

C E R T I F I C A T E
of Conformity



Registration No.: AK 50526318 0001

Report No.: CN21L000 001

Holder: SMA Solar Technology AG
Sonnenallee 1
34266 Niestetal
Deutschland

Product: PV-Inverter
(Grid-connected PV Inverter)

Identification: Type Designation : STP 110-60
Serial Number : Engineering Samples
Firmware version : 1.00.00.R
Remark(s) : Refer to report CN21L000 001 for details.

Tested acc. to: G99/NI

The certificate of conformity refers to the above mentioned product. This is to certify that the specimen is in conformity with the assessment requirement mentioned above. This certificate does not imply assessment of the production of the product and does not permit the use of a TÜV Rheinland mark of conformity.

Date 07.12.2021

Certification Body
A circular blue stamp with the text 'TÜV Rheinland LGA Products GmbH' around the perimeter and 'TÜV Rheinland' in the center. A signature is written across the stamp.
Weichun Li

TÜV Rheinland LGA Products GmbH - Tillystraße 2 - 90431 Nürnberg

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| Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record |
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|---|
| Extract from test report according to the Engineering Recommendation G99/NI |
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| | |
|---------------------------------|----------------------------|
| PGM technology | Grid-Connected PV Inverter |
| Registered Capacity | |
| Model | STP110-60 |
| Rated Output Power [W] | 110000 |
| Max. Output Apparent Power [VA] | 110000 |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| 1 | | | | TABLE: Normal operating range (Operation range) | P |
|-----------------------------|--------|------|-------|---|---------------|
| Test Conditions | | | | Measurements | Limitation |
| U/Un | f [Hz] | cosφ | t [s] | | |
| 85% | 47.5 | 1.00 | 5400 | No disconnect | No disconnect |
| 110% | 51.5 | 1.00 | 5400 | No disconnect | No disconnect |
| 110% | 52.0 | 1.00 | 900 | No disconnect | No disconnect |
| frequency change rate 1Hz/s | | | | No disconnect | No disconnect |

| 2.1 | | TABLE: Harmonics current (THDi) | | | | P |
|-----------|------|---------------------------------|-------|-----------|-----------|-------|
| P/Pn[%] | | 50 | | 100 | | Limit |
| Order No. | [A] | Measurement | | | | |
| | | lh/ln [%] | [A] | lh/ln [%] | lh/ln [%] | |
| 1 | 80 | 50 | 158.7 | 100 | -- | |
| 2 | 0.13 | 0.08 | 0.22 | 0.14 | 8.0 | |
| 3 | 0.25 | 0.16 | 0.37 | 0.23 | -- | |
| 4 | 0.06 | 0.04 | 0.13 | 0.08 | 4.0 | |
| 5 | 1.03 | 0.65 | 0.51 | 0.32 | 10.7 | |
| 6 | 0.10 | 0.06 | 0.10 | 0.06 | 2.67 | |
| 7 | 0.73 | 0.46 | 0.57 | 0.36 | 7.2 | |
| 8 | 0.05 | 0.03 | 0.05 | 0.03 | 2.0 | |
| 9 | 0.10 | 0.06 | 0.06 | 0.04 | -- | |
| 10 | 0.11 | 0.07 | 0.10 | 0.06 | 1.6 | |
| 11 | 0.37 | 0.23 | 0.21 | 0.13 | 3.1 | |
| 12 | 0.10 | 0.06 | 0.08 | 0.05 | 1.33 | |
| 13 | 0.17 | 0.11 | 0.16 | 0.1 | 2.0 | |
| THDi | 0.97 | | 0.73 | | 13 | |
| PWHD | 21.5 | | 2.11 | | 22 | |

Note(s): The worst value of the three phases has been chosen.

 Since the nominal current of product $I_n > 75A$, the following extra flicker table 2.2 has been also implemented per BS EN 61000-4-7, as the requirement of EREC G5.

