ENA ERAC G99/1-3:2018

Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019

Report reference No. ..... :	P2019031206
Tested by (printed name and signature) ..... :	Daniel Keis
Approved by (printed name and signature) ..... :	Manuel Shimasaki
Date of issue ..... :	12 April 2019
Testing Laboratory Name :	EnTEST Laboratories
	Tests indicated as traceable only are outside of the laboratory's scope of accreditation **Accreditation number: 1273**
Address ..... :	1 Treffers Road, Wigram, Christchurch 8042, New Zealand
Testing location/procedure ..... :	NZ ☒
Other (please explain) ..... :	
Applicant's Name ..... :	Enphase Energy
Address ..... :	1420 North McDowell Boulevard, Petaluma, CA 94954, USA
Test specification	
Standard ..... :	ENA ERAC G99/1-3:2018
Test procedure ..... :	EnTEST Laboratories
Non-standard test method ..... :	
Test Report Form No. ..... :	ENA ERAC G99/1-3:2018
TRF originator. ..... :	EnTEST Laboratories
Non-standard test method ..... :	

Test item description ..... :	Solar Micro-inverter
Trademark ..... :	ENPHASE.
Manufacturer ..... :	Enphase Energy Inc.
Model and/or type reference ..... :	IQ7X-96-X-Y-Z
Rating(s) ..... :	See rating table

Model rating table:

Specification	Units	IQ7X
Rated output active power	W	315
Output apparent power	VA	315
Nominal output voltage	V_{rms}	230
Output voltage range	V_{rms}	184-276
Nominal output frequency	Hz	50
Output frequency range	Hz	45-55
AC output current	A_{rms}	1.37
EN50530 efficiency	%	96.8
Full power MPPT input voltage	V	53-64
Input operating range	V	25–79.5
Input current limit region	V	25-53
Input frequency	Hz	DC
Input maximum continuous current	A	6.5
DC short circuit input maximum	A	10
Ingress protection		IP67
Environmental category		Outdoor
Wet locations		suitable
Pollution degree		PD3
Ambient temperature		-40C to +65C
Relative humidity		4K4H
Maximum altitude		< 2000m
Overvoltage category		OVC III

Models IQ7X-96-X-Y-Z are similar except as indicated above.
Model nomenclature details:
Suffix X = 2, 5 or B
- 2 = Multicontact PV connector
- 5 = Amphenol PV connector
- B = Bulkhead PV connector

Y = blank or ACM (X marking not required)
Z = blank or any letter for country of intended installation e.g.:
- INT = International
- FR = France
- NL = Netherlands
- DE = Germany

Mode and control of the inverter can be performed via PLC (Power Line Communication) with an external control gateway named Envoy.

There was reinforced isolation between the SELV DC input and the hazardous voltage AC output.

