Site Compliance and Commissioning test requirements

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| **Form A2-4: Site Compliance and Commissioning test requirements for Type A Power Generating Modules**  This form should be completed:   * If site compliance tests are being undertaken for some or all of the **Interface Protection**   where it is not **Type Tested** and   * For other compliance tests that have been identified in Form A2-1, Form A2-2 or Form A2-3 as being undertaken on site (details shall be provided in the “Other onsite tests” part at the end of this form). | | | |
| **Generator Details:** | | | |
| **Generator** (name) |  | | |
| **Installation details**: | | | |
| Address |  | | |
| Post Code |  | | |
| Date of commissioning |  | | |
|  | | | |
| Requirement | | Compliance by provision of **Manufacturers’ Information** or type test reports.  Reference number should be detailed and **Manufacturers’ Information** attached. | Compliance by commissioning tests  Tick if true and complete relevant sections of form below |
| Over and under voltage protection **LV** –calibration test | |  |  |
| Over and under voltage protection **LV** –stability test | |  |  |
| Over and under voltage protection **HV** –calibration test | |  |  |
| Over and under voltage protection **HV** – stability test | |  |  |
| Over and Under Frequency protection – calibration test | |  |  |
| Over and Under Frequency protection - stability test | |  |  |

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| Loss of mains protection – calibration test | | | |  | | | | |  | | | |  |
| Loss of mains protection – stability test | | | |  | | | | |  | | | |
| Wiring functional tests: If required by para 15.2.1 | | | |  | | | | |  | | | |
| **Over and Under Voltage Protection Tests LV**  Where the **Connection Point** is at **LV** the **Generator** shall demonstrate compliance with this EREC G99 in respect of Over and Under Voltage Protection by provision of **Manufacturers’ Information,** type test reports or by undertaking the following tests on site. | | | | | | | | | | | | | |
| **Calibration and Accuracy Tests** | | | | | | | | | | | | | |
| Phase | Setting | Time Delay | **Pickup Voltage** | | | | **Relay Operating Time - step from 230 V to test value** | | | | | | |
| **Stage 1 Over Voltage** | | | Lower Limit | Measured Value | Upper Limit | Result | Test Value | Lower Limit | | Measured Value | Upper Limit | Result | |
| **L1 - N** | **262.2 V**  230 V  system | **1.0 s** | *258.75* |  | *265.65* | Pass/ Fail | 266.2 | *1.0 s* | |  | *1.1 s* | Pass/ Fail | |
| **L2 - N** |  | Pass/ Fail |  | Pass/ Fail | |
| **L3 - N** |  | Pass/ Fail |  | Pass/ Fail | |
| **Stage 2 Over Voltage** | | | Lower Limit | Measured Value | Upper Limit | Result | Test Value | Lower Limit | | Measured Value | Upper Limit | Result | |
| **L1 - N** | **273.7 V**  230 V  system | 0.5s | *270.25* |  | *277.15* | Pass/ Fail | 277.7 | *0.5 s* | |  | *0.6 s* | Pass/ Fail | |
| **L2 - N** |  | Pass/ Fail |  | Pass/ Fail | |
| **L3 - N** |  | Pass/ Fail |  | Pass/ Fail | |
| **Under Voltage** | | | Lower Limit | Measured Value | Upper Limit |  | Test Value | Lower Limit | | Measured Value | Upper Limit | Result | |
| **L1 - N** | **184.0 V**  230 V  system | 2.5 s | *180.55* |  | *187.45* | Pass/ Fail | 180 | *2.5 s* | |  | *2.6 s* | Pass/ Fail | |
| **L2 - N** |  | Pass/ Fail |  | Pass/ Fail | |
| **L3 - N** |  | Pass/ Fail |  | Pass/ Fail | |
| **Over and Under Voltage Protection Tests LV** | | | | | | | | | | | | | |
| **Stability Tests** (confirm no trip of **Interface Protection**) | | | | | | | | | | | | | |

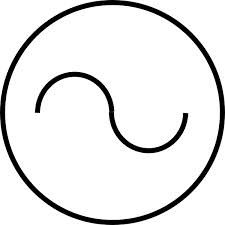