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| 3.1 | TABLE: Voltage fluctuations (Flicker) | | | | | | P | |
|--------------------------------------|---------------------------------------|-------|----------|----------|-------|----------|-----------------|-----------------|
| | Starting | | | Stooping | | | Running | |
| | dmax[%] | dc[%] | d(t)[ms] | dmax[%] | dc[%] | d(t)[ms] | P _{st} | P _{It} |
| Measured value | 1.31 | 0 | 0 | 1.31 | 0 | 0 | 0.27 | 0.26 |
| Z _{ref} Normalised value | 1.75 | 0 | 0 | 1.75 | 0 | 0 | 0.36 | 0.35 |
| Z _{max} Normalised value | -- | -- | -- | -- | -- | -- | -- | -- |
| Limitation | 4.0 | 3.3 | 500 | 4.0 | 3.3 | 500 | 1.0 | 0.65 |
| Test impedance Z _{test} | R | 0.24 | Ω | XI | 0.15 | Ω | | |
| Z _{ref} Normalised value | R | 0.24 | Ω | XI | 0.15 | Ω | | |
| Z _{max} Normalised value | R | -- | Ω | XI | -- | Ω | | |

Note(s): The worst value of the three phases has been chosen.

 Since the nominal current of product $I_n > 75A$, the following extra flicker table 3.2 has been also implemented per BS EN 61400-21, as the requirement of EREC P28, clause 8.8.

| 4 | TABLE: DC Injection (Idc) | | | P |
|-----------------|---------------------------|------|------|--------------------|
| Test Conditions | Measurements | | | Limit |
| Pn/Pn | Idc / I _n [%] | | | Idc/I _n |
| | L1 | L2 | L3 | |
| 10% | 0.22 | 0.15 | 0.01 | 0.25% |
| 55% | 0.21 | 0.12 | 0.03 | 0.25% |
| 100% | 0.20 | 0.18 | 0.12 | 0.25% |

Note(s):

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| 5 | | TABLE: Power Factor | | | | | | P |
|-----------------|------|---------------------|--------------|----------|-------|--------|--------|-------|
| Test Conditions | | | Measurements | | | | | Limit |
| P/Pn | cosφ | U/Un | P [kW] | Q [kVar] | cosφ | U [V] | I [A] | cosφ |
| 100% | 1.00 | 0.94 | 103.35 | 1.75 | 0.999 | 216.84 | 158.89 | >0.95 |
| 100% | 1.00 | 1.0 | 109.39 | 2.00 | 0.999 | 230.70 | 158.07 | >0.95 |
| 100% | 1.00 | 1.1 | 109.50 | 2.01 | 0.999 | 253.77 | 143.83 | >0.95 |

Note(s):

| 6 | | TABLE: Protection-Frequency tests (OF/UF) | | | | P |
|-----------|--------------|---|--|------------|--|---|
| Condition | Setting [Hz] | Measurement | | Limitation | | |
| | | Trip value [Hz] | | | | |
| F> | 52.0 | 52.01 | | ± 0.01HZ | | |
| F< | 48.0 | 47.99 | | | | |
| Condition | Setting [ms] | Measurement | | Limitation | | |
| | | Trip time | | | | |
| F> | 1000 | 1039 | | 1000-1100 | | |
| F< | 500 | 528.6 | | 500-600 | | |
| Condition | | Measurement | | limitation | | |
| F [Hz] | t [s] | | | | | |
| 48.2 | 25 | No trip | | No trip | | |
| 47.8 | 0.45 | No trip | | No trip | | |
| 51.8 | 120 | No trip | | No trip | | |
| 52.2 | 0.98 | No trip | | No trip | | |

Note(s):