Firmware version:
520-00082-r01- v02.14.02

Copy of marking plate

Model: **IQ7X-96-X-Y-Z**

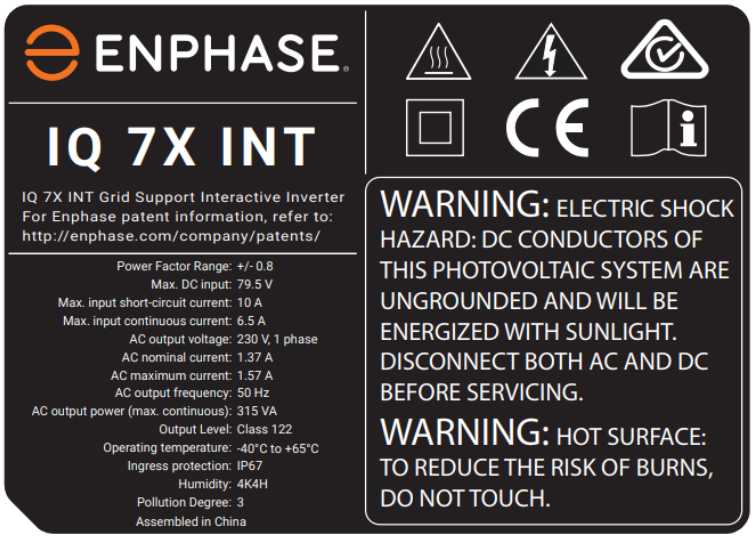

Figure 1: IQ7X marking plate

SUMMARY OF COMPLIANCE WITH ENA ERAC G99/1-3:2018

All tests passed the requirements of the ENA ERAC G99/1-3:2018 standard within the required limits and within the equipment uncertainties.

The system, consisting of Photovoltaic Micro-inverters model numbers IQ7X-96-X-Y-Z **COMPLIED** with the tested clauses of ENA ERAC G99/1-3:2018.

Possible test case verdicts:

- test case does not apply to the test object ..... : N/A
- test object does meet the requirement ..... : P(Pass)
- test object does not meet the requirement ..... : F(Fail)
- informative information only ..... : Noted

Testing ……..:

Date of receipt of test item……: August 2019

Date (s) of completion of tests……....: March - April 2019

General remarks:

1. The test results presented in this report relate only to the object tested.
2. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
3. If the measured result complies up to the limit of acceptance, the result shall be reported along with our uncertainty of measurement. e.g. results to state window of uncertainty.
4. "(see Enclosure #)" refers to additional information appended to the report.
5. "(see appended table)" refers to a table appended to the report.
6. This report supersedes P2018071713 as G59/3-4 has been superseded by G99/1-3:2018 and firmware has been upgraded from 520-00082-r01-v02.12.02 to 520-00082-r01-v02.14.02.
7. New tests include
    a. Operating range,
    b. Removal of stage 1 over frequency and stage 1 under voltage tests,
    c. adding of LFSM over frequency test

General product information:

The EUT (Equipment Under Test), known as Photovoltaic Micro-inverters, model IQ7 were supplied for testing to ENA ERAC G99/1-3:2018 by Enphase Energy Inc of 1420 North McDowell Boulevard, Petaluma, CA 94954, USA.

Worst case uncertainty of Measurements

Parameter	Range	Instrument accuracy of Measuring Range
Voltage		
- Up to 1000 V	up to 1 kHz	±1,5 %
	1kHz up to 5 kHz	±2 %
	5 kHz up to 20 kHz	±3 %
	20 kHz and above	±5 %
- 1000 V and above	dc up to 20 kHz	±3 %
	20 kHz and above	±5 %
Current		
- Up to 5 A	up to 60 Hz	±1,5 %
	above 60 Hz up to 5 kHz	±2,5 %
	5 kHz up to 20 kHz	±3,5 %
	20 kHz and above	±5 %
- Above 5 A	up to 5 kHz	±2,5 %
	5 kHz up to 20 kHz	±3,5 %
	20 kHz and above	± %
Leakage (Touch) current[1]	50 Hz up to 60 Hz	±3,5 %
	greater 60 Hz up to 5 kHz	±5 %
	greater 5 kHz up to 100 kHz	±10 %
	greater 100 kHz up to 1 MHz	under consideration
Power (50/60 Hz)	up to 3 kW	±3 %
	above 3 kW	±5 %
Power Factor (50/60 Hz)		±0,05
Frequency	up to 10 kHz	±0,2 %
Resistance	1 mW up to 100 mΩ and above 1 MΩ up to 1 TΩ	±5 %
	above 1 TΩ	±10 %
	for all other cases	±3 %
Temperature [2,3]		
	- 35°C to below 100° C	±2° C
	100° C up to 500° C	±3° C
	below - 35°C	±3° C
Time	10 ms up to 200 ms	±5 %
	200 ms up to 1 s	±10 ms
	1 s and above	±1 %
Linear dimensions	up to 1 mm	±0,05 mm
	1 mm up to 25 mm	±0,1 mm
	25 mm and above	±0,5 %
Mass	above 10 g and up to 100 g	±1 %
	100 g up to 5 kg	±2 %
	5 kg and above	±5 %
Force	for all values	±6 %
Mechanical energy	for all values ± 10%	±10 %
Torque		±10%
Angles		±1 degree
Relative humidity	30% to 95% RH	±6% RH
Barometric air pressure		±10 kPa

