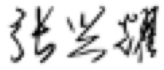
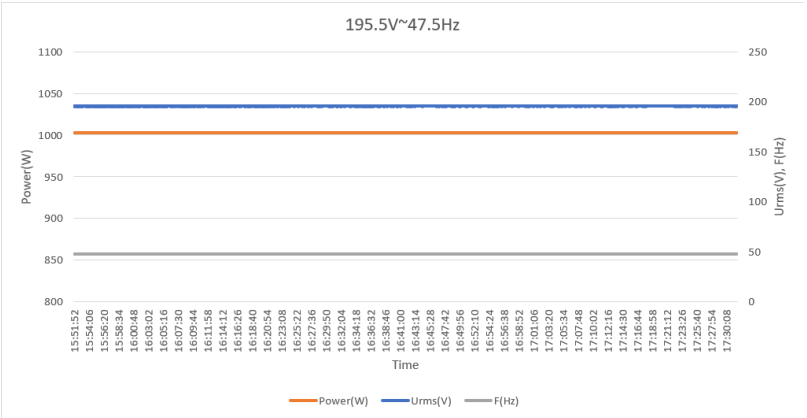
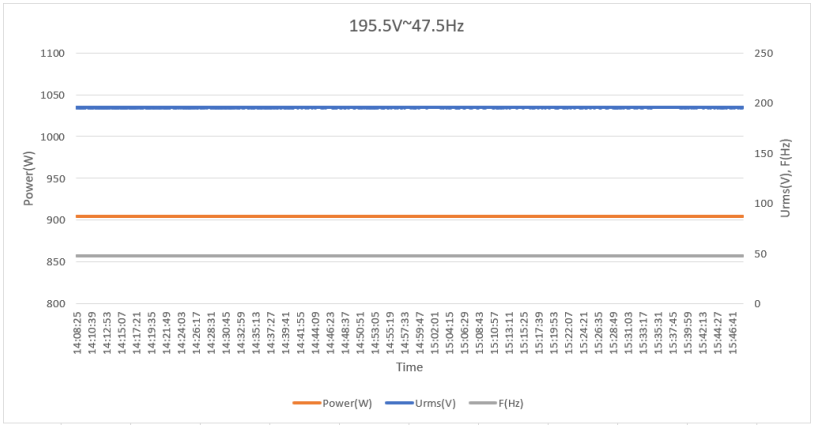
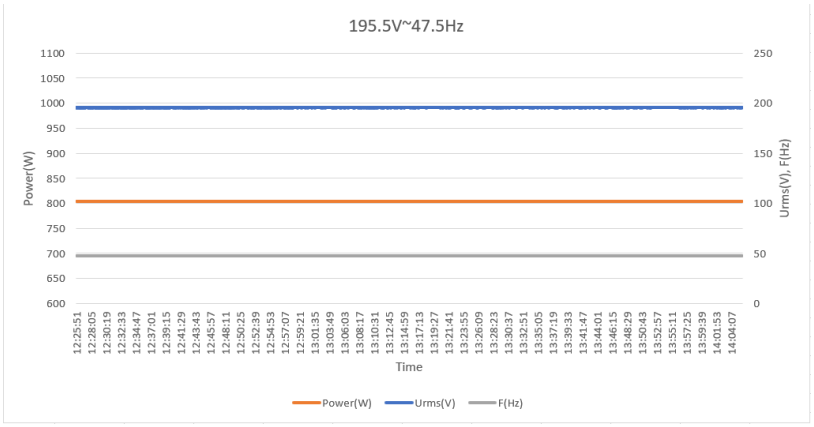