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| Test Description | | | Setting | | | Time Delay | Test Condition  (3-Phase Value ) | | | Test Voltage all phases  ph-n | | Test Duration | Confirm No Trip | | Result | |
| Inside Normal band | | | **---------** | | | **---------** | < OV Stage 1 | | | 258.2 V | | 5.00 s |  | | Pass/ Fail | |
| **Stage 1 Over Voltage** | | | **262.2 V** | | | **1.0 s** | > OV Stage 1 | | | 269.7 V | | 0.95 s |  | | Pass/ Fail | |
| **Stage 2 Over Voltage** | | | **273.7 V** | | | **0.5 s** | > OV Stage 2 | | | 277.7 V | | 0.45 s |  | | Pass/ Fail | |
| Inside Normal band | | | **---------** | | | **---------** | > UV | | | 188 V | | 5.00 s |  | | Pass/ Fail | |
| **Under Voltage** | | | **184.0 V** | | | **2.5 s** | < UV | | | 180 V | | 2.45 s |  | | Pass/ Fail | |
| Over voltage test - Voltage shall be stepped from 258 V to the test voltage and held for the test duration and then stepped back to 258 V.  Under voltage test – Voltage shall be stepped from 188 V to the test voltage and held for the test duration and then stepped back to 188 V | | | | | | | | | | | | | | | | |
| **Additional Comments / Observations:** | | | | | | | | | | | | | | | | |
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| **Over and Under Voltage Protection HV**  Where the **Connection Point** is at **HV** the **Generator** shall demonstrate compliance with this EREC G99 in respect of Over and Under Voltage Protection by provision of **Manufacturers’ Information,** type test reports or by undertaking the following tests on site.  Tests referenced to 110 V ph-ph VT output | | | | | | | | | | | | | | | | |
| **Calibration and Accuracy Tests** | | | | | | | | | | | | | | | | |
| Phase | Setting | Time Delay | | **Pickup Voltage** | | | | | **Relay Operating Time** measured value ± 2 V | | | | | | | |
| **Stage 1 Over Voltage** | | | | Lower Limit | Measured Value | | Upper Limit | Result | Test Value | | Lower Limit | Measured Value | | Upper Limit | | Result |
| **L1 - L2** | **121 V**  110 V VT  secondary | **1.0 s** | | *119.35* |  | | *122.65* | Pass/ Fail | Measured value plus 2 V | | *1.0 s* |  | | *1.1 s* | | Pass /Fail |
| **L2 - L3** |  | | Pass/ Fail |  | | Pass/ Fail |
| **L3 - L1** |  | | Pass/ Fail |  | | Pass/ Fail |

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| **Stage 2 Over Voltage** | | | | Lower Limit | Measured Value | | Upper Limit | Result | Test Value | | Lower Limit | Measured Value | | Upper Limit | Result |
| **L1 - L2** | **124.3 V**  110 V VT  secondary | 0.5 s | | *122.65* |  | | *125.95* | Pass/ Fail | Measured value plus 2 V | | *0.5 s* |  | | *0.6 s* | Pass/Fail |
| **L2 - L3** |  | | Pass/ Fail |  | | Pass/Fail |
| **L3 - L1** |  | | Pass/ Fail |  | | Pass/Fail |
| **Under Voltage** | | | | Lower Limit | Measured Value | | Upper Limit |  | Test Value | | Lower Limit | Measured Value | | Upper Limit | Result |
| **L1 - L2** | **88.0 V**  110 V VT  secondary | 2.5s | | *86.35* |  | | *89.65* | Pass/ Fail | Measured value minus 2 V | | *2.5 s* |  | | *2.6 s* | Pass/ Fail |
| **L2 - L3** |  | | Pass/ Fail |  | | Pass / Fail |
| **L3 - L1** |  | | Pass/ Fail |  | | Pass/ Fail |
| **Over and Under Voltage Protection Tests HV**  **referenced to 110 V ph-ph VT output** | | | | | | | | | | | | | | | |
| **Stability Tests** (confirm no trip of **Interface Protection**) | | | | | | | | | | | | | | | |
| Test Description | | | Setting | | | Time Delay | Test Condition (3-Phase Value ) | | | Test Voltage All phase  s ph-ph | | Test Duration | Confirm No Trip | | Result |
| Inside Normal band | | | **---------** | | | **---------** | < OV Stage 1 | | | 119 V | | 5.00 s |  | | Pass/Fail |
| **Stage 1 Over Voltage** | | | **121 V** | | | **1.0 s** | > OV Stage 1 | | | 122.3 V | | 0.95 s |  | | Pass/Fail |