1. The stated tolerances apply to the total tolerance of the leakage (touch) current circuit and metering Instrument.
2. Thermocouple not included in the Instrument accuracy of measuring range. Thermocouples type “T” premium grade, are recommended.
3. Not for measurements related to relative humidity.

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Type Test Verification Report

Form A2-3: Compliance Verification Report for 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

   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 must 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 must 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) 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	Micro-inverter
Manufacturer name	Enphase Energy Inc
Address	1420 North McDowell Boulevard, Petaluma, CA 94954, USA.

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Type Test Verification Report

Tel		Web site	Enphase.com
E:mail			
Registered Capacity		0.315 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).

Tested option:	**1. Fully Type Tested**	**2. Partially Type Tested**	**3. One-off Man. Info.**	**4. Tested on Site at time of Commission-ing**
0. **Fully Type Tested** - all tests detailed below completed and evidence attached to this submission	Pass	**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 Modules** 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				
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)*				

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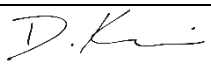
* may be carried out at the time of commissioning (Form A.2-4). Document reference(s) for **Manufacturers' Information:**
Manufacturer compliance declaration. - I certify that all products supplied by the company with the above **Type Tested Manufacturer's** reference number will be manufactured and 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	Enphase Energy

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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Type Test Verification Report

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

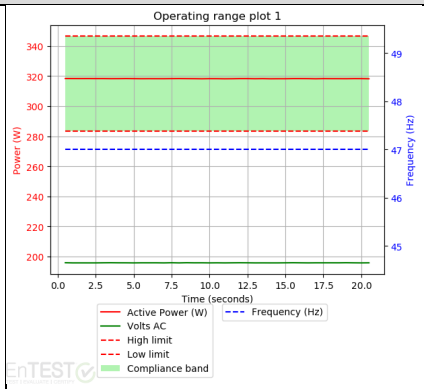
1. Operating Range: Two tests should be carried with the **Power Generating Module** operating at **Registered Capacity** and connected to a suitable test supply or grid simulation set. The power supplied by the primary source shall be kept stable within ± 5 % of the apparent power value set for the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

Test 1 Voltage = 85% of nominal (195.5 V), Frequency = 47 Hz, **Power Factor** = 1, Period of test 20 s	
Test 2 Voltage = 85% of nominal (195.5 V), Frequency = 47.5 Hz, **Power Factor** = 1, Period of test 90 minutes	

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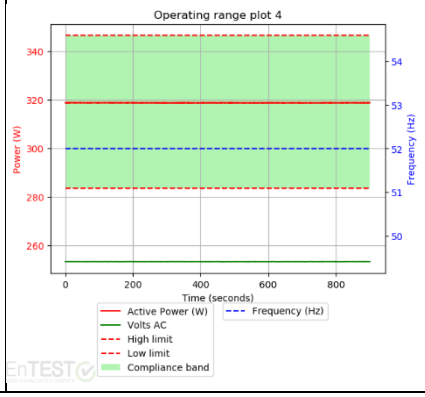
Type Test Verification Report

Test 3 Voltage = 110% of nominal (253 V), Frequency = 51.5 Hz, **Power Factor** = 1, Period of test 90 minutes	
Test 4 Voltage = 110% of nominal (253 V), Frequency = 52.0 Hz, **Power Factor** = 1, Period of test 15 minutes	

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Type Test Verification Report

