

### Form C: Type Test Verification Report

Type Approval and **Manufacturer** declaration of compliance with the requirements of G98.

This form should be used when making a Type Test submission to the Energy Networks Association (ENA).

If the **Micro-generator** is **Fully Type Tested** and already registered with the ENA **Type Test Verification Report** Register, the **Installation Document** should include the **Manufacturer's** Reference Number (the Product ID), and this form does not need to be submitted.

Where the **Micro-generator** is not registered with the ENA **Type Test Verification Report** Register this form needs to be completed and provided to the **DNO**, to confirm that the **Micro-generator** has been tested to satisfy the requirements of this EREC G98.

<b>Manufacturer's</b> reference number		LXP-3K hybrid,LXP-3.6K hybrid, LXP-4K hybrid,LXP-4.6K hybrid, LXP-5K hybrid	
<b>Micro-generator</b> technology		Hybrid Inverter	
<b>Manufacturer</b> name		Shenzhen Lux Power TechnologyCo.,Ltd	
Address		403, Building 63, Zhongwu Community New Industrial Park, Hangcheng Street, Baoan District, Shenzhen, Guangdong, Province, China.	
Tel	+86 755 8520 9056	Fax	
E-mail	service@luxpowertek.com	Web site	www.luxpowertek.com
<b>Registered Capacity</b> , use separate sheet if more than one connection option.	Connection Option		
	5.0	kW single phase, single, split or three phase system	
	NA	kW three phase	
	NA	kW two phases in three phase system	
	NA	kW two phases split phase system	
<b>Manufacturer Type Test</b> declaration. - I certify that all products supplied by the company with the above <b>Type Tested</b> 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 G98.			
Signed	<i>James Wang</i>	On behalf of	<i>James Wang</i>

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.

**Operating Range:** This test should be carried out as specified in EN 50438 D.3.1.

**Active Power** shall be recorded every second. The tests will verify that the **Micro-generator** 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 **Micro-generator** the PV primary source may be replaced by a **DC** source.

In case of a full converter **Micro-generator** (eg wind) the primary source and the prime mover **Inverter/rectifier** may be replaced by a **DC** source.

In case of a DFIG **Micro-generator** the mechanical drive system may be replaced by a test bench motor.

## Test 1

Voltage = 85% of nominal (195.5 V)

Frequency = 47.5 Hz

Power factor = 1

Period of test 90 minutes

Connection: always connected

Limit: always connected

## Test 2

Voltage = 110% of nominal (253 V).

Frequency = 51.5 Hz

Power factor = 1

Period of test 90 minutes

Connection: always connected

Limit: always connected

## Test 3

Voltage = 110% of nominal (253 V).

Frequency = 52.0 Hz

Power factor = 1

# Declaration



Period of test 15 minutes
Connection: always connected Limit: always connected
Power Quality – Harmonics: These tests should be carried out as specified in BS EN 61000-3-2. The chosen test should be undertaken with a fixed source of energy at two power levels a) between 45 and 55% and b) at 100% of Registered Capacity. The test requirements are specified in Annex A1 A.1.3.1 (Inverter connected) or Annex A2 A.2.3.1 (Synchronous).
Micro-generator tested to BS EN 61000-3-2

Micro-generator rating per phase (rpp)		3.0	kW		NV=MV*3,68/rpp	
Harmonic	At 45-55% of Registered Capacity		100% of Registered Capacity		Limit in BS EN 61000-3-2 in Amps	Higher limit for odd harmonics 21 and above
	Measured Value MV in Amps		Measured Value MV in Amps			
2	0,025	0,031	0,044	0,054	1.080	
3	0,056	0,069	0,091	0,112	2.300	
4	0,054	0,066	0,065	0,080	0.430	
5	0,013	0,016	0,019	0,023	1.140	
6	0,037	0,045	0,032	0,039	0.300	
7	0,031	0,038	0,033	0,040	0.770	
8	0,010	0,012	0,010	0,012	0.230	
9	0,017	0,021	0,024	0,029	0.400	
10	0,011	0,013	0,023	0,028	0.184	
11	0,008	0,010	0,014	0,017	0.330	
12	0,011	0,013	0,005	0,006	0.153	