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| 7 | TABLE: Protection-Voltage tests (OV/UV) | | | | | P |
|-----------|---|----------------|-------|-------|-------|------------|
| Condition | Setting [U] | Measurement | | | | Limitation |
| | | Trip value [V] | | | | |
| | | L1-L2 | L2-L3 | L3-L1 | L123 | |
| U> | 438.2 | 438.5 | 438.0 | 439.1 | 438.0 | ±3.45V |
| U< | 338.6 | 338.3 | 337.9 | 338.3 | 337.9 | |
| U<< | 239.0 | 238.3 | 238.0 | 238.3 | 238.0 | |
| Condition | Setting [ms] | Measurement | | | | Limitation |
| | | Trip time | | | | |
| | | L1-L2 | L2-L3 | L3-L1 | L123 | |
| U> | 500 | 561.8 | 565.8 | 577.8 | 569.8 | 500-600 |
| U< | 3000 | 3076 | 3072 | 3076 | 3080 | 3000-3100 |
| U<< | 2000 | 2080 | 2076 | 2080 | 2068 | 2000-2100 |
| Condition | | Measurement | | | | limitation |
| U/Un | t [s] | | | | | |
| 431.3 | 5 | No trip | | | | No trip |
| 445.1 | 0.45 | No trip | | | | No trip |
| 345.5 | 5 | No trip | | | | No trip |
| 245.9 | 2.5 | No trip | | | | No trip |
| 232.1 | 1.98 | No trip | | | | No trip |
| Note(s): | | | | | | |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| 8.1 | | TABLE: Protection-Loss of mains test | | | | P | |
|--|---------------------|--------------------------------------|-----------------------|----------------|----------------|-----------------|--|
| Power 100% | | | | | | | |
| Input : 800 Vdc | | | | | | | |
| Conditions | P _R [kW] | Q _L [kVar] | Q _C [kVar] | Q _f | Trip time [ms] | Limitation [ms] | |
| P _R : -10% Q _C : +10% | L1: 32.94 | L1: 36.60 | L1: 40.15 | 1.16 | 104 | 500 | |
| | L2: 32.94 | L2: 36.50 | L2: 40.15 | 1.16 | | | |
| | L3: 32.94 | L3: 36.60 | L3: 40.15 | 1.16 | | | |
| P _R : -10% Q _C : +5% | L1: 32.94 | L1: 36.60 | L1: 38.43 | 1.14 | 134 | 500 | |
| | L2: 32.94 | L2: 36.50 | L2: 38.33 | 1.14 | | | |
| | L3: 32.94 | L3: 36.60 | L3: 38.43 | 1.14 | | | |
| P _R : -10% Q _C : 0% | L1: 32.94 | L1: 36.60 | L1: 36.50 | 1.11 | 176 | 500 | |
| | L2: 32.94 | L2: 36.50 | L2: 36.50 | 1.11 | | | |
| | L3: 32.94 | L3: 36.60 | L3: 36.50 | 1.11 | | | |
| P _R : -10% Q _C : -5% | L1: 32.94 | L1: 36.60 | L1: 34.68 | 1.08 | 154 | 500 | |
| | L2: 32.94 | L2: 36.50 | L2: 34.68 | 1.08 | | | |
| | L3: 32.94 | L3: 36.60 | L3: 34.68 | 1.08 | | | |
| P _R : -10% Q _C : -10% | L1: 32.94 | L1: 36.60 | L1: 32.85 | 1.05 | 127 | 500 | |
| | L2: 32.94 | L2: 36.50 | L2: 32.85 | 1.05 | | | |
| | L3: 32.94 | L3: 36.60 | L3: 32.85 | 1.05 | | | |
| P _R : -5% Q _C : +10% | L1: 34.77 | L1: 36.60 | L1: 40.15 | 1.10 | 114 | 500 | |
| | L2: 34.77 | L2: 36.50 | L2: 40.15 | 1.10 | | | |
| | L3: 34.77 | L3: 36.60 | L3: 40.15 | 1.10 | | | |
| P _R : -5% Q _C : -10% | L1: 34.77 | L1: 36.60 | L1: 32.85 | 1.00 | 137 | 500 | |
| | L2: 34.77 | L2: 36.50 | L2: 32.85 | 1.00 | | | |
| | L3: 34.77 | L3: 36.60 | L3: 32.85 | 1.00 | | | |
| P _R : 0% Q _C : +10% | L1: 36.60 | L1: 36.60 | L1: 40.15 | 1.05 | 140 | 500 | |
| | L2: 36.60 | L2: 36.50 | L2: 40.15 | 1.05 | | | |
| | L3: 36.60 | L3: 36.60 | L3: 40.15 | 1.05 | | | |
| P _R : -5% Q _C : +5% | L1: 34.77 | L1: 36.60 | L1: 38.33 | 1.08 | 140 | 500 | |
| | L2: 34.77 | L2: 36.50 | L2: 38.33 | 1.08 | | | |
| | L3: 34.77 | L3: 36.60 | L3: 38.33 | 1.08 | | | |
| | L1: 34.77 | L1: 36.60 | L1: 36.50 | 1.05 | 191 | | |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| | | | | | | |
|---|-----------|-----------|-----------|------|-----|-----|
| P _R : -5% Q _C : 0% | L2: 34.77 | L2: 36.50 | L2: 36.50 | 1.05 | | 500 |
| | L3: 34.77 | L3: 36.60 | L3: 36.50 | 1.05 | | |
| P _R : -5% Q _C : -5% | L1: 34.77 | L1: 36.60 | L1: 34.68 | 1.02 | 176 | 500 |
| | L2: 34.77 | L2: 36.50 | L2: 34.68 | 1.02 | | |
| | L3: 34.77 | L3: 36.60 | L3: 34.68 | 1.02 | | |
| P _R : 0% Q _C : +5% | L1: 36.60 | L1: 36.60 | L1: 38.33 | 1.02 | 160 | 500 |
