

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

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.

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.

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:

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 Product ID), 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		Combined heat and power	
Manufacturer name		GENTEC CHP s.r.o.	
Address		Antala Staska 1076/33a 140 00 Prague 4 Czech Republic	
Tel	+420 724 031 836	Web site	www.gentec.cz
E:mail	vaclav.klein@gentec.cz		
Registered Capacity , use separate sheet if more than one connection option.			70 kW

There are four options for Testing: (1) **Fully Type Tested**, (2) **Partially Type Tested**, (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 PGMs** tests marked with * may be carried out at the time of commissioning (Form A4).
Insert reference for **Manufacturers' Information** including the ENA Type Test Verification Report Register Product ID number where applicable:

Tested option:	1. Fully Type Tested	2. Partially Type Tested	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	Tested		
2. PQ – Harmonics		Tested		
3. PQ – Voltage Fluctuation and Flicker		Tested		
4. Power Factor (PF)		Not tested		
5 Frequency protection trip and ride through tests*		Tested		
6 Voltage protection trip and ride through tests*		Tested		
7. Protection – Loss of Mains Test, Vector Shift and RoCoF Stability Test*		Not tested		
8. LFSM-O Test*		Tested		
9. Power Output with Falling Frequency Test*		Tested		
10. Protection – Reconnection Timer*		Not tested		
11. Fault Level Contribution		Tested		


There are four options for Testing: (1) **Fully Type Tested**, (2) **Partially Type Tested**, (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 PGMs** tests marked with * may be carried out at the time of commissioning (Form A4).

Insert reference for **Manufacturers' Information** including the ENA Type Test Verification Report Register Product ID number where applicable:

Tested option:	1. Fully Type Tested	2. Partially Type Tested	3. One-Off Manufacturers' Info.	4. Tested on Site at time of Commissioning
12. Wiring functional test if required by paragraph 15.2.1 (attach relevant schedule of tests)*		Tested		
13. Logic Interface (input port)*		Tested		

* may be carried out at the time of commissioning (Form A2-4).

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.

Signed		On behalf of	Erik Bartusek
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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.

A2-2 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: Five 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 $\pm 5\%$ 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.

<p>Test 1</p> <p>Voltage = 85% of nominal ((195.5 V), Frequency = 47 Hz, Power Factor = 1, Period of test 20 s</p>	<p>Confirmed</p>
<p>Test 2</p> <p>Voltage = 85% of nominal (195.5 V), Frequency = 47.5 Hz, Power Factor = 1, Period of test 90 minutes</p>	<p>Confirmed</p>
<p>Test 3</p> <p>Voltage = 110% of nominal (253 V), Frequency = 51.5 Hz, Power Factor = 1, Period of test 90 minutes</p>	<p>Confirmed</p>
<p>Test 4</p> <p>Voltage = 110% of nominal (253 V), Frequency = 52.0 Hz, Power Factor = 1, Period of test 15 minutes</p>	<p>Confirmed</p>
<p>Test 5 RoCoF withstand</p> <p>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.</p>	<p>Confirmed</p>

2. Power Quality – Harmonics:

The installation shall be designed in accordance with EREC G5. For **Power Generating Modules** 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.

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

Power Generating Module rating per phase (rpp)		23.3		kVA	Harmonic % = Measured Value (A) x 23/rating per phase (kVA)	
Harmonic	At 45-55% of Registered Capacity		100% of Registered Capacity		Limit in BS EN 61000-3-12	
	Measured Value (A)	%	Measured Value (A)	%	1 phase	3 phase
2	0.28	0.28	0.19	0.19	8%	8%
3	0.41	0.40	0.34	0.34	21.6%	Not stated
4	0.15	0.15	0.12	0.12	4%	4%
5	1.04	1.03	1.49	1.47	10.7%	10.7%
6	0.18	0.18	0.10	0.10	2.67%	2.67%
7	0.70	0.69	0.88	0.87	7.2%	7.2%
8	0.09	0.09	0.06	0.06	2%	2%
9	0.23	0.23	0.16	0.16	3.8%	Not stated
10	0.19	0.19	0.12	0.12	1.6%	1.6%
11	0.35	0.35	0.43	0.42	3.1%	3.1%
12	0.12	0.12	0.09	0.09	1.33%	1.33%
13	0.22	0.22	0.21	0.21	2%	2%
THD ¹	1.73	1.71	2.07	2.04	23%	13%
PWHD ²	2.96	2.92	3.51	3.47	23%	22%

¹ THD = Total Harmonic Distortion

² PWHD = Partial Weighted Harmonic Distortion

3. Power Quality – Voltage fluctuations and Flicker:

The installation shall be designed in accordance with EREC P28.

For **Power Generating Modules** 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.

	Starting			Stopping		Running		
	d max	d c	d(t)	d max	d c	d(t)	P st	P It 2 hours
Measured Values at 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	0.24	Ω	X	0.15	Ω		
Standard Impedance	R	0.24 * 0.4 ^	Ω	X	0.15 * 0.25 ^	Ω		
Maximum Impedance	R		Ω	X		Ω		

* Applies to three phase and split single phase **Power Generating Modules**.

^ Applies to single phase **Power Generating Module** and **Power Generating Modules** using two phases on a three phase system.

For voltage change and flicker measurements the following formula is to be used to convert the measured values to the normalised values where the **Power Factor** of the generation output is 0.98 or above.

Normalised value = Measured value x reference source resistance/measured source resistance at test point.

Single phase units reference source resistance is 0.4 Ω.

Two phase units in a three phase system reference source resistance is 0.4 Ω.

Two phase units in a split phase system reference source resistance is 0.24 Ω.

Three phase units reference source resistance is 0.24 Ω.

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 need to comply with the particular requirements set out in the testing notes for the technology under test. Dates and location of the test need to be noted below.

Test start date	7.4.2020	Test end date	7.4.2020
Test location	GENTEC CHP		

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.

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	47.51 Hz	20.08 s	47.7 Hz 30 s	No trip
					47.2 Hz 19.5 s	No trip
U/F stage 2	47 Hz	0.5 s	46.95 Hz	0.52 s	46.8 Hz 0.45 s	No trip
O/F	52 Hz	0.5 s	51.97 Hz	0.56 s	51.8 Hz 120 s	No trip
					52.2 Hz 0.45 s	No trip

6. Protection operation and stability – Voltage tests: See Form A2-4 for **LV** or **HV** as applicable.

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 V	2.56 s	188 V 5.00 s	No trip

					180 V 2.45 s	No trip
O/V stage 1	1.14 pu (262.2 V)	1.0 s	262.3 V	0.98 s	258.2 V 5.0 s	No trip
					269.7 V 0.95s	No trip
O/V stage 2	1.19 pu (273.7 V)	0.5 s	274 V	0.55 s	277.7 V 0.45s	No trip
7. Protection – Loss of Mains test and Vector Shift and RoCoF Stability test: See Form A2-4.						
8. Limited Frequency Sensitive Mode – Over frequency 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
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	70 kW	100% Registered Capacity				
49.5 Hz for 5 minutes	70 kW	99% Registered Capacity				
48.0 Hz for 5 minutes	69 kW	97% Registered Capacity				
47.6 Hz for 5 minutes	68 kW	96.2% Registered Capacity				
47.1 Hz for 20 s	67 kW	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.						
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)	At 0.78 pu (180.0 V)	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.				
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			
Additional comments.				