# Declaration



13	0,005	0,006	0,004	0,005	0.210	
14	0,020	0,025	0,021	0,026	0.131	
15	0,006	0,007	0,019	0,023	0.150	
16	0,013	0,016	0,020	0,025	0.115	
17	0,009	0,011	0,007	0,009	0.132	
18	0,025	0,031	0,028	0,034	0.102	
19	0,010	0,012	0,009	0,011	0.118	
20	0,011	0,013	0,017	0,021	0.092	
21	0,005	0,006	0,003	0,004	0.107	0.160
22	0,024	0,029	0,026	0,032	0.084	
23	0,010	0,012	0,011	0,013	0.098	0.147
24	0,015	0,018	0,009	0,011	0.077	
25	0,007	0,009	0,009	0,011	0.090	0.135
26	0,009	0,011	0,013	0,016	0.071	
27	0,002	0,002	0,004	0,005	0.083	0.124
28	0,009	0,011	0,004	0,005	0.066	
29	0,004	0,005	0,006	0,007	0.078	0.117
30	0,003	0,004	0,007	0,009	0.061	
31	0,005	0,006	0,005	0,006	0.073	0.109
32	0,002	0,002	0,003	0,004	0.058	
33	0,005	0,006	0,009	0,011	0.068	0.102
34	0,006	0,007	0,005	0,006	0.054	
35	0,004	0,005	0,008	0,010	0.064	0.096
36	0.0023	0.0024	0.0113	0.0116	0.051	

# Declaration



37	0.0048	0.0049	0.0031	0.0032	0.061	0.091
38	0.0048	0.0049	0.0032	0.0033	0.048	
39	0.0023	0.0024	0.0022	0.0022	0.058	0.087
40	0.008	0.0082	0.0103	0.0105	0.046	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.

The tests had been performed on the LXP-3K hybrid are valid for the LXP-3.6K hybrid, since it is same as in hardware and just power derated by software.

Micro-generator rating per phase (rpp)		5.0	kW		Harmonic %= Measured Value (MV)x23/ rating per phase (kVA)	
Harmonic	At 45-55% of Registered Capacity	100% of Registered Capacity		Limit in BS EN61000-3-12 in %		
	Measured Value (MV) in Amps	Measured Value (MV) in %	Measured Value (MV) in Amps	Measured Value (MV) in %	1 phase	3 phase
2	0,037	0,172	0,098	0,453	8	8
3	0,076	0,350	0,143	0,656	21,6	N/A
4	0,063	0,291	0,098	0,452	4	4
5	0,017	0,077	0,013	0,060	10,7	10,7
6	0,034	0,156	0,031	0,144	2,67	2,67
7	0,032	0,148	0,042	0,192	7,2	7,2
8	0,011	0,051	0,006	0,029	2	2
9	0,024	0,112	0,030	0,138	3,8	N/A
10	0,019	0,088	0,028	0,130	1,6	1,6
11	0,016	0,071	0,014	0,064	3,1	3,1
12	0,011	0,053	0,016	0,073	1,33	1,33
13	0,005	0,024	0,029	0,136	2	2
14	0,023	0,107	0,020	0,090	N/A	N/A
15	0,011	0,051	0,011	0,051	N/A	N/A
16	0,014	0,065	0,010	0,045	N/A	N/A
17	0,007	0,032	0,021	0,096	N/A	N/A
18	0,032	0,147	0,036	0,167	N/A	N/A
19	0,006	0,029	0,017	0,076	N/A	N/A
20	0,012	0,057	0,017	0,080	N/A	N/A