| | L2: 36.60 | L2: 36.50 | L2: 38.33 | 1.02 | | |
| | L3: 36.60 | L3: 36.60 | L3: 38.33 | 1.02 | | |
| P _R : 0% Q _C : 0% | L1: 36.60 | L1: 36.60 | L1: 36.50 | 1.00 | 212 | 500 |
| | L2: 36.60 | L2: 36.50 | L2: 36.50 | 1.00 | | |
| | L3: 36.60 | L3: 36.60 | L3: 36.50 | 1.00 | | |
| P _R : 0% Q _C : -5% | L1: 36.60 | L1: 36.60 | L1: 34.68 | 0.97 | 182 | 500 |
| | L2: 36.60 | L2: 36.50 | L2: 34.68 | 0.97 | | |
| | L3: 36.60 | L3: 36.60 | L3: 34.68 | 0.97 | | |
| P _R : +5% Q _C : +5% | L1: 38.43 | L1: 36.60 | L1: 38.33 | 0.97 | 144 | 500 |
| | L2: 38.43 | L2: 36.50 | L2: 38.33 | 0.97 | | |
| | L3: 38.43 | L3: 36.60 | L3: 38.33 | 0.97 | | |
| P _R : +5% Q _C : 0% | L1: 38.43 | L1: 36.60 | L1: 36.50 | 0.95 | 188 | 500 |
| | L2: 38.43 | L2: 36.50 | L2: 36.50 | 0.95 | | |
| | L3: 38.43 | L3: 36.60 | L3: 36.50 | 0.95 | | |
| P _R : +5% Q _C : -5% | L1: 38.43 | L1: 36.60 | L1: 34.68 | 0.93 | 163 | 500 |
| | L2: 38.43 | L2: 36.50 | L2: 34.68 | 0.93 | | |
| | L3: 38.43 | L3: 36.60 | L3: 34.68 | 0.93 | | |
| P _R : 0% Q _C : -10% | L1: 36.60 | L1: 36.60 | L1: 32.85 | 0.95 | 160 | 500 |
| | L2: 36.60 | L2: 36.50 | L2: 32.85 | 0.95 | | |
| | L3: 36.60 | L3: 36.60 | L3: 32.85 | 0.95 | | |
| P _R : +5% Q _C : +10% | L1: 38.43 | L1: 36.60 | L1: 40.15 | 1.00 | 107 | 500 |
| | L2: 38.43 | L2: 36.50 | L2: 40.15 | 1.00 | | |
| | L3: 38.43 | L3: 36.60 | L3: 40.15 | 1.00 | | |
| P _R : +5% Q _C : -10% | L1: 38.43 | L1: 36.60 | L1: 32.85 | 0.90 | 134 | 500 |
| | L2: 38.43 | L2: 36.50 | L2: 32.85 | 0.90 | | |
| | L3: 38.43 | L3: 36.60 | L3: 32.85 | 0.90 | | |
| | L1: 40.26 | L1: 36.60 | L1: 40.15 | 0.95 | 105 | |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| P _R : +10% Q _C : +10% | L2: 40.26 | L2: 36.50 | L2: 40.15 | 0.95 | | 500 |
|--|---------------------|-----------------------|-----------------------|----------------|----------------|-----------------|
| | L3: 40.26 | L3: 36.60 | L3: 40.15 | 0.95 | | |
| P _R : +10% Q _C : +5% | L1: 40.26 | L1: 36.60 | L1: 38.33 | 0.93 | 136 | 500 |
| | L2: 40.26 | L2: 36.50 | L2: 38.33 | 0.93 | | |
| | L3: 40.26 | L3: 36.60 | L3: 38.33 | 0.93 | | |
| P _R : +10% Q _C : 0% | L1: 40.26 | L1: 36.60 | L1: 36.50 | 0.91 | 174 | 500 |
| | L2: 40.26 | L2: 36.50 | L2: 36.50 | 0.91 | | |
| | L3: 40.26 | L3: 36.60 | L3: 36.50 | 0.91 | | |
| P _R : +10% Q _C : -5% | L1: 40.26 | L1: 36.60 | L1: 34.68 | 0.88 | 148 | 500 |
| | L2: 40.26 | L2: 36.50 | L2: 34.68 | 0.88 | | |
| | L3: 40.26 | L3: 36.60 | L3: 34.68 | 0.88 | | |
| P _R : +10% Q _C : -10% | L1: 40.26 | L1: 36.60 | L1: 32.85 | 0.86 | 118 | 500 |
| | L2: 40.26 | L2: 36.50 | L2: 32.85 | 0.86 | | |
| | L3: 40.26 | L3: 36.60 | L3: 32.85 | 0.86 | | |
| Power 66% | | | | | | |
| Input : 650 Vdc | | | | | | |
| Conditions | P _R [kW] | Q _L [kVar] | Q _C [kVar] | Q _f | Trip time [ms] | Limitation [ms] |
| P _R : 0% Q _C : -5% | L1: 24.20 | L1: 24.20 | L1: 22.80 | 0.97 | 156 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 22.80 | 0.97 | | |
| | L3: 24.20 | L3: 24.20 | L3: 22.80 | 0.97 | | |
| P _R : 0% Q _C : -4% | L1: 24.20 | L1: 24.20 | L1: 23.04 | 0.98 | 159 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 23.04 | 0.98 | | |
| | L3: 24.20 | L3: 24.20 | L3: 23.04 | 0.98 | | |
| P _R : 0% Q _C : -3% | L1: 24.20 | L1: 24.20 | L1: 23.28 | 0.98 | 164 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 23.28 | 0.98 | | |
| | L3: 24.20 | L3: 24.20 | L3: 23.28 | 0.98 | | |
| P _R : 0% Q _C : -2% | L1: 24.20 | L1: 24.20 | L1: 23.52 | 0.99 | 168 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 23.52 | 0.99 | | |
| | L3: 24.20 | L3: 24.20 | L3: 23.52 | 0.99 | | |
| P _R : 0% Q _C : -1% | L1: 24.20 | L1: 24.20 | L1: 23.76 | 0.99 | 191 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 23.76 | 0.99 | | |
