## Form A2-3: Compliance Verification Report for Type A Inverter Connected Power Generating Modules

This form should be used by the **Manufacturer** to demonstrate and declare compliance with the requirements of EREC G99. The form can be used in a variety of ways as detailed below:

1. To obtain **Fully Type Tested** status (≤ 50 kW)

   The **Manufacturer** can use this form to obtain **Fully Type Tested** status for a **Power Generating Module** by registering this completed form with the Energy Networks Association (ENA) Type Test Verification Report Register. Tests 1 – 15 must all be completed and compliant for the **Power Generating Module** to be classified as **Fully Type Tested**.

2. To obtain **Type Tested** status for a product

   This form can be used by the **Manufacturer** to obtain **Type Tested** status for a product which is used in a **Power Generating Module** by registering this form with the relevant parts completed with the Energy Networks Association (ENA) Type Test Verification Report Register.
   Where the **Manufacturer** is seeking to obtain **Type Tested** status for an **Interface Protection** device the appropriate section of Form A2-4 should be used.

3. One-off Installation

   This form can be used by the **Manufacturer** or **Installer** to confirm that the **Power Generating Module** has been tested to satisfy all or part of the requirements of this EREC G99. This form shall be submitted to the **DNO** as part of the application.

A combination of (2) and (3) can be used as required, together with Form A2-4 where compliance of the **Interface Protection** is to be demonstrated on site.

Note:

Within this Form A2-3 the term **Power Park Module** will be used but its meaning can be interpreted within Form A2-3 to mean **Power Park Module**, **Generating Unit or Inverter** as appropriate for the context. However, note that compliance shall be demonstrated at the **Power Park Module** level.

If the **Power Generating Module** is **Fully Type Tested** and registered with the Energy Networks Association (ENA) Type Test Verification Report Register, the Installation Document (Form A3-1 or A3-2) should include the **Manufacturer's** reference number (the system reference), and this form does not need to be submitted.

Where the **Power Generating Module** is not registered with the ENA Type Test Verification Report Register or is not **Fully Type Tested** this form (all or in parts as applicable) needs to be completed and provided to the **DNO**, to confirm that the **Power Generating Module** has been tested to satisfy all or part of the requirements of this EREC G99.

| | | | |
|---|---|---|---|
| **PGM** technology | | Transformerless - LIBBI-HS5000 | |
| **Manufacturer** name | | Myenergi Ltd | |
| Address | | Pioneer Business Park, Faraday Way, Grimsby, DN418FF, UNITED KINGDOM | |
| Tel | 0333300 1303 | Web site | www.myenergi.com |
| E:mail | james.chapman@myenergi.com | | |
| **Registered Capacity** | | 5 kW | |

| | |
|---|---|
| Energy storage capacity for **Electricity Storage** devices | 5 / 10 / 15 / 20 kWh |

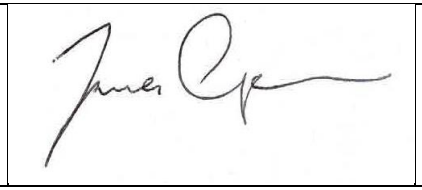
Type A

| There are four options for Testing: (1) **Fully Type Tested**(≤ 50 kW), (2) **Type Tested** product, (3) one-off installation, (4) tested on site at time of commissioning. The check box below indicates which tests in this Form have been completed for each of the options. With the exception of **Fully Type Tested PGM**s tests may be carried out at the time of commissioning (Form A4). **Type Tested** status is suitable for devices > 50 kW where the power quality aspects need consideration on a site by site basis in accordance with EREC G5 and EREC P28.<br>Insert Document reference(s) for **Manufacturers' Information** | | | | |
|---|---|---|---|---|
| **Tested option:** | **1. Fully Type Tested** | **2. Type Tested product** | **3. One-off Manufacturers' Info.** | **4. Tested on Site at time of Commissioning** |
| 0. **Fully Type Tested** - all tests detailed below completed and evidence attached to this submission | | **N/A** | **N/A** | **N/A** |
| 1. Operating Range | **N/A** | | | |
| 2. PQ – Harmonics | | | | |
| 3. PQ – Voltage Fluctuation and Flicker | | | | |
| 4. PQ – DC Injection (**Power Park Module**s only) | | | | |
| 5. **Power Factor** (PF) | | | | |
| 6. Frequency protection trip and ride through tests | | | | |
| 7. Voltage protection trip and ride through tests | | | | |
| 8. Protection – Loss of Mains Test, Vector Shift and RoCoF Stability Test | | | | |
| 9. **LFSM-O** Test | | | | |
| 10. Protection – Reconnection Timer | | | | |
| 11. Fault Level Contribution | | | | |