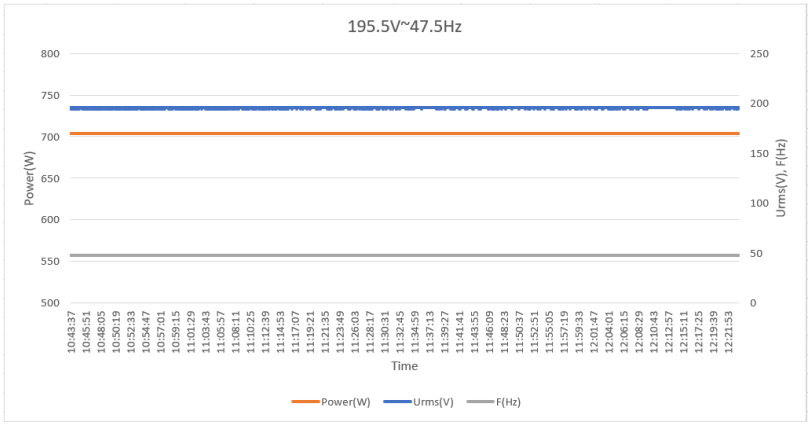
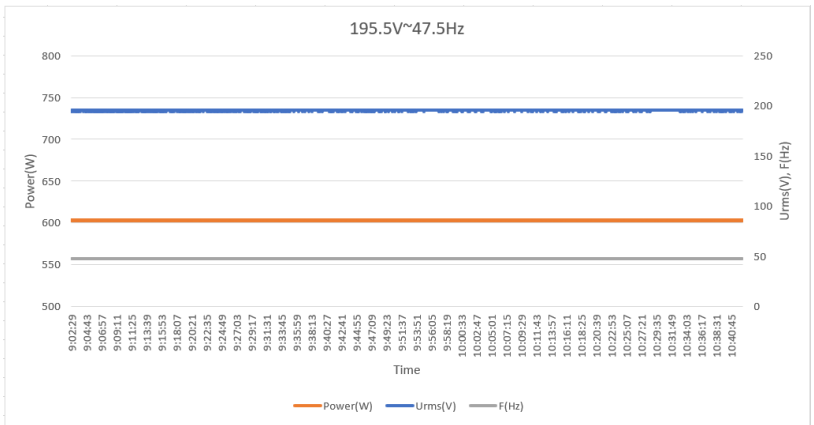
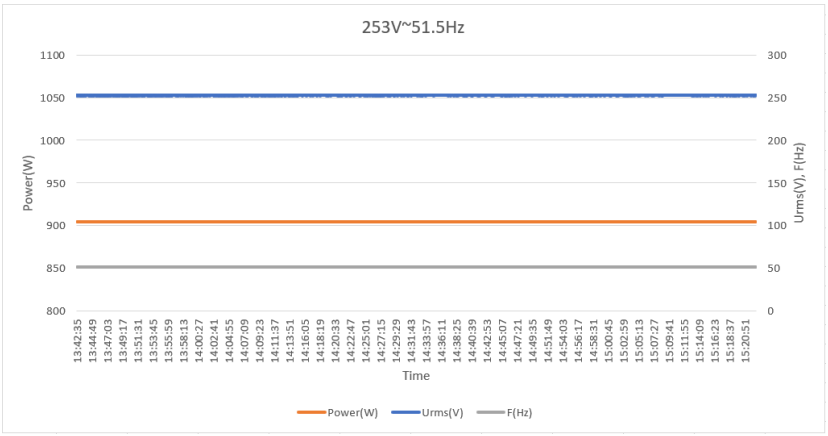
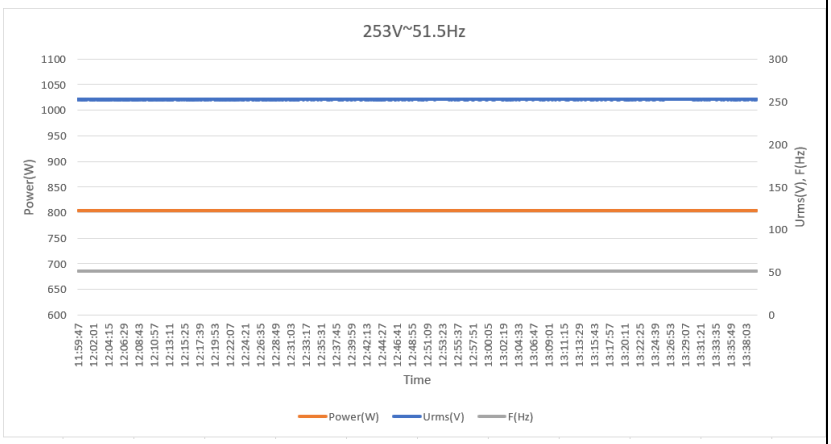
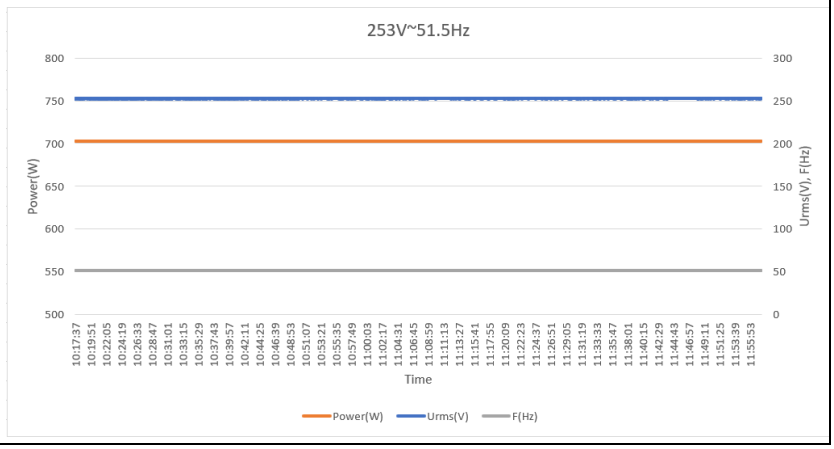