| | L3: 24.20 | L3: 24.20 | L3: 23.76 | 0.99 | | |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| P _R : 0% Q _C : 0% | L1: 24.20 | L1: 24.20 | L1: 24.00 | 1.00 | 264 | 500 |
|---|---------------------|-----------------------|-----------------------|----------------|----------------|-----------------|
| | L2: 24.20 | L2: 24.20 | L2: 24.00 | 1.00 | | |
| | L3: 24.20 | L3: 24.20 | L3: 24.00 | 1.00 | | |
| P _R : 0% Q _C : +1% | L1: 24.20 | L1: 24.20 | L1: 24.24 | 1.00 | 208 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 24.24 | 1.00 | | |
| | L3: 24.20 | L3: 24.20 | L3: 24.24 | 1.00 | | |
| P _R : 0% Q _C : +2% | L1: 24.20 | L1: 24.20 | L1: 24.48 | 1.01 | 193 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 24.48 | 1.01 | | |
| | L3: 24.20 | L3: 24.20 | L3: 24.48 | 1.01 | | |
| P _R : 0% Q _C : +3% | L1: 24.20 | L1: 24.20 | L1: 24.72 | 1.01 | 171 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 24.72 | 1.01 | | |
| | L3: 24.20 | L3: 24.20 | L3: 24.72 | 1.01 | | |
| P _R : 0% Q _C : +4% | L1: 24.20 | L1: 24.20 | L1: 24.96 | 1.02 | 156 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 24.96 | 1.02 | | |
| | L3: 24.20 | L3: 24.20 | L3: 24.96 | 1.02 | | |
| P _R : 0% Q _C : +5% | L1: 24.20 | L1: 24.20 | L1: 25.20 | 1.02 | 148 | 500 |
| | L2: 24.20 | L2: 24.20 | L2: 25.20 | 1.02 | | |
| | L3: 24.20 | L3: 24.20 | L3: 25.20 | 1.02 | | |
| Power 33% | | | | | | |
| Input : 550 Vdc | | | | | | |
| Conditions | P _R [kW] | Q _L [kVar] | Q _C [kVar] | Q _f | Trip time [ms] | Limitation [ms] |
| P _R : 0% Q _C : -5% | L1: 12.10 | L1: 12.10 | L1: 11.50 | 0.97 | 103 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 11.40 | 0.97 | | |
| | L3: 12.00 | L3: 12.00 | L3: 11.50 | 0.98 | | |
| P _R : 0% Q _C : -4% | L1: 12.10 | L1: 12.10 | L1: 11.62 | 0.98 | 111 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 11.52 | 0.98 | | |
| | L3: 12.00 | L3: 12.00 | L3: 11.62 | 0.98 | | |
| P _R : 0% Q _C : -3% | L1: 12.10 | L1: 12.10 | L1: 11.74 | 0.98 | 126 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 11.64 | 0.98 | | |
| | L3: 12.00 | L3: 12.00 | L3: 11.74 | 0.99 | | |
| P _R : 0% Q _C : -2% | L1: 12.10 | L1: 12.10 | L1: 11.86 | 0.99 | 138 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 11.76 | 0.99 | | |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| | | | | | | |
|---|-----------|-----------|-----------|------|-----|-----|
| | L3: 12.00 | L3: 12.00 | L3: 11.86 | 0.99 | | |
| P _R : 0% Q _C : -1% | L1: 12.10 | L1: 12.10 | L1: 11.98 | 0.99 | 182 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 11.88 | 0.99 | | |
| | L3: 12.00 | L3: 12.00 | L3: 11.98 | 1.00 | | |
| P _R : 0% Q _C : 0% | L1: 12.10 | L1: 12.10 | L1: 12.10 | 1.00 | 250 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 12.00 | 1.00 | | |
| | L3: 12.00 | L3: 12.00 | L3: 12.10 | 1.00 | | |
| P _R : 0% Q _C : +1% | L1: 12.10 | L1: 12.10 | L1: 12.22 | 1.00 | 235 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 12.12 | 1.00 | | |
| | L3: 12.00 | L3: 12.00 | L3: 12.22 | 1.01 | | |
| P _R : 0% Q _C : +2% | L1: 12.10 | L1: 12.10 | L1: 12.34 | 1.01 | 154 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 12.24 | 1.01 | | |
| | L3: 12.00 | L3: 12.00 | L3: 12.34 | 1.01 | | |
| P _R : 0% Q _C : +3% | L1: 12.10 | L1: 12.10 | L1: 12.46 | 1.01 | 128 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 12.36 | 1.01 | | |
| | L3: 12.00 | L3: 12.00 | L3: 12.46 | 1.02 | | |
| P _R : 0% Q _C : +4% | L1: 12.10 | L1: 12.10 | L1: 12.58 | 1.02 | 118 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 12.48 | 1.02 | | |
| | L3: 12.00 | L3: 12.00 | L3: 12.58 | 1.02 | | |
| P _R : 0% Q _C : +5% | L1: 12.10 | L1: 12.10 | L1: 12.71 | 1.02 | 108 | 500 |
| | L2: 12.10 | L2: 12.10 | L2: 12.60 | 1.02 | | |
| | L3: 12.00 | L3: 12.00 | L3: 12.71 | 1.03 | | |