# Declaration



21	0,004	0,017	0,012	0,056	N/A	N/A
22	0,028	0,128	0,015	0,069	N/A	N/A
23	0,011	0,048	0,012	0,055	N/A	N/A
24	0,014	0,063	0,007	0,032	N/A	N/A
25	0,007	0,034	0,003	0,013	N/A	N/A
26	0,015	0,071	0,003	0,014	N/A	N/A
27	0,005	0,025	0,005	0,022	N/A	N/A
28	0,008	0,036	0,004	0,017	N/A	N/A
29	0,005	0,025	0,005	0,021	N/A	N/A
30	0,004	0,018	0,006	0,028	N/A	N/A
31	0,007	0,030	0,004	0,016	N/A	N/A
32	0,003	0,013	0,008	0,037	N/A	N/A
33	0,006	0,028	0,006	0,028	N/A	N/A
34	0,010	0,048	0,009	0,041	N/A	N/A
35	0,004	0,017	0,005	0,025	N/A	N/A
36	0,003	0,016	0,007	0,030	N/A	N/A
37	0,003	0,014	0,005	0,024	N/A	N/A
38	0,004	0,020	0,004	0,018	N/A	N/A
39	0,003	0,016	0,003	0,014	N/A	N/A
40	0,002	0,011	0,004	0,016	N/A	N/A
THD	--	1,25	--	1,01	23	13
PWHD	--	0,59	--	0,36	23	22

NOTE: The tests had been performed on the LXP-5K hybrid are valid for the LXP- 4K hybrid, LXP-4.6K hybrid, since it is same as in hardware and just power derated by software.

# Declaration

**Power Quality – Voltage fluctuations and Flicker:** These tests should be undertaken in accordance with EREC G98 Annex A1 A.1.3.3 (**Inverter** connected) or Annex A2 A.2.3.3 (Synchronous).

Test: LXP 5K hybrid

	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P <sub>st</sub>	P <sub>lt</sub> 2 hours
Measured Values at test impedance	0,21	0,09	0	0,21	0,09	0	0,11	0,10
Normalised to standard impedance	0,21	0,09	0	0,21	0,09	0	0,11	0,10
Normalised to required maximum impedance	--	--	--	--	--	--	--	--
Limits set under BS EN 61000-3-11	4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65

Test: LXP 3K hybrid

	Starting			Stopping			Running	
	d max	d c	d(t)	d max	d c	d(t)	P <sub>st</sub>	P <sub>lt</sub> 2 hours
Measured Values at test impedance	0,19	0,07	0	0,19	0,07	0	0,08	0,07
Normalised to standard impedance	0,19	0,07	0	0,19	0,07	0	0,08	0,07
Normalised to required	--	--	--	--	--	--	--	--

# Declaration



maximum impedance								
Limits set under BS EN 61000-3-11	4%	3,3%	3,3% 500ms	4%	3,3%	3,3% 500ms	1,0	0,65
Test Impedance	R	0,24	Ω	XI	0,15	Ω		
Standard Impedance	R	0,24* 0,4^	Ω	XI	0,15* 0,25^	Ω		
Maximum Impedance	R	0,24	Ω	XI	0,1	Ω		
<p>Applies to three phase and split single phase <b>Micro-generators</b>.</p> <p>^ Applies to single phase <b>Micro-generators</b> and <b>Micro-generators</b> using two phases on a three phase system.</p> <p>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.</p> <p>Normalised value = Measured value*reference source resistance/measured source resistance at test point.</p> <p>Single phase units reference source resistance is 0.4 Ω</p> <p>Two phase units in a three phase system reference source resistance is 0.4 Ω.</p> <p>Two phase units in a split phase system reference source resistance is 0.24 Ω.</p> <p>Three phase units reference source resistance is 0.24 Ω.</p> <p>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.</p> <p>The stopping test should be a trip from full load operation.</p> <p>The duration of these tests need to conform to 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.</p>								
Test start date	2019/05/02			Test end date	2019/05/02			
Test location	Luxpower testing laboratory& Intertek Testing Services Shenzhen Ltd. Guangzhou Branch							

