Type A ENA Engineering Recommendation G99

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| **Form A2-2: Compliance Verification Report for Synchronous and Asynchronous (non inverter) Power Generating Modules > 50 kW and also for Synchronous and Asynchronous (non inverter) Power Generating Modules ≤ 50 kW where the approach of this form is preferred to that in Form A2-1**  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 – 14 must all be completed and compliant for the **Power Generating Module** to be classified as **Fully Type Tested**.   1. 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.   1. 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:  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 | |  | | | |
| **Manufacturer** name | |  | | | |
| Address | |  | | | |
| Tel |  | | Web site |  | |
| E:mail |  | | | | |
| **Registered Capacity**, use separate sheet if more than one connection option. | | | | | kW |

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| 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 reference for **Manufacturers’ Information** including the ENA Type Test Verification Report Register system reference number where applicable: | | | | |
| **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. **Power Factor** (PF) |  |  |  |
| 5 Frequency protection trip and ride through tests |  |  |  |
| 6 Voltage protection trip and ride through tests |  |  |  |
| 7. Protection – Loss of Mains Test, Vector Shift and RoCoF Stability Test |  |  |  |
| 8.**LFSM-O** Test |  |  |  |
| 9. Power Output with Falling Frequency Test |  |  |  |
| 10. Protection – Reconnection Timer |  |  |  |

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| 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 reference for **Manufacturers’ Information** including the ENA Type Test Verification Report Register system reference number where applicable: | | | | | | | | |
| **Tested option:** | | **1. Fully Type Tested** | | **2. Type Tested product** | | **3. One-Off Manufacturers’ Info.** | **4. Tested on Site at time of Commissioning** | |
| 11. Fault Level Contribution | |  | |  | |  |  | |
| 12. Wiring functional test if required by paragraph  15.2.1 (attach relevant schedule of tests) | |  | |  |  | |
| 13. Logic Interface (input port) | |  | |  |  | |
| 14. 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 | |  | | |  |
| 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. | | | | | | | | |

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| **A2-2 Compliance Verification Report –Tests for Type A Synchronous Power Generating Modules > 50 kW and also for Synchronous Power Generating Modules ≤ 50 kW where the approach of this form is preferred to that in Form A2-1 – test record** | |
| **1. Operating Range:** Tests should be carried with the **Power Generating Module** operating at **Registered Capacity** and connected to a suitable load bank, 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.  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  Voltage = 85% of nominal (195.5 V), Frequency = 47 Hz,  **Power Factor** = 1, Period of test 20 s | Test results or chart to confirm operation |
| Test 2  Voltage = 85% of nominal (195.5 V), Frequency = 47.5 Hz,  **Power Factor** = 1, Period of test 90 minutes | Test results or chart to confirm operation |
| Test 3  Voltage = 110% of nominal (253 V), Frequency = 51.5 Hz,  **Power Factor** = 1, Period of test 90 minutes | Test results or chart to confirm operation |
| Test 4  Voltage = 110% of nominal (253 V), Frequency = 52.0 Hz,  **Power Factor** = 1, Period of test 15 minutes | Test results or chart to confirm operation |
| Test 5  Voltage = 100% of nominal (230 V), Frequency = 50.0 Hz,  **Power Factor** = 1,  Period of test = 90 minutes | Test results or chart to confirm operation |

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| Test 6 RoCoF withstand  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. | Test results or chart to confirm operation |
| **2. Power Quality – Harmonics**:  The installation shall be designed in accordance with EREC G5. For **Power Generating Module**s of up to 17 kW per phase or 50 kW three phase harmonic measurements as required by BS EN 61000- 3-12 shall be made and recorded in a test declaration as in Form A2-1. The relevant part of Form A2- 1 can be used for this purpose. | |
| **3. Power Quality – Voltage fluctuations and Flicker**:  The installation shall be designed in accordance with EREC P28.  For **Power Generating Module**s of up to 17kW per phase or 50kW three phase the voltage fluctuations and flicker emissions from the **Generating Unit** shall be measured in accordance with BS EN 61000- 3-11. The relevant part of Form A2-1 can be used for recording the measurements. | |
| **4. Power Factor**: **Manufacturers’ Information** shall be provided or factory test results or on site testing in respect of the operation of the control system at 0.94 pu V, 1.0 pu V and 1.1 pu V shall be undertaken. The test can be undertaken by stepping the network voltage such as via an appropriate transformer/tap changer, or alternatively by injecting a test voltage signal into the **Controller**.  This test shall be undertaken with the **Controller** in constant **Power Factor** mode and a set point of 1.0.  The tests are successful if the **Power Factor** is > 0.95 (leading and lagging). | |
| **5. Protection operation and stability– Frequency tests:** See Form A2-4. | |
| **6. Protection operation and stability – Voltage tests:** See Form A2-4 for **LV** or **HV** as applicable. | |
| **7. Protection – Loss of Mains test and Vector Shift and RoCoF Stability test:** See Form A2-4. | |
| **8. Limited Frequency Sensitive Mode – Overfrequency test:** The tests below should be carried out using the specific threshold frequency of 50.4 Hz and **Droop** of 10% in accordance with paragraph 11.2.4.  The tests should be carried out in accordance with Annex A.7.2.4 | |
| **Active Power** response to rising frequency/time plots are attached | **Y/N** |

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| **9. Power output with falling frequency test** | | | | | | |
| Tests should prove that the **Power Generating Module** does not reduce output power as the frequency falls. These tests should be carried out in accordance with Annex A.7.2.3. | | | | | | |
| Test sequence | | Measured **Active Power** Output | Acceptable **Active Power** | | Primary power source (if applicable) | |
| 49.5 Hz for 5 minutes | |  | 100% **Registered Capacity** | |  | |
| 49.0 Hz for 5 minutes | |  | 99% **Registered Capacity** | |  | |
| 48.0 Hz for 5 minutes | |  | 97% **Registered Capacity** | |  | |
| 47.6 Hz for 5 minutes | |  | 96.2% **Registered Capacity** | |  | |
| 47.1 Hz for 20 s | |  | 95% **Registered Capacity** | |  | |
| **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. | | | | |
|  |  | 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. | |  |  |  | |  |
| **11. Fault level contribution**: **Manufacturers’ Information** in respect of the fault level contribution shall be provided. | | | | | | |
| **12. Wiring functional tests:** If required by para 15.2.1. | | | | | | |

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| Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning) | Yes / NA |
| **13. Logic interface (input port)** | |
| Confirm that an input port is provided and can be used to shut down the module | Yes / NA |
| 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 / NA |
| **14. Cyber security** | |
| Confirm that the **Power Generating Module** has been designed to comply with cyber security requirements, as detailed in 9.1.7. | Yes / NA |
| Additional comments. | |
|  | |