | 0,91Vn | 80,42 | 209,28 | 536,50 | -0,5 Qmin | 1,83 |
| 90% | 0,91Vn | 90,55 | 209,26 | 540,75 | -0,5 Qmin | 2,04 |
| 100% | 0,91Vn | 97,83 | 209,36 | 537,95 | -0,5 Qmin | 1,90 |
| 100% | 0,90Vn | 87,23 | 207,07 | 1042,70 | -Qmin | 2,14 |
| 100%-10% | 0,90Vn | 8,87 | 207,02 | 1026,65 | -Qmin | 1,33 |
| 10%→ ≤5% | 0,90Vn | 2,43 | 207,02 | -0,55 | ≈0(<±2.5%Pn) | 0,03 |

**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

**Standard curve Q(f)**
**X1-3.3-S-D**

**Qmin reactive power in accordance to standard characteristic curve Q=f(V)**

| P/Pn | Vac [V] Set point | P/Pn [%] | Vac [V] measured | Q [Var] measured | Q [Var] expected | ΔQ [%] |
|---|---|---|---|---|---|---|
| < 20% | 1,07Vn | 9,70 | 246,12 | 59,20 | ≈0(<±2.5%Pn) | 1,79 |
| < 20% | 1,09Vn | 9,66 | 250,60 | 58,95 | ≈0(<±2.5%Pn) | 1,79 |
| < 20%-30% | 1,09Vn | 29,56 | 250,59 | 832,50 | -0,5 Qmin | 0,53 |
| 40% | 1,09Vn | 39,60 | 250,61 | 797,70 | -0,5 Qmin | 1,58 |
| 50% | 1,09Vn | 49,46 | 250,60 | 823,00 | -0,5 Qmin | 0,82 |
| 60% | 1,09Vn | 59,37 | 250,60 | 828,95 | -0,5 Qmin | 0,64 |
| 70% | 1,09Vn | 69,25 | 250,60 | 807,45 | -0,5 Qmin | 1,29 |
| 80% | 1,09Vn | 78,89 | 250,59 | 815,45 | -0,5 Qmin | 1,05 |
| 90% | 1,09Vn | 88,73 | 250,61 | 774,00 | -0,5 Qmin | 2,30 |
| 100% | 1,09Vn | 98,53 | 250,60 | 817,70 | -0,5 Qmin | 0,98 |
| 100% | 1,1Vn | 98,67 | 253,01 | 1663,20 | -Qmin | 1,12 |
| 100%-10% | 1,1Vn | 8,82 | 253,02 | 1627,95 | -Qmin | 2,18 |
| 10%→ ≤5% | 1,1Vn | 2,56 | 253,01 | 64,75 | ≈0(<±2.5%Pn) | 1,96 |

**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 | 9,69 | 213,86 | 50,45 | ≈0(<±2.5%Pn) | 1,53 |
| < 20% | 0,91Vn | 9,78 | 209,16 | 51,45 | ≈0(<±2.5%Pn) | 1,56 |
| < 20%-30% | 0,91Vn | 29,70 | 209,17 | 917,10 | -0,5 Qmin | 2,03 |
| 40% | 0,91Vn | 39,67 | 209,17 | 931,20 | -0,5 Qmin | 2,46 |
| 50% | 0,91Vn | 49,49 | 209,17 | 927,65 | -0,5 Qmin | 2,35 |
| 60% | 0,91Vn | 59,36 | 209,16 | 926,15 | -0,5 Qmin | 2,31 |
| 70% | 0,91Vn | 69,08 | 209,17 | 876,95 | -0,5 Qmin | 0,82 |
| 80% | 0,91Vn | 79,09 | 209,17 | 872,50 | -0,5 Qmin | 0,68 |
| 90% | 0,91Vn | 88,81 | 209,17 | 845,00 | -0,5 Qmin | -0,15 |
| 100% | 0,91Vn | 89,90 | 209,17 | 902,55 | -0,5 Qmin | 1,59 |
| 100% | 0,90Vn | 79,86 | 207,04 | 1673,30 | -Qmin | -1,06 |
| 100%-10% | 0,90Vn | 9,02 | 207,03 | 1662,25 | -Qmin | -1,14 |
| 10%→ ≤5% | 0,90Vn | 2,50 | 207,04 | 55,65 | ≈0(<±2.5%Pn) | -1,69 |

**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

| **Connection and starting to generate electrical power** | | |
|---|---|---|
| **X1-2.0-S-D** | | |
| | **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** | **<47,45 Hz for twice of setting observation time** | **>50,15 Hz for twice of setting observation time** |
| **Connection:** | No connection | No connection |
| **Limit** | No connection allowed | |
| **e) In frequency range at start-up** | **≥47,45 Hz within twice of setting observation time** | **≤51,15 Hz within twice of setting observation time** |
| **Reconnection time [s]** | 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. | |
| **f) In frequency range after frequency failure** | **≥47,45 Hz for twice of setting observation time** | **≤51,15 Hz for twice of setting observation time** |
| **Reconnection time [s]** | 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-16JY2393FTSP**

| **Connection and starting to generate electrical power** | | |
|---|---|---|
| **X1-3.3-S-D** | | |
| | **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** | **<47,45 Hz for twice of setting observation time** | **>50,15 Hz for twice of setting observation time** |
| **Connection:** | No connection | No connection |
| **Limit** | No connection allowed | |
| **e) In frequency range at start-up** | **≥47,45 Hz within twice of setting observation time** | **≤51,15 Hz within twice of setting observation time** |
| **Reconnection time [s]** | 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. | |
| **f) In frequency range after frequency failure** | **≥47,45 Hz for twice of setting observation time** | **≤51,15 Hz for twice of setting observation time** |
| **Reconnection time [s]** | 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-16JY2393FTSP**

| **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** | 8,7 ms | |
| **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** | 0,38 ms | |

**Appendix E Type Verification Test Report**

**Extract from test report according to EN 50438** **Nr. SXP-16JY2393FTSP**

| 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-16JY2393FTSP**

| 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-16JY2393FTSP**

| 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-16JY2393FTSP**

| 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-16JY2393FTSP**

| 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-16JY2393FTSP**

| 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-16JY2393FTSP**

| **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% |
| **Test value** | 0,08 | 0,08 | 0,00% | 0,43% | 0,48% |
| **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% |
| **Test value** | 0,18 | 0,16 | 0,00% | 0,88% | 0,89% |

| **DC-Injection.** | | | | |
|---|---|---|---|---|
| **X1-1.1-S-D** | | | | |
| **Protection limit** | Tested at four power levels limit 0,5% of $IAC_{nom}$ | | | |
| **Output power** | **~20%** | **~50%** | **75%** | **~100%** |
| **Max. test value (phase L1) [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 $IAC_{nom}$ | | | |
| **Output power** | **~20%** | **~50%** | **75%** | **~100%** |
| **Max. test value (phase L1) [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 $IAC_{nom}$ | | | |
| **Output power** | **~20%** | **~50%** | **75%** | **~100%** |
| **Max. test value (phase L1) [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 $IAC_{nom}$ | | | |
| **Output power** | **~20%** | **~50%** | **75%** | **~100%** |
| **Max. test value (phase L1) [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 $IAC_{nom}$ | | | |
| **Output power** | **~20%** | **~50%** | **75%** | **~100%** |
| **Max. test value (phase L1) [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 $IAC_{nom}$ | | | |
| **Output power** | **~20%** | **~50%** | **75%** | **~100%** |
| **Max. test value (phase L1) [mA]** | 14,8 | 7,7 | -10,4 | 3,7 |