# Declaration



**Power quality – DC injection:** This test should be carried out in accordance with EN 50438 Annex D.3.10

Test: LXP 3K Hybrid

Test power level	20%	50%	75%	100%
Recorded value in Amps	0.013	0.009	0.011	0.011
as % of rated AC current	0.099%	0.069%	0.084%	0.084%
Limit	0.25%	0.25%	0.25%	0.25%

Test: LXP 5K Hybrid

Test power level	20%	50%	75%	100%
Recorded value in Amps	0,01 A	0,007A	-0,009 A	0,007 A
as % of rated AC current	0,046%	0,032%	-0,04%	0,032%
Limit	0.25%	0.25%	0.25%	0.25%

Note: The tests had been performed on the LXP-5K hybrid and LXP-3K hybrid are valid for the LXP- 3.6K hybrid, LXP- 4K hybrid, LXP-4.6K hybrid, since it is same as in hardware and just power derated by software.

**Power Quality – Power factor:** This test shall be carried out in accordance with EN 50538 Annex D.3.4.1 but with nominal voltage -6% and +10%. Voltage to be maintained within  $\pm 1.5\%$  of the stated level during the test.

Test: LXP 3K Hybrid

	216.2 V	230 V	253 V
20% of <b>Registered Capacity</b>	0.9912	0.9905	0.9896
50% of <b>Registered Capacity</b>	0.9965	0.9962	0.9959
75% of <b>Registered Capacity</b>	0.9978	0.9973	0.997

# Declaration

100% of <b>Registered Capacity</b>	0.9983	0.998	0.9968
Limit	>0.95	>0.95	>0.95
Test: LXP 5K Hybrid			
	216.2 V	230 V	253 V
20% of <b>Registered Capacity</b>	0.9942	0.9935	0.9931
50% of <b>Registered Capacity</b>	0.9984	0.9980	0.9975
75% of <b>Registered Capacity</b>	0.999	0.9983	0.9979
100% of <b>Registered Capacity</b>	0.999	0.9985	0.9981
Limit	>0.95	>0.95	>0.95
Note: The tests had been performed on the LXP-5K hybrid and LXP-3K hybrid are valid for the LXP- 3.6K hybrid, LXP- 4K hybrid, LXP-4.6K hybrid, since it is same as in hardware and just power derated by software.			

<b>Protection – Frequency tests:</b> These tests should be carried out in accordance with EN 50438 Annex D.2.4 and the notes in EREC G98 Annex A1 A.1.2.3 ( <b>Inverter</b> connected) or Annex A2 A.2.2.3 (Synchronous)						
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	47.48	20.1	47.7 Hz 25 s	No trip
U/F stage 2	47 Hz	0.5 s	47	0.596	47.2 Hz 19.98 s	No trip
					46.8 Hz 0.48 s	No trip
O/F stage 1	52 Hz	0.5 s	52.01	0.608	51.8 Hz 89.98 s	No trip
					52.2 Hz 0.48 s	No trip

# Declaration

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

The tests had been performed on the LXP-5K hybrid are valid for the LXP-3K hybrid, LXP-4K hybrid and LXP-4.6K hybrid, since it is same as in hardware and just power derated by software.

**Protection – Voltage tests:** These tests should be carried out in accordance with EN 50438 Annex D.2.3 and the notes in EREC G98 Annex A1 A.1.2.2 (**Inverter** connected) or Annex A2 A.2.2.2 (Synchronous)

Function	Setting		Trip test		“No trip tests”	
	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
U/V	184 V	2.5 s	184	2.62	188 V 3.50 s	No trip
					180 V 2.48 s	No trip
O/V stage 1	262.2 V	1.0 s	262.5	1.2	258.2 V 2.0 s	No trip
O/V stage 2	273.7 V	0.5 s	274	0.56	269.7 V 0.98 s	No trip
					277.7 V 0.48 s	No trip

Note for Voltage tests the Voltage required to trip is the setting  $\pm 3.45$  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  $\pm 4$  V and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

The tests had been performed on the LXP-5K hybrid are valid for the LXP-3K hybrid, LXP-4K hybrid and LXP-4.6K hybrid, since it is same as in hardware and just power derated by software.