2. Power Quality – Harmonics:

For **Power Generating Modules** 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 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.
Power Generating Modules with emissions close to the limits laid down in BS EN 61000-3-12 may require the installation of a transformer between 2 and 4 times the rating of the **Power Generating Module** in order to accept the connection to a **Distribution Network.**

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

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

Power Generating Module rating per phase (rpp)				0.315 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 in Amps	%	Measured Value in Amps	%	1 phase	3 phase
2	0.0029	0.212	0.0062	0.453	8%	8%
3	0.0071	0.518	0.0051	0.372	21.6%	Not stated
4	0.0001	0.007	0.0001	0.007	4%	4%
5	0.0152	1.110	0.0313	2.285	10.7%	10.7%
6	0.0001	0.007	0.0001	0.007	2.67%	2.67%
7	0.0027	0.197	0.0038	0.277	7.2%	7.2%
8	0.0001	0.007	0.0001	0.007	2%	2%
9	0.0011	0.080	0.0023	0.168	3.8%	Not stated
10	0.0001	0.007	0.0001	0.007	1.6%	1.6%
11	0.0007	0.051	0.002	0.146	3.1%	3.1%
12	0.0001	0.007	0.0001	0.007	1.33%	1.33%
13	0.0003	0.022	0.0015	0.110	2%	2%
THD[1]	0.031	2.227	0.053	3.848	23%	13%
PWHD[2]	0.007	0.540	0.009	0.643	23%	22%

[1] THD = Total Harmonic Distortion

[2] PWHD = Partial Weighted Harmonic Distortion

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Type Test Verification Report

3. Power Quality – Voltage fluctuations and Flicker:

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

	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P st	P lt 2 hours
Measured Values at test impedance	0.38	0.35	0.00	0.40	0.38	0.00	0.13	0.12
Normalised to standard impedance	0.38	0.35	0.00	0.40	0.38	0.00	0.13	0.12
Normalised to required maximum impedance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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 * 0.4 ^	Ω	Xl	0.15 * 0.25 ^	Ω
Maximum Impedance	R	N/A	Ω	Xl	N/A	Ω

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Type Test Verification Report

* 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 Xl 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	9 August 2018	Test end date	9 August 2018
Test location	1 Treffers Rd., Wigram, Christchurch, NZ		

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.

Test power level	10%	55%	100%
Recorded value in Amps	0.04 mA	0.028 mA	0.03 mA
as % of rated AC current	0.003%	0.002%	0.002%
Limit	0.25%	0.25%	0.25%

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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**. 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.

Voltage	0.94 pu (216.2 V)	1 pu (230 V)	1.1 pu (253 V)
Measured value	1.00	1.00	1.00
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.

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	47.52 Hz	20.3 s	47.7 Hz 25 s	Confirmed
U/F stage 2	47 Hz	0.5 s	47.02 Hz	0.60 s	47.2 Hz 19.98 s	Confirmed
					46.8 Hz 0.48 s	Confirmed
O/F	52 Hz	0.5 s	51.98 Hz	0.58 s	51.8 Hz 89.98 s	Confirmed
					52.2 Hz 0.48 s	Confirmed

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.

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7. Protection – Voltage tests: These tests should be carried out in accordance with Annex A.7.1.2.2.

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	183.1 V	2.57 s	188 V 3.50 s	Confirmed
					180 V 2.48 s	Confirmed
O/V stage 1	1.14 pu (262.2 V)	1.0 s	261.9 V	1.06 s	258.2 V 2.0 s	Confirmed
O/V stage 2	1.19 pu (273.7 V)	0.5 s	273.6 V	0.57 s	269.7 V 0.98s	Confirmed
					277.7 V 0.48 s	Confirmed

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% -5% Q Test 22	66% -5% Q Test 12	100% -5% P Test 5	33% +5% Q Test 31	66% +5% Q Test 21	100% +5% P Test 10
Trip time. Limit is 0.5s	142 ms	174 ms	168 ms	144 ms	158 ms	174 ms

Loss of Mains Protection, Vector Shift Stability test. This test should be carried out in accordance with Annex A.7.1.2.6.