There are four options for Testing: (1) **Fully Type Tested**(≤ 50 kW), (2) **Type Tested** product, (3) one-off installation, (4) tested on site at time of commissioning. The check box below indicates which tests in this Form have been completed for each of the options. With the exception of **Fully Type Tested PGM**s tests may be carried out at the time of commissioning (Form A4). **Type Tested** status is suitable for devices > 50 kW where the power quality aspects need consideration on a site by site basis in accordance with EREC G5 and EREC P28.
Insert Document reference(s) for **Manufacturers' Information**

| **Tested option:** | **1. Fully Type Tested** | **2. Type Tested product** | **3. One-off Manufacturers' Info.** | **4. Tested on Site at time of Commissioning** |
|---|---|---|---|---|
| 12. Self-monitoring Solid State Switch | | | | |
| 13. Wiring functional tests if required by para 15.2.1 (attach relevant schedule of tests) | | | | |
| 14. Logic Interface (input port) | | | | |
| 15. Cyber security | | | | |

**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 **Modification**s are required to ensure that the product meets all the requirements of EREC G99.

| Signed |  | On behalf of | myenergi Ltd |
|---|---|---|---|

Note that testing can be done by the **Manufacturer** of an individual component or by an external test house.

Where parts of the testing are carried out by persons or organisations other than the **Manufacturer** then that person or organisation 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.

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

**1. Operating Range:** Tests should be carried with the **Power Generating Module** operating at **Registered Capacity** and connected to a suitable test supply or grid simulation set. The power supplied by the primary source shall be kept stable within ± 5 % of the apparent power value set for the entire duration of each test sequence.

Frequency, voltage and **Active Power** measurements at the output terminals of the **Power Generating Module** shall be recorded every second. The tests will verify that the **Power Generating Module** can operate within the required ranges for the specified period of time.

The **Interface Protection** shall be disabled during the tests.

In case of a PV **Power Park Module** the PV primary source may be replaced by a DC source.

In case of a full converter **Power Park Module** (eg wind) the primary source and the prime mover I**nverter**/rectifier may be replaced by a DC source.

Pass or failure of the test should be indicated in the fields below (right hand side), for example with the statement "Pass", "No disconnection occurs", etc. Graphical evidence is preferred.

Note that the value of voltage stated in brackets assumes a **LV** connection. This should be adjusted for **HV** as required.

| | |
|---|---|
| Test 1<br><br>Voltage = 85% of nominal (195.5 V),<br>Frequency = 47 Hz,<br>**Power Factor** = 1,<br>Period of test 20 s | Measured Voltage(V): 196.6<br>Measured Frequency(Hz):47<br>Measured Power(W): 5136<br>Measured Factor:1<br>Period of test: 20 seconds<br>Confirm normal operation: YES |
| Test 2<br><br>Voltage = 85% of nominal (195.5 V),<br>Frequency = 47.5 Hz,<br>**Power Factor** = 1,<br>Period of test 90 minutes | Measured Voltage(V): 196.8<br>Measured Frequency(Hz):47.5<br>Measured Power(W): 5157<br>Measured Factor:1<br>Period of test: 90 minutes<br>Confirm normal operation: YES |
| Test 3<br><br>Voltage = 110% of nominal (253 V).,<br>Frequency = 51.5 Hz,<br>**Power Factor** = 1,<br>Period of test 90 minutes | Measured Voltage(V): 254.3<br>Measured Frequency(Hz):51.5<br>Measured Power(W): 6029<br>Measured Factor:1<br>Period of test: 90 minutes<br>Confirm normal operation: YES |
| Test 4<br><br>Voltage = 110% of nominal (253 V),<br>Frequency = 52.0 Hz,<br>**Power Factor** = 1,<br>Period of test 15 minutes | Measured Voltage(V): 254.3<br>Measured Frequency(Hz):52<br>Measured Power(W): 6024<br>Measured Factor:1<br>Period of test: 15 minutes<br>Confirm normal operation: YES |