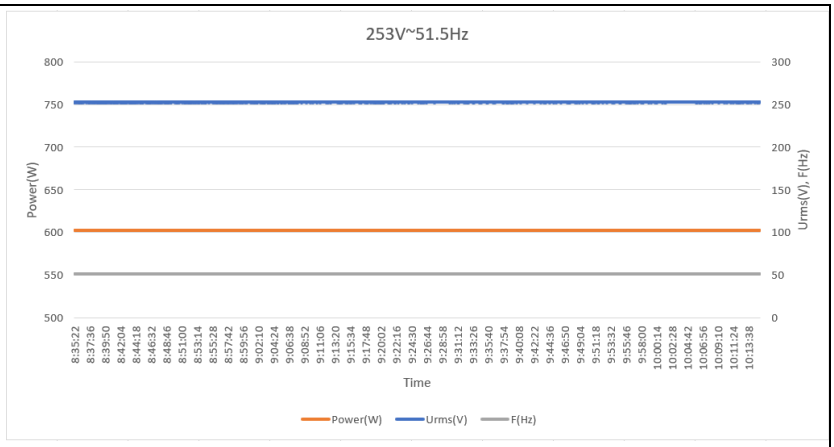
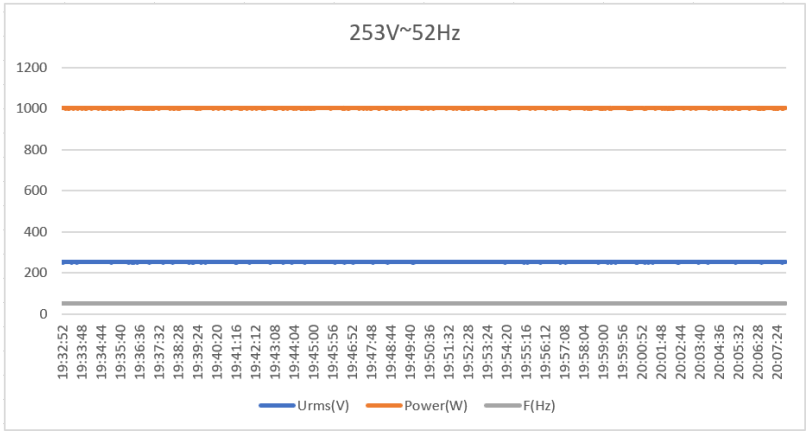
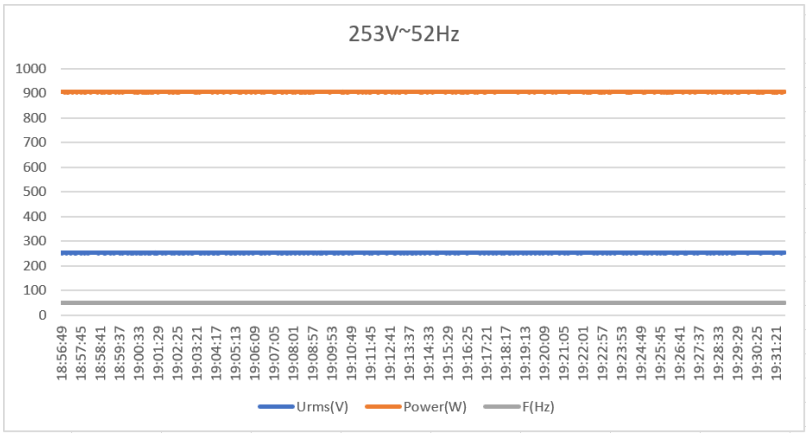
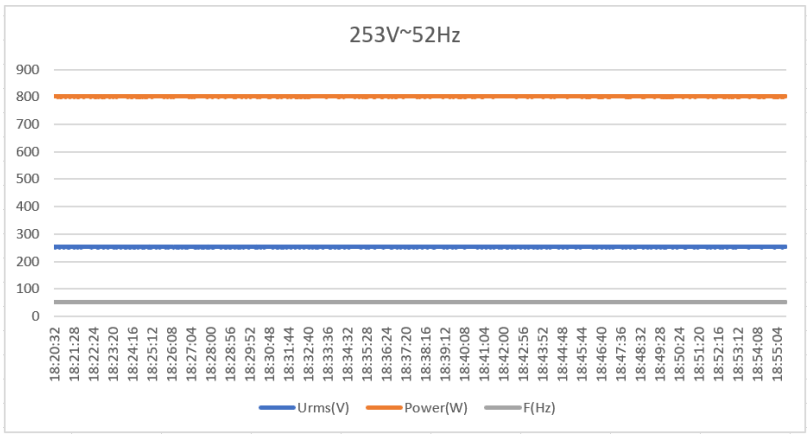
# ENA EREC G99/NI