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

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Loss of Mains Protection, RoCoF Stability test: This test should be carried out in accordance with Annex A.7.1.2.6.			
Ramp range	Test frequency ramp:	Test Duration	Confirm no trip
49.0 Hz to 51.0 Hz	+0.95 Hzs^{-1}	2.1 s	Confirmed
51.0 Hz to 49.0 Hz	-0.95 Hzs^{-1}	2.1 s	Confirmed

9. Limited Frequency Sensitive Mode – Over frequency test: The test should be carried out using the specific threshold frequency of 50.4 Hz and **Droop** of 10%. This test should be carried out in accordance with Annex A.7.1.3.	
Active Power response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex A.7.2.4.	**N**
Alternatively, simulation results should be noted below:	

Test sequence at **Registered Capacity** >80%	Measured **Active Power** Output	Frequency	Primary Power Source	**Active Power** Gradient
Step a) 50.00Hz ±0.01Hz	318.6 W	50.00 Hz	DC Supply	-
Step b) 50.45Hz ±0.05Hz	316.2 W	50.45 Hz		-
Step c) 50.70Hz ±0.10Hz	300.4 W	50.70 Hz		-
Step d) 51.15Hz ±0.05Hz	271.4 W	51.15 Hz		-
Step e) 50.70Hz ±0.10Hz	300.4 W	50.70 Hz		-
Step f) 50.45Hz ±0.05Hz	316.2 W	50.45 Hz		-
Step g) 50.00Hz ±0.01Hz	318.8 W	50.00 Hz		0.6 % / s

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Test sequence at **Registered Capacity** 40% - 60%	Measured **Active Power** Output	Frequency	Primary Power Source	**Active Power** Gradient
Step a) 50.00Hz ±0.01Hz	161.1 W	50.00 Hz	DC supply	-
Step b) 50.45Hz ±0.05Hz	161.0 W	50.45 Hz		-
Step c) 50.70Hz ±0.10Hz	152.8 W	50.70 Hz		-
Step d) 51.15Hz ±0.05Hz	137.9 W	51.15 Hz		-
Step e) 50.70Hz ±0.10Hz	152.8 W	50.70 Hz		-

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.			
20 s	25 to 28 s	At 1.16 pu (266.2 V)	At 0.85 pu (196.1 V)	At 47.4 Hz	At 52.1 Hz
Confirmation that the **Power Generating Module** does not re-connect.		Confirmed	Confirmed	Confirmed	Confirmed

11. Fault level contribution: These tests shall be carried out in accordance with EREC G99 Annex A.7.1.5.

For **Inverter** output

Time after fault	Volts	Amps
20ms	0	0
100ms	0	0
250ms	0	0
500ms	0	0
Time to trip	0.01	In seconds

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12. Self-Monitoring solid state switching: No specified test requirements. Refer to Annex A.7.1.7.	
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.	Yes
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
Additional comments.	