| | |
|---|---|
| Test 5<br>Voltage = 100% of nominal (230 V),<br>Frequency = 50.0 Hz,<br>**Power Factor** = 1,<br>Period of test = 90 minutes | Measured Voltage(V):230<br>Measured Frequency(Hz):50<br>Measured Power(W):5000<br>Measured Factor:1<br>Period of test: 90 minutes<br>Confirm normal operation: YES |
| Test 6 RoCoF withstand<br><br>Confirm that the **Power Generating Module** is capable of staying connected to the **Distribution Network** and operate at rates of change of frequency up to 1 $Hzs^{-1}$ as measured over a period of 500 ms. Note that this is not expected to be demonstrated on site. | Measured Voltage(V):230<br>Measured Frequency(Hz):50±1<br>Measured Power(W):5000<br>Period of test: 1 second<br>Confirm normal operation: YES |

**2. Power Quality – Harmonics**:

For **Power Generating Module**s of **Registered Capacity** of less than 75 A per phase (ie 50 kW) the test requirements are specified in Annex A.7.1.5. These tests should be carried out as specified in BS EN 61000-3-12, and measurements for the 2nd – 13th harmonics should be provided. The results need to comply with the limits of Table 2 of BS EN 61000-3-12 for single phase equipment and Table 3 of BS EN 610000-3-12 for three phase equipment. For three phase **Power Generating Module**s, measurements for all phases should be provided.

For **Power Generating Module**s of **Registered Capacity** of greater than 75 A per phase (ie 50 kW) the installation shall be designed in accordance with EREC G5.

The rating of the **Power Generating Module** (per phase) should be provided below, and the Total Harmonic Distortion (THD) and Partial Weighted Harmonic Distortion (PWHD) should be provided at the bottom of this section.

**Power Generating Module** tested to BS EN 61000-3-12

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Power Generating Module** rating per phase (rpp) | | | | 5 | | kVA | Harmonic % = Measured Value (A) x 23/rating per phase (kVA) | |
| Single or three phase measurements (for single phase measurements, only complete L1 columns below). | | | | | | | | |
| Harmonic | At 45-55% of **Registered Capacity** | | | | | | Limit in BS EN 61000-3-12 | |
| | Measured Value (MV) in Amps | | | Measured Value (MV) in % | | | | |
| | L1 | L2 | L3 | L1 | L2 | L3 | 1 phase | 3 phase |
| 2 | 0.035 | | | 0.27 | | | 8% | 8% |
| 3 | 0.158 | | | 1.22 | | | 21.6% | Not stated |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4 | 0.011 | | | 0.08 | | | 4% | 4% |
| 5 | 0.062 | | | 0.47 | | | 10.7% | 10.7% |
| 6 | 0.010 | | | 0.08 | | | 2.67% | 2.67% |
| 7 | 0.057 | | | 0.44 | | | 7.2% | 7.2% |
| 8 | 0.008 | | | 0.007 | | | 2% | 2% |
| 9 | 0.050 | | | 0.072 | | | 3.8% | Not stated |
| 10 | 0.011 | | | 0.009 | | | 1.6% | 1.6% |
| 11 | 0.036 | | | 0.068 | | | 3.1% | 3.1% |
| 12 | 0.006 | | | 0.006 | | | 1.33% | 1.33% |
| 13 | 0.029 | | | 0.062 | | | 2% | 2% |
| THD[27] | | | | 1.52 | | | 23% | 13% |
| PWHD[28] | | | | 0.83 | | | 23% | 22% |
| Harmonic | At 100% of **Registered Capacity** | | | | | | Limit in BS EN 61000-3-12 | |
| | Measured value (MV) in Amps | | | Measured value (MV) in % | | | | |
| | L1 | L2 | L3 | L1 | L2 | L3 | 1 phase | 3 phase |
| 2 | 0.016 | | | 0.06 | | | 8% | 8% |
| 3 | 0.333 | | | 1.28 | | | 21.6% | Not stated |
| 4 | 0.007 | | | 0.03 | | | 4% | 4% |
| 5 | 0.151 | | | 0.58 | | | 10.7% | 10.7% |
| 6 | 0.006 | | | 0.02 | | | 2.67% | 2.67% |
| 7 | 0.084 | | | 0.32 | | | 7.2% | 7.2% |
| 8 | 0.007 | | | 0.03 | | | 2% | 2% |
| 9 | 0.072 | | | 0.28 | | | 3.8% | Not stated |
| 10 | 0.009 | | | 0.03 | | | 1.6% | 1.6% |