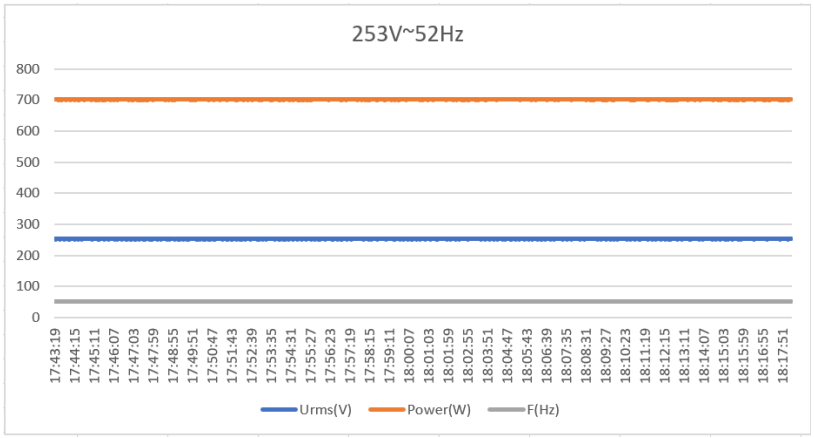
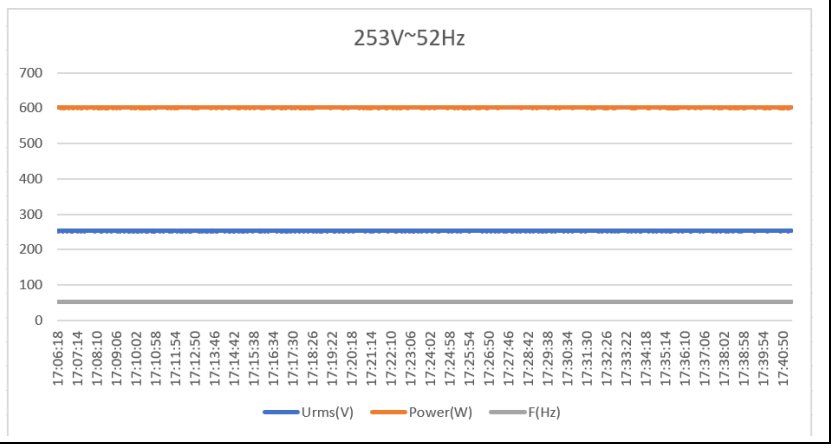
| | | | |
|---|---|---|---|
| Type Test reference number | | HMS-1000W-2T, HMS-900W-2T, HMS-800W-2T, HMS-700W-2T, HMS-600W-2T | |
| **Generating Unit** technology | | Photovoltaic Microinverter | |
| System Supplier name | | Hoymiles Power Electronics Inc. | |
| Address | | No.18 Kangjing Road, Hangzhou 310015, China | |
| Tel | +86 571 28056101 | Fax | - |
| E:mail | info@hoymiles.com | Web site | - |
| Registered Capacity, use separate sheet if more than one connection option. | 1.0/0.9/0.8/0.7/0.6 per Unit | kW single phase, single, split or three phase system | |
| | NA | kW three phase | |
| | NA | kW two phases in three phase system | |
| | NA | kW two phases split phase system | |
| Manufacturer compliance declaration. - I certify that all products supplied by the company with the above Type Tested Manufacturer's reference number will be manufactured and tested to ensure that they perform as stated in this document, prior to shipment to site and that no site Modifications are required to ensure that the product meets all the requirements of EREC G99/NI. | | | |
| Signed |  | On behalf of | Hoymiles Power Electronics Inc. |
| Note that testing can be done by the Manufacturer of an individual component or by an external test house.<br>Where parts of the testing are carried out by persons or organizations other than the Manufacturer then that person or organization shall keep copies of all test records and results supplied to them to verify that the testing has been carried out by people with sufficient technical competency to carry out the tests. | | | |