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Test Equipment calibration

Type	Model No	Calibration date	Expiration date	Fixtures-No.
AC POWER SOURCE	MX30	NCR	NCR	SAF-PSU-02
Current Probe	TCP303	20/03/2017	19/03/2020	SAF-TCP-01
Current Probe	TCP303	17/03/2017	16/03/2020	SAF-TCP-02
Current Probe	TCP202A	5/03/2018	4/03/2021	SAF-TCP-03
Current Probe	N2783B	8/08/2017	7/08/2020	SAF-TCP-05
Current Probe	1147A	8/08/2017	7/08/2020	SAF-TCP-07
Current Probe	1147A	9/08/2017	8/08/2020	SAF-TCP-08
Current Probe	N2783B	NCR	NCR	SAF-TCP-04
Current Probe	1147A	NCR	NCR	SAF-TCP-06
Current Probe Power Supply	N2779A	NCR	NCR	SAF-CPA-03
Current Probe Power Supply	N2779A	NCR	NCR	SAF-CPA-04
DATA AQUISITION / SWITCH UNIT	34970A	6/03/2019	5/03/2020	SAF-DAT-01
Digital Multimeter	34461A	14/02/2019	14/02/2020	SAF-DMM-01
Digital Multimeter	34461A	6/03/2019	5/03/2020	SAF-DMM-02
Modular SAS Mainframe	E4360A	NCR	NCR	SAF-SAS-04
Modular SAS Mainframe	E4360A	NCR	NCR	SAF-SAS-07
Modular SAS Mainframe	E4360A	NCR	NCR	SAF-SAS-10
Oscilloscope	TDS3034C	1/03/2019	29/02/2020	SAF-OSC-01
Oscilloscope	TDS3034C	18/03/2019	17/03/2020	SAF-OSC-02
Oscilloscope	DSO-X 3034A	11/05/2018	11/05/2019	SAF-OSC-03
Oscilloscope	DSO-X 3034T	27/02/2019	27/02/2020	SAF-OSC-05
Power Quality Analyzer	WT1800	1/06/2018	1/06/2019	SAF-PQA-03
Power Quality Analyzer	WT3000	15/06/2018	15/06/2019	SAF-PQA-04
Power Quality Analyzer	WT3000E	7/2/2019	7/2/2020	SAF-PQA-05
Power Quality Analyzer	WT3000E	7/2/2019	7/2/2020	SAF-PQA-06
RLC Load for Anti-Islanding	ACLT-3802H	18/06/2018	18/06/2019	SAF-RLC-01
Solar Array Simulator (in SAF-SAS-04)	E4361A	NCR	NCR	SAF-SAS-05
Solar Array Simulator (in SAF-SAS-04)	E4361A	NCR	NCR	SAF-SAS-06
Solar Array Simulator (in SAF-SAS-07)	E4361A	NCR	NCR	SAF-SAS-08
Solar Array Simulator (in SAF-SAS-07)	E4361A	NCR	NCR	SAF-SAS-09
Solar Array Simulator (in SAF-SAS-10)	E4361A	13/03/2019	12/03/2020	SAF-SAS-11
Solar Array Simulator (in SAF-SAS-10)	E4361A	13/03/2019	12/03/2020	SAF-SAS-12

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Photographic Record of Test Sample

IQ7X Photos:

Figure 2: IQ7X general view

Figure 3: IQ7X bottom

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Photographic Record of Test Sample

Figure 4: IQ7X top

Figure 5: IQ7X connector side

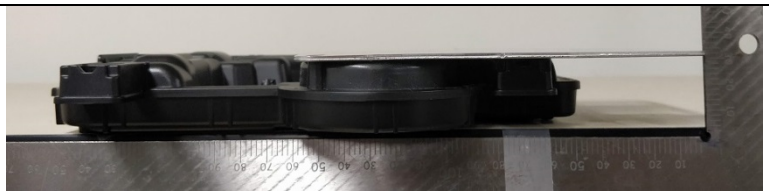

Figure 6: IQ7X right side

Figure 7: IQ7X barcode side

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Photographic Record of Test Sample

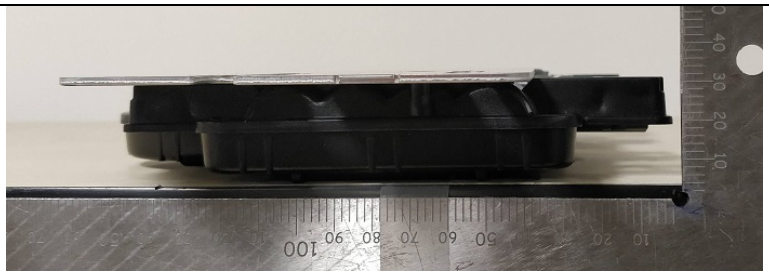

Figure 8: IQ7X mounting plate side

End of report