[27] THD = Total Harmonic Distortion

[28] PWHD = Partial Weighted Harmonic Distortion

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 11 | 0.068 | | | 0.26 | | | 3.1% | 3.1% |
| 12 | 0.006 | | | 0.02 | | | 1.33% | .33% |
| 13 | 0.062 | | | 0.24 | | | 2% | 2% |
| THD[29] | | | | 1.53 | | | 23% | 13% |
| PWHD[30] | | | | 1.08 | | | 23% | 22% |

**3. Power Quality – Voltage fluctuations and Flicker**:

For **Power Generating Module**s of **Registered Capacity** of less than 75 A per phase (ie 50 kW) these tests should be undertaken in accordance with Annex A.7.1.4.3. Results should be normalised to a standard source impedance, or if this results in figures above the limits set in BS EN 61000-3-11 to a suitable Maximum Impedance.

For **Power Generating Module**s of **Registered Capacity** of greater than 75 A per phase (ie 50 kW) the installation shall be designed in accordance with EREC P28.

The standard test impedance is 0.4 Ω for a single phase **Power Generating Module** (and for a two phase unit in a three phase system) and 0.24 Ω for a three phase **Power Generating Module** (and for a two phase unit in a split phase system). Please ensure that both test and standard impedance are completed on this form. If the test impedance (or the measured impedance) is different to the standard impedance, it must be normalised to the standard impedance as follows (where the **Power Factor** of the generation output is 0.98 or above):

d max normalised value = (Standard impedance / Measured impedance) x Measured value.

Where the **Power Factor** of the output is under 0.98 then the X to R ratio of the test impedance should be close to that of the standard impedance.

The stopping test should be a trip from full load operation.

The duration of these tests needs to comply with the particular requirements set out in the testing notes for the technology under test.

The test date and location must be declared.

| | | | |
|---|---|---|---|
| Test start date | 5TH September | Test end date | 11TH September |
| Test location | TUV SUD Certification and Testing(China) Co., Ltd. Guangzhou Branch | | |

| | Starting | | | Stopping | | | Running | |
|---|---|---|---|---|---|---|---|---|
| | d max | d c | d(t) | d max | d c | d(t) | P st | P lt 2 hours |
| Measured Values at | 0.343 % | 0.295% | 0 | 0% | 0% | 0.344% | 0.182 | 0.136 |

[29] THD = Total Harmonic Distortion

[30] PWHD = Partial Weighted Harmonic Distortion

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| test impedance | | | | | | | | |
| Normalised to standard impedance | | | | | | | | |
| Normalised to required maximum impedance | | | | | | | | |
| Limits set under BS EN 61000-3-11 | 4% | 3.3% | 3.3% | 4% | 3.3% | 3.3% | 1.0 | 0.65 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Impedance | R | 0.4 | Ω | Xl | 0.25 | Ω |
| Standard Impedance | R | 0.24 *<br>0.4 ^ | Ω | Xl | 0.15 *<br>0.25 ^ | Ω |
| Maximum Impedance | R | | Ω | Xl | | Ω |

* Applies to three phase and split single phase **Power Generating Module**s. Delete as appropriate.