| **Operating Range** | |
|---|---|
| | Test 1:195.5V~47.5Hz, PF=1 |
| HMS-1000W-2T |  |

| | |
|---|---|
| HMS-900W-2T |  |
| HMS-800W-2T |  |
| HMS-700W-2T |  |
| HMS-600W-2T |  |
| | Test 2:253V~51.5Hz, PF=1 |

| | |
|---|---|
| HMS-1000W-2T |  |
| HMS-900W-2T |  |
| HMS-800W-2T |  |
| HMS-700W-2T |  |

| | |
|---|---|
| HMS-600W-2T |  |
| | Test 3:253V~52Hz, PF=1 |
| HMS-1000W-2T |  |
| HMS-900W-2T |  |
| HMS-800W-2T |  |

| | |
|---|---|
| HMS-700W-2T |  |
| HMS-600W-2T |  |

| **1. Power Quality - Harmonic Generation<br>Generating Unit tested to BS EN 61000-3-12** | | | | | | |
|---|---|---|---|---|---|---|
| **Generating Unit** rating per phase (rpp) | | | 1.0 | kW | Harmonic % =Measured Value (Amps) x 23/rating per phase (kVA) | |
| Harmonic | At 45-55% of rated output | | 100% of rated output | | Limit in BS EN 61000-3-12 | |
| | Measured Value MV in Amps | % | Measured Value MV in Amps | % | 1 phase | 3 phase |
| 2 | 0.0015 | 0.0345 | 0.0023 | 0.0529 | 8% | 8% |
| 3 | 0.0054 | 0.1242 | 0.0063 | 0.1449 | 21.6% | Not stated |
| 4 | 0.0012 | 0.0276 | 0.0009 | 0.0207 | 4% | 4% |
| 5 | 0.0031 | 0.0713 | 0.0025 | 0.0575 | 10.7% | 10.7% |
| 6 | 0.0005 | 0.0115 | 0.0007 | 0.0161 | 2.67% | 2.67% |
| 7 | 0.0012 | 0.0276 | 0.0018 | 0.0414 | 7.2% | 7.2% |
| 8 | 0.0005 | 0.0115 | 0.0006 | 0.0138 | 2% | 2% |
| 9 | 0.0013 | 0.0299 | 0.0012 | 0.0276 | 3.8% | Not |

| | | | | | | stated |
|---|---|---|---|---|---|---|
| 10 | 0.0005 | 0.0115 | 0.0005 | 0.0115 | 1.6% | 1.6% |
| 11 | 0.0008 | 0.0184 | 0.001 | 0.023 | 3.1% | 3.1% |
| 12 | 0.0004 | 0.0092 | 0.0002 | 0.0046 | 1.33% | 1.33% |
| 13 | 0.0005 | 0.0115 | 0.0006 | 0.0138 | 2% | 2% |
| THD | | 2.6562 | | 2.8978 | 23% | 13% |
| PWHD | | 4.4799 | | 5.5703 | 23% | 22% |
| | | | | | | |