| **Stage 2 Over Voltage** | | | **124.3 V** | | | **0.5 s** | > OV Stage 2 | | | 126.3 V | | 0.45 s |  | | Pass/Fail |
| Inside Normal band | | | **---------** | | | **---------** | > UV | | | 90 V | | 5.00 s |  | | Pass/Fail |
| **Under Voltage** | | | **88 V** | | | **2.5 s** | < UV | | | 86 V | | 2.45 s |  | | Pass/Fail |
| Additional Comments / Observations: | | | | | | | | | | | | | | | |
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| **Over and Under Frequency Protection**  The **Generator** shall demonstrate compliance with this EREC G99 in respect of Over and Under Frequency Protection by provision of **Manufacturers’ Information**, type test reports or by undertaking the following tests on site. | | | | | | | | | | | | | | |
| **Calibration and Accuracy Tests** | | | | | | | | | | | | | | |
| Setting | Time Delay | **Pickup Frequency** | | | | | **Relay Operating Time** | | | | | | | |
| **Over Frequency** | | Lower Limit | Measured Value | | Upper Limit | Result | Freq step | | Lower Limit | | Measured Value | | Upper Limit | Result |
| 52 Hz | 0.5 s | *51.90* |  | | *52.10* | Pass/ Fail | 51.7-  52.3 Hz | | *0.50 s* | |  | | *0.60 s* | Pass/ Fail |
| **Stage 1 Under Frequency** | | Lower Limit | Measured Value | | Upper Limit | Result | Freq step | | Lower Limit | | Measured Value | | Upper Limit | Result |
| 47.5 Hz | 20 | *47.40* |  | | *47.60* | Pass  /Fail | 47.8-  47.2 Hz | | *20.0 s* | |  | | *20.2 s* | Pass/ Fail |
| **Stage 2 Under Frequency** | | Lower Limit | Measured Value | | Upper Limit | Result | Freq step | | Lower Limit | | Measured Value | | Upper Limit | Result |
| 47 Hz | 0.5 s | *46.90* |  | | *47.1* | Pass/ Fail | 47.3-  46.7 Hz | | *0.50 s* | |  | | *0.60 s* | Pass /Fail |
| **Stability Tests** (confirm no trip of **Interface Protection**) | | | | | | | | | | | | | | |
| Test Description | | Setting | | Time Delay | Test Condition | | | Test Frequency | | Test Duration | | Confirm No Trip | | Result |
| Inside Normal band | | **---------** | | **---------** | < OF | | | 51.8 Hz | | 120 s | |  | | Pass/ Fail |
| **Over Frequency** | | 52 Hz | | 0.5 s | > OF | | | 52.2 Hz | | 0.45 s | |  | | Pass/ Fail |
| Inside Normal band | | **---------** | | **---------** | > UF Stage 1 | | | 47.7 Hz | | 30 s | |  | | Pass/ Fail |
| **Stage 1 Under Frequency** | | 47.5 Hz | | 20 s | < UF Stage 1 | | | 47.2 Hz | | 19.5 s | |  | | Pass/ Fail |
| **Stage 2 Under Frequency** | | 47 Hz | | 0.5 s | < UF Stage 2 | | | 46.8 Hz | | 0.45 s | |  | | Pass/ Fail |
| Over frequency test - Frequency shall be stepped from 51.8 Hz to the test frequency and held for the test duration and then stepped back to 51.8 Hz.  Under frequency test - Frequency shall be stepped from 47.7 Hz to the test frequency and held for the test duration and then stepped back to 47.7 Hz. | | | | | | | | | | | | | | |
| Additional Comments / Observations: | | | | | | | | | | | | | | |
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| **Details of Loss of Mains Protection** | | | | |
| **Manufacturer** | **Manufacturer**’s type | Date of Installation | Settings | Other information |
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| **Loss-of-Mains (LOM) Protection Tests**  The **Generator** shall demonstrate compliance with this EREC G99 in respect of LOM Protection by either providing the **DNO** with appropriate **Manufacturers’ Information,** type test reports or by undertaking the following tests on site | | | | | | | | | | |
| **Calibration and Accuracy Tests** | | | | | | | | | | |
| Ramp in range 49.0 - 51.0 Hz | | | | | | | | | | |
|  | **Pickup (**± 0.025 Hzs-1) | | | | **Relay Operating Time** RoCoF= +**0.10 Hzs-1**  above setting | | | | | |