^ Applies to single phase **Power Generating Module** and **Power Generating Module**s using two phases on a three phase system. Delete as appropriate.

**4. Power quality – DC injection:** The tests should be carried out on a single **Generating Unit**. Tests are to be carried out at three defined power levels ±5%. At 230 V a 50 kW three phase **Inverter** has a current output of 217 A so DC limit is 543 mA. These tests should be undertaken in accordance with Annex A.7.1.4.4.

The % DC injection ("as % of rated AC current" below) is calculated as follows:

% DC injection = Recorded DC value in Amps / Base current

where the base current is the **Registered Capacity** (W) / Vphase. The % DC injection should not be greater than 0.25%.

| Test power level | 10% | 55% | 100% |
|---|---|---|---|
| Recorded DC value in Amps | 0.008 | 0.010 | 0.011 |
| as % of rated AC current | 0.037% | 0.046% | 0.051% |
| Limit | 0.25% | 0.25% | 0.25% |

**5. Power Factor**: The tests should be carried out on a single **Power Generating Module**. Tests are to be carried out at three voltage levels and at **Registered Capacity** and the measured **Power Factor** must be

greater than 0.95 to pass. Voltage to be maintained within ±1.5% of the stated level during the test. These tests should be undertaken in accordance with Annex A.7.1.4.2.

Note that the value of voltage stated in brackets assumes a **LV** connection. This should be adjusted for **HV** as required.

| Voltage | 0.94 pu (216.2 V) | 1 pu (230 V) | 1.1 pu (253 V) |
|---|---|---|---|
| Measured value | 0.9997 | 0.9997 | 0.9997 |
| **Power Factor** Limit | >0.95 | >0.95 | >0.95 |

**6. Protection – Frequency tests:** These tests should be carried out in accordance with the Annex A.7.1.2.3. For trip tests, frequency and time delay should be stated. For “no trip tests”, “no trip” can be stated.

| Function | Setting | | Trip test | | “No trip tests” | |
|---|---|---|---|---|---|---|
| | Frequency | Time delay | Frequency | Time delay | Frequency /time | Confirm no trip |
| U/F stage 1 | 47.5 Hz | 20 s | 47.46 Hz | 20.074 s | 47.7 Hz 30 s | No trip |
| U/F stage 2 | 47 Hz | 0.5 s | 46.97 Hz | 0.498 s | 47.2 Hz 19.5 s | No trip |
| | | | | | 46.8 Hz 0.45 s | No trip |
| O/F | 52 Hz | 0.5 s | 52.02 Hz | 0.496 s | 51.8 Hz 120.0 s | No trip |
| | | | | | 52.2 Hz 0.45 s | No trip |

Note. For frequency trip tests the frequency required to trip is the setting ± 0.1 Hz. In order to measure the time delay a larger deviation than the minimum required to operate the projection can be used. The “No trip tests” need to be carried out at the setting ± 0.2 Hz and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

**7. Protection – Voltage tests:** These tests should be carried out in accordance with Annex A.7.1.2.2. For trip tests, voltage and time delay should be stated. For “no trip tests”, “no trip” can be stated.

Note that the value of voltage stated below assumes a **LV** connection This should be adjusted for **HV** taking account of the VT ratio as required.

| Function | Setting | | Trip test | | “No trip tests” | |
|---|---|---|---|---|---|---|
| | Voltage | Time delay | Voltage | Time delay | Voltage /time | Confirm no trip |
| U/V | 0.8 pu (184 V) | 2.5 s | 183.0V | 2.500s | 188 V 5.0 s | No trip |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | 180 V<br>2.45 s | No trip |
| O/V stage 1 | 1.14 pu (262.2 V ) | 1.0 s | 262.8V | 1.010s | 258.2 V<br>5.0 s | No trip |
| O/V stage 2 | 1.19 pu (273.7 V ) | 0.5 s | 273.6V | 0.501s | 269.7 V<br>0.95 s | No trip |
| | | | | | 277.7 V<br>0.45 s | No trip |

Note for Voltage tests the Voltage required to trip is the setting ±3.45 V. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting ±4 V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

**8.Protection – Loss of Mains test:** These tests should be carried out in accordance with BS EN 62116. Annex A.7.1.2.4.