**2. Power Quality. Voltage fluctuations and Flicker**

**Test to BS EN 61000-3-11**

| | Starting | | | Stopping | | | Running | |
|---|---|---|---|---|---|---|---|---|
| | dmax [%] | dc [%] | d(t) [%] | dmax [%] | dc [%] | d(t) [%] | Pst | Plt 2 hours |
| Measured Values at test impedance | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0.066 | 0.066 |
| Normalised to standard impedance | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0.066 | 0.066 |
| Normalised to required maximum impedance | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0.066 | 0.066 |
| Limits set under BS EN 61000-3-11 | 4% | 3.3% | 3.3% | 4% | 3.3% | 3.3% | 1 | 0.65 |
| | | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Test impedance | R | 0.4 | Ω | XI | 0.25 | Ω |
| Standard impedance | R | 0.24*<br>0.4^ | Ω | XI | 0.15*<br>0.25^ | Ω |
| Maximum impedance | R | 0.4 | Ω | XI | 0.25 | Ω |
| Test start date | | 2023-07-24 | Test end date | | 2023-07-24 | |
| Test location | | SHANGHAI TESTING & INSPECTION INSTITUTE FOR ELECTRICAL EQUIPMENT CO., LTD. | | | | |

**3. Power quality. DC injection**

| Test power level | 10% | 55% | 100% | |
|---|---|---|---|---|
| Recorded value(mA) | 1.054 | 3.133 | 1.895 | |
| as % of rated AC | 0.0242 | 0.0721 | 0.0436 | |

| | | | | |
|---|---|---|---|---|
| current | | | | |
| Limit | 0.25% | 0.25% | 0.25% | |

| 4. **Power Quality. Power factor** | | | | |
|---|---|---|---|---|
| | 216.2V | 230V | 253V | Measured at three voltage levels and at full output. Voltage to be maintained within ±1.5% of the stated level during the test. |
| Measured value | 0.9989 | 0.9985 | 0.9978 | |
| Limit (Leading) | >0.95 | >0.95 | >0.95 | |
| Limit (Lagging) | >0.98 | >0.98 | >0.98 | |

| **5. Protection. Frequency tests** | | | | | | |
|---|---|---|---|---|---|---|
| Function | Setting | | Trip test | | "No trip tests" | |
| | Frequency | Time delay | Frequency | Time delay | Frequency /time | Confirm no trip |
| U/F | 48Hz | 0.5s | 48Hz | 0.52s | 48.2Hz/ 25s | Confirmed |
| | | | | | 47.8Hz/ 0.45s | Confirmed |
| O/F | 52Hz | 1.0s | 52Hz | 1.02s | 51.8Hz/120s | Confirmed |
| | | | | | 52.2Hz/ 0.98s | Confirmed |

| 6. **Protection. Voltage tests** | | | | | | |
|---|---|---|---|---|---|---|
| Function | Setting | | Trip test | | "No trip tests" | |
| | Voltage | Time delay | Voltage | Time delay | Voltage /time | Confirm no trip |
| U/V stage 1 | 195.5V | 3s | 195.2V | 3.02s | 199.5V/5s | Confirmed |
| U/V stage 2 | 138V | 2s | 138.3V | 2.02s | 142V/2.5s | Confirmed |
| | | | | | 134V/1.95s | Confirmed |
| O/V stage 1 | 253V | 0.5s | 252.7V | 0.52s | 249V/5.0s | Confirmed |
| | | | | | 257V/0.45s | Confirmed |

| 7. **Power Park Modules - Protection – Loss of Mains test** | | | | | | |
|---|---|---|---|---|---|---|
| Note: Inverter tested according to BS EN 62116. | | | | | | |
| Test Power and | 33% | 66% | 100% | 33% | 66% | 100% |

| imbalance | -5% Q Test 22 | -5% Q Test 12 | -5% P Test 5 | +5% Q Test 31 | +5% Q Test 21 | +5% P Test 10 |
|---|---|---|---|---|---|---|
| Trip time. Limit is 0.5s | 91.6ms | 183.5ms | 243.2ms | 94.8ms | 181.4ms | 246.7ms |