Note(s):

| 8.2 | TABLE: Vector shift stability test | P |
|-------------------|------------------------------------|---------|
| Test Condition | Measurement | Limit |
| 49.5Hz, +50degree | No trip | No trip |
| 50.5Hz, -50degree | No trip | No trip |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| | | |
|---------------------------|-----------------------------|---------|
| 8.3 | TABLE: RoCoF stability test | P |
| Test Condition | Measurement | Limit |
| 49Hz->51Hz + 0.95 Hz/s | No trip | No trip |
| 51Hz->49Hz - 0.95 Hz/s | No trip | No trip |

| | | | | | | | | | | |
|--|--|--------|-----------------------|---------------------------|--------------------|--------------|---------------|-----------------|-----------------------|--------------------|
| 9.1 | TABLE: Limitest frequency sensitive mode-over frequency (LFSM-O) | P | | | | | | | | |
| Test No. 1 | | | | | | | | | | |
| Test Conditions | Measurements | | | | | Target value | Δ | Limitation | | |
| f [Hz] | P/Pn | f [Hz] | T _{rise} [s] | T _{settling} [s] | T _v [s] | P/Pn | Δ P/Pn | Δ P/Pn | T _{rise} [s] | T _v [s] |
| a) 50 | 100.0 | 50.0 | -- | -- | -- | 100 | 0.0 | $\leq \pm 10\%$ | ≤ 10 | ≤ 2 |
| b) 50.25 | 97.7 | 50.25 | 3.4 | 3.4 | 0.4 | 97.5 | 0.2 | | | |
| c) 50.7 | 76.1 | 50.7 | 0.8 | 0.8 | 0.2 | 75 | 1.1 | | | |
| d) 51.15 | 53.1 | 51.15 | 1.2 | 1.2 | 0.2 | 52.5 | 0.5 | | | |
| e) 50.7 | 74.9 | 50.7 | 0.9 | 0.9 | 0.2 | 75 | -0.1 | | | |
| f) 50.25 | 97.5 | 50.25 | 0.8 | 0.8 | 0.2 | 97.5 | 0.0 | | | |
| g) 50 | 99.8 | 50 | 1.0 | 1.0 | 0.2 | 100 | -0.2 | | | |
| Test No. 2 | | | | | | | | | | |
| Test Conditions | Measurements | | | | | Target value | Δ | Limitation | | |
| f [Hz] | P/Pn | f [Hz] | T _{rise} [s] | T _{settling} [s] | T _v [s] | P/Pn | Δ P/Pn | Δ P/Pn | T _{rise} [s] | T _v [s] |
| a) 50 | 49.9 | 50.0 | -- | -- | -- | 50 | -0.1 | $\leq \pm 10\%$ | ≤ 10 | ≤ 2 |
| b) 50.25 | 47.5 | 50.25 | 1.0 | 1.0 | 0.2 | 47.5 | 0.0 | | | |
| c) 50.7 | 25.2 | 50.7 | 0.8 | 0.8 | 0.2 | 25 | 0.2 | | | |
| d) 51.15 | 2.7 | 51.15 | 0.6 | 0.6 | 0.2 | 2.5 | 0.2 | | | |
| e) 50.7 | 24.8 | 50.7 | 0.5 | 0.5 | 0.2 | 25 | -0.2 | | | |
| f) 50.25 | 47.4 | 50.25 | 0.7 | 0.7 | 0.2 | 47.5 | -0.1 | | | |
| g) 50 | 49.9 | 50 | 0.8 | 0.8 | 0.2 | 50 | -0.1 | | | |
| Note(s): P(f) curve setting for test: f1: 50.2Hz; fstop: 50.2Hz (Deactivated); Droop: 4% Droop range:2%-12%, default setting 4%. | | | | | | | | | | |

Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record

Extract from test report according to the Engineering Recommendation G99/NI

| 10 | TABLE: Protection-Reconnection timer (Reconnection) | | | | P |
|---------------|---|-----------------------------|-----------------|----------------|---|
| Condition | Measurement | | Limitation | | |
| | Delay time [s] | Power Gradient [per minute] | Delay time [s] | Power Gradient | |
| Reconnection: | | | | | |
| 251.0V | 89 | -- | 60 | -- | |
| 197.5V | 92 | -- | | | |
| 48.1Hz | 92 | -- | | | |
| 51.9Hz | 91 | -- | | | |
| 257.0V | No reconnection | -- | No reconnection | -- | |
| 191.5V | No reconnection | -- | | | |
| 47.9Hz | No reconnection | -- | | | |
| 52.1Hz | No reconnection | -- | | | |
| Note(s): | | | | | |

| 11 | TABLE: Fault level contribution | | | P |
|-------------------|---------------------------------|-------|--|---|
| Test Condition | Measurement | | | |
| | U [V] | I [A] | | |
| 20ms after fault | 3.2 | 160.9 | | |
| 100ms after fault | 3.2 | 162.0 | | |
| 250ms after fault | 3.2 | 162.0 | | |
| 500ms after fault | 3.2 | 143.0 | | |
| Trip time [ms] | 4900 | | | |

| 12 | TABLE: Self-Monitoring solid state switching | N/A |
|---|--|-----|
| It has been verified that in the event of the solid state switching device failing to disconnect the Power Park Module, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0.5 s. | | N/A |

| 13 | TABLE: Wiring functional tests | N/A |
|---|--------------------------------|-----|
| Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning) | | N/A |

| |
|---|
| Appendix A2-3: Compliance Verification Report – Tests for Type A Inverter Connected Power Generating Modules – test record |
|---|

| |
|---|
| Extract from test report according to the Engineering Recommendation G99/NI |
|---|

| | | |
|----|---|---|
| 14 | TABLE: Logic interface (input port). | P |
| | Confirm that an input port is provided and can be used to shut down the module. | P |