The following sub set of tests should be recorded in the following table.

| Test Power and imbalance | 33%<br>-5% Q<br>Test 22 | 66%<br>-5% Q<br>Test 12 | 100%<br>-5% P<br>Test 5 | 33%<br>+5% Q<br>Test 31 | 66%<br>+5% Q<br>Test 21 | 100%<br>+5% P<br>Test 10 |
|---|---|---|---|---|---|---|
| Trip time.<br>Limit is 0.5s[31] | 0.267s | 0.376s | 0.453s | 0.270s | 0.409 | 0.441 |

**Loss of Mains Protection, Vector Shift Stability test:** This test should be carried out in accordance with Annex A.7.1.2.6. Confirmation is required that the **Power Generating Module** does not trip under positive / negative vector shift.

| | Start Frequency | Change | Confirm no trip |
|---|---|---|---|
| Positive Vector Shift | 49.5 Hz | +50 degrees | No trip |
| Negative Vector Shift | 50.5 Hz | - 50 degrees | No trip |

[31] If the device requires additional shut down time (beyond 0.5 s but less than 1 s) then this should be stated on this form.

| | | | |
|---|---|---|---|
| **Loss of Mains Protection, RoCoF Stability test:** This test should be carried out in accordance with Annex A.7.1.2.6. Confirmation is required that the **Power Generating Module** does not trip for the duration of the ramp up and ramp down test. | | | |
| Ramp range | Test frequency ramp: | Test Duration | Confirm no trip |
| 49.0 Hz to 51.0 Hz | +0.95 $Hzs^{-1}$ | 2.1 s | No trip |
| 51.0 Hz to 49.0 Hz | -0.95 $Hzs^{-1}$ | 2.1 s | No trip |

| | |
|---|---|
| **9. Limited Frequency Sensitive Mode – Overfrequency test:** The test should be carried out using the specific threshold frequency of 50.4 Hz and **Droop** of 10%.<br>This test should be carried out in accordance with Annex A.7.1.3, which also contains the measurement tolerances. | |
| **Active Power** response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex A.7.2.4. | **Y/N** |
| Alternatively, test results should be noted below: | |

| **Note: $P_{ref}$ = $P_M$ = 4977 W, Droop = 10%, threshold frequency 50.4Hz** | | | | |
|---|---|---|---|---|
| Test sequence at **Registered Capacity** >80% | Measured **Active Power** Output | Frequency | Primary Power Source | **Active Power** Gradient |
| Step a) 50.00Hz ±0.01Hz | 4977W | 50.00Hz | 5100W | - |
| Step b) 50.45Hz ±0.05Hz | 4967W | 50.45Hz | | - |
| Step c) 50.70Hz ±0.10Hz | 4710W | 50.72Hz | | - |
| Step d) 51.15Hz ±0.05Hz | 4251W | 51.14Hz | | - |
| Step e) 50.70Hz ±0.10Hz | 4711W | 50.68Hz | | - |
| Step f) 50.45Hz ±0.05Hz | 4968W | 50.46Hz | | - |
| Step g) 50.00Hz ±0.01Hz | 4976W | 50.00Hz | | |

| **Note: $P_{ref}$ = $P_M$ = 2515 W, Droop = 10%, threshold frequency 50.4Hz** | | | | |
|---|---|---|---|---|
| Test sequence at **Registered Capacity** 40% - 60% | Measured **Active Power** Output | Frequency | Primary Power Source | **Active Power** Gradient |
| Step a) 50.00Hz ±0.01Hz | 2515W | 50.00Hz | 2600W | - |
| Step b) 50.45Hz ±0.05Hz | 2248W | 50.46Hz | | - |