| **Setting = 1.0 Hzs-1** | Lower Limit | Measured Value | Upper Limit | Result | Test Condition | | Lower Limit | Measured Value | Upper Limit | Result |
| Increasing Frequency | *0.975* |  | *1.025* | Pass/Fail | 1.10 Hzs-1 | | *>0.5 s* |  | *<1.0 s* | Pass/Fail |
| Reducing Frequency | *0.975* |  | *1.025* | Pass/Fail | 1.10 Hzs-1 | | *>0.5 s* |  | *<1.0 s* | Pass/Fail |
| Ramp in range 48.5-51.5 Hz | | | | | | | | | | |
| Increasing Frequency | *0.975* |  | *1.025* | Pass/Fail | 3.00 Hzs-1 | | *>0.5 s* |  | *<1.0 s* | Pass/Fail |
| Reducing Frequency | *0.975* |  | *1.025* | Pass/Fail | 3.00 Hzs-1 | | *>0.5 s* |  | *<1.0 s* | Pass/Fail |
| **Stability Tests** (confirm no trip of **Interface Protection**) | | | | | | | | | | |
| Ramp in range 49.0-51.0 Hz | | | | | | | | | | |
|  | Test Condition | | Test frequency ramp | | | Test Duratio n | | Confirm No Trip | | Result |
| Inside Normal band | < RoCoF setting  (increasing f) | | +0.95 Hzs-1 | | | 2.1 s | |  | | Pass/Fail |
| Inside Normal band | < RoCoF setting  (reducing f) | | -0.95 Hzs-1 | | | 2.1 s | |  | | Pass/Fail |
| Ramp as shown | | | | | | | | | | |
| Inside Normal band | > RoCoF setting  (increasing f) | | +1.20 Hzs-1  (ramp between 49.80  and 50.34 Hz) | | | 0.45 s | |  | | Pass/Fail |



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| Inside Normal band | > RoCoF setting  (reducing f) | - -1.20 Hzs-1  (ramp between 50.30  and 49.76 Hz | | | 0.45 s | |  | Pass/Fail |
| Additional Comments / Observations: | | | | | | | | |
|  | | | | | | | | |
| **LoM Protection - Stability test** (confirm no trip of **Interface Protection**) | | | | | | | | |
|  | Start Frequency | | Change | | | Confirm no trip | | |
| Positive Vector Shift | 49.5 Hz | | +50 degrees | | |  | | |
| Negative Vector Shift | 50.5 Hz | | - 50 degrees | | |  | | |
| **Wiring functional tests** | | | | | | | | |
| If required by para 15.2.1, confirm that wiring functional tests have been carried out in accordance with the instructions below | | | | Yes/ NA | | | | |
| Where components of a **Power Generating Module** are separately **Type Tested** and assembled into a **Power Generating Module**, if the connections are made via loose wiring, rather than specifically designed error-proof connectors, then it will be necessary to prove the functionality of the components that rely on the connections that have been made by the loose wiring.  As an example, consider a **Type Tested** alternator complete with its control systems etc. It needs to be connected to a **Type Tested Interface Protection** unit. In this case there are only three voltage connections to make, and one tripping circuit. The on-site checks need to confirm that the **Interface Protection** sees the correct three phase voltages and that the tripping circuit is operative. It is not necessary to inject the **Interface Protection** etc to prove this. Simple functional checks are all that are required.  Test schedule:   * With **Generating Unit** running and energised, confirm L1, L2, L3 voltages on **Generating Unit** and on   **Interface Protection**.   * Disconnect one phase of the control wiring at the **Generating Unit**. Confirm received voltages at the   **Interface Protection** have one phase missing.   * Repeat for other phases. * Confirm a trip on the **Interface Protection** trips the appropriate circuit breaker.   L1 L2 L3  Interface Protection | | | | | | | | |

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| **Logic Interface Port** | |
| Confirm that an input port is provided and can be used to shut down the module |  |
| **Other onsite tests**: Provide details here of any additional tests which have been carried out (as identified as being required by Form A2-1, A2-2 or A2-3) | |
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