| **8. Loss of Mains Protection, Vector Shift Stability test and RoCoF Stability test** | | | | |
|---|---|---|---|---|
| | Start Frequency | Change | End Frequency | Confirm no trip |
| Positive Vector Shift | 49.5Hz | +50 degrees | | Confirmed |
| Negative Vector Shift | 50.5Hz | - 50 degrees | | Confirmed |
| | Ramp range | Test frequency ramp | Test Duration | Confirm no trip |
| Positive Frequency drift | 49Hz to 51Hz | +0.95Hz/sec | 2.1s | Confirmed |
| Negative Frequency drift | 51Hz to 49Hz | -0.95Hz/sec | 2.1s | Confirmed |

| 9. **Limited Frequency Sensitive Mode – Over frequency test** | | | | |
|---|---|---|---|---|
| Active Power response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex A.8.2.4 | | | | |
| Test sequence at Registered Capacity >80 % | Measured Active Power Output (W) | Frequency (Hz) | Primary Power Source | Active Power Gradient |
| Step a) 50.00Hz ±0.01Hz | 1003.6 | 50 | | - |
| Step b) 50.25Hz ±0.01Hz | 992.8 | 50.25 | | - |
| Step c) 50.70Hz ±0.10Hz | 905.3 | 50.7 | | - |
| Step d) 51.15Hz ±0.05Hz | 814.6 | 51.15 | | - |
| Step e) 50.70Hz ±0.10Hz | 903.5 | 50.7 | | - |
| Step f) 50.25Hz ±0.05Hz | 991.7 | 50.25 | | - |
| Step g) 50.00Hz ±0.01Hz | 1002.9 | 50 | | - |
| Test sequence at Registered Capacity 40%~60% | Measured Active Power Output | Frequency | Primary Power Source | Active Power Gradient |
| Step a) 50.00Hz ±0.01Hz | 505.8 | 50 | | - |
| Step b) 50.25Hz ±0.05Hz | 499.1 | 50.25 | | - |
| Step c) 50.70Hz | 456.2 | 50.7 | | - |

| | | | | |
|---|---|---|---|---|
| ±0.10Hz | | | | |
| Step d) 51.15Hz ±0.05Hz | 409.5 | 51.15 | | - |
| Step e) 50.70Hz ±0.10Hz | 455.9 | 50.7 | | - |

| 10. **Protection. Re-connection timer** | | | | | |
|---|---|---|---|---|---|
| Test should prove that the reconnection sequence starts in no less than 20s for restoration of voltage and frequency to within the stage 1 settings of table 10.5.7.1 | | | | | |
| Time delay setting | Measured delay | Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 10.5.7.1. | | | |
| 60s | 60.8s | At 257V | At 191.5V | At 47.9Hz | At 52.1Hz |
| Confirmation that the **Generating Unit** does not re-connect. | | Confirmed | Confirmed | Confirmed | Confirmed |

| **11. Fault level contribution** | | | | | |
|---|---|---|---|---|---|
| For machines with electro-magnetic output | | | For Inverter output | | |
| Parameter | Symbol | Value | Time after fault | Volts | Amps |
| Peak Short Circuit current | ip | N/A | 20ms | 19.12V | 0.679A |
| Initial Value of aperiodic current | A | N/A | 100ms | 11.67V | 0.235A |
| Initial symmetrical short-circuit current* | Ik | N/A | 250ms | 9.54V | 0.186A |
| Decaying (aperiodic) component of short circuit current* | iDC | N/A | 500ms | 5.43V | 0.153A |
| Reactance/Resistance Ratio of source* | X/R | N/A | Time to trip | 0.004s | |
| For rotating machines and linear piston machines the test should produce a 0s – 2s plot of the short circuit current as seen at the Generating Unit terminals.<br>* Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot | | | | | |

| **12. Self-Monitoring solid state switching** | Yes/or NA |
|---|---|
| It has been verified that in the event of the solid state switching device failing to disconnect the **Generating Unit**, the voltage on the output side of the | N/A |

| | |
|---|---|
| switching device is reduced to a value below 50 Volts within 0.5 seconds | |

| **13. Wiring functional tests:** If required by para 15.2.1 | Yes/or NA |
|---|---|
| Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning). | N/A |

| **14. Logic interface (input port)** | Yes/or NA |
|---|---|
| Confirm that an input port is provided and can be used to shut down the module. | Yes |