| | | | | |
|---|---|---|---|---|
| Step c) 50.70Hz ±0.10Hz | 1977W | 50.69Hz | | - |
| Step d) 51.15Hz ±0.05Hz | 1513W | 51.14Hz | | - |
| Step e) 50.70Hz ±0.10Hz | 1978W | 50.68Hz | | - |
| Step f) 50.45Hz ±0.05Hz | 2246W | 50.46Hz | | |
| Step g) 50.00Hz ±0.01Hz | 2515W | 50.00Hz | | |

**10. Protection – Re-connection timer**

Test should prove that the reconnection sequence starts after a minimum delay of 20 s for restoration of voltage and frequency to within the stage 1 settings of Table 10.1. Both the time delay setting and the measured delay should be provided in this form; both should be greater than 20 s to pass. Confirmation should be provided that the **Power Generating Module** does not reconnect at the voltage and frequency settings below; a statement of "no reconnection" can be made.

| Time delay setting | Measured delay | Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of Table 10.1. | | | |
|---|---|---|---|---|---|
| 20s | See below | At 1.16 pu (266.2 V **LV** connection, 127.6 V **HV** connection assuming 110 V ph-ph VT) | At 0.78 pu (180.0 V **LV** connection, 85.8 V **HV** connection assuming 110 V ph-ph VT) | At 47.4 Hz | At 52.1 Hz |
| Confirmation that the **Power Generating Module** does not re-connect. | | No reconnection | No reconnection | No reconnection | No reconnection |
| Recover to normal operation range after confirmation of no reconnection | | At 1.12 pu | At 0.82 pu | At 47.6 Hz | At 51.9 Hz |
| Confirmation that the **Power Generating Module** shall reconnect | | 76.8s | 78.6s | 76.8s | 77.0s |

**11. Fault level contribution**: These tests shall be carried out in accordance with EREC G99 Annex A.7.1.5. Please complete each entry, even if the contribution to the fault level is zero.

For **Inverter** output

| Time after fault | Volts | Amps |
|---|---|---|
| 20ms | 0 | -25.6 |
| 100ms | 0 | 0 |
| 250ms | 0 | 0 |

| | | |
|---|---|---|
| 500ms | 0 | 0 |
| Time to trip | 0.032 | In seconds |

| | |
|---|---|
| **12. Self-Monitoring solid state switching:** No specified test requirements. Refer to Annex A.7.1.6. | |
| 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. | NA |
| **13. Wiring functional tests:** If required by para 15.2.1. | |
| Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning) | NA |
| **14. Logic interface (input port)** | |
| Confirm that an input port is provided and can be used to shut down the module | Yes |
| Provide high level description of logic interface, e.g. details in 11.1.3.1 such as AC or DC signal (the additional comments box below can be used) | Yes |
| The inverter incorporates a high level potential on pin 2 of the DRM port. The active power of the inverter decreases to zero, in accordance with the EREC G98 requirements.<br>Additionally, the inverter incorporates a serial communication link (RS485), which is used to reduce the active power output to zero, in accordance with the EREC G98 requirements. | |
| **15. Cyber security** | |
| Confirm that the **Power Generating Module** has been designed to comply with cyber security requirements, as detailed in 9.1.7. | Yes |
| Additional comments. | |
| The myenergi libbi BESS/ PV Inverter + controller has been designed to ensure cyber security<br>• Communication between the controller and myenergi servers is secured using AES encryption.<br>• PKI keys are updated /exchanged securely, using a secure factory key to establish the initial communication.<br>• All security credentials are stored in the controller, encrypted in a local flash memory enclave.<br>• The controller hardware has been designed to protect against local cyber attacks, eg, programming "fuses" are blown to prevent modification to the installed firmware or access to local memory/data<br>• Firmware updates are signed and downloaded over an encrypted link.<br>• Any communications between the controller and other myenergi devices used a proprietary protocol which is also encrypted.<br><br>There is no other port to access the device through internet. | |