# Declaration

Protection – Loss of Mains test: For PV Inverters shall be tested in accordance with BS EN 62116. Other Inverters should be tested in accordance with EN 50438 Annex D.2.5 at 10%, 55% and 100% of rated power.

To be carried out at three output power levels with a tolerance of plus or minus 5% in Test Power levels.

Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>
Trip time. Limit is 0.5 s	217	235	262	243	196	240

For Multi phase **Micro-generators** confirm that the device shuts down correctly after the removal of a single fuse as well as operation of all phases.

Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>
Trip time. Ph1 fuse removed	NA	NA	NA	NA	NA	NA

Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>
Trip time. Ph2 fuse removed	NA	NA	NA	NA	NA	NA

Test Power	10%	55%	100%	10%	55%	100%
Balancing load on islanded network	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	95% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>	105% of <b>Registered Capacity</b>
Trip time. Ph3 fuse removed	NA	NA	NA	NA	NA	NA

Note for technologies which have a substantial shut down time this can be added to the 0.5 s in establishing that

# Declaration

the trip occurred in less than 0.5 s. Maximum shut down time could therefore be up to 1.0 s for these technologies.

Indicate additional shut down time included in above results.	850 ms
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For **Inverters** tested to BS EN 62116 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 0.5 s	0.124	0.137	0.105	0.196	0.186	0.155

Note: The tests had been performed on the LXP-5K hybrid are valid for the LXP-3K hybrid, LXP-4K hybrid and LXP- 4.6K hybrid, since it is same as in hardware and just power derated by software.

**Protection – Frequency change, Vector Shift Stability test:** This test should be carried out in accordance with EREC G98 Annex A1 A.1.2.6 (**Inverter** connected) or Annex A2 A.2.2.6 (Synchronous).

	Start Frequency	Change	Confirm no trip
Positive Vector Shift	49.0 Hz	+50 degrees	No trip
Negative Vector Shift	50.0 Hz	- 50 degrees	No trip

**Protection – Frequency change, RoCoF Stability test:** The requirement is specified in section 11.3, test procedure in Annex A.1.2.6 (**Inverter** connected) or Annex A2 A.2.2.6 (Synchronous).

Ramp range	Test frequency ramp:	Test Duration	Confirm no trip
49.0 Hz to 51.0 Hz	+0.95 Hzs <sup>-1</sup>	2.1 s	No trip
51.0 Hz to 49.0 Hz	-0.95 Hzs <sup>-1</sup>	2.1 s	No trip

# Declaration

**Limited Frequency Sensitive Mode – Overfrequency test:** This test should be carried out in accordance with EN 50438 Annex D.3.3 Power response to over- frequency. The test should be carried out using the specific threshold frequency of 50.4 Hz and **Droop** of 10%.

**Test: LXP 3K hybrid**

Test sequence at <b>Registered Capacity &gt;80%</b>	Measured <b>Active Power</b> Output	Frequency	Primary Power Source	<b>Active Power</b> Gradient
Step a) 50.00 Hz ±0.01 Hz	3010	50	NA	-0
Step b) 50.45 Hz ±0.05 Hz	2985	50.45		-
Step c) 50.70 Hz ±0.10 Hz	2875	50.70		-
Step d) 51.15 Hz ±0.05 Hz	2715	51.15		-
Step e) 50.70 Hz ±0.10 Hz	2878	50.70		-
Step f) 50.45 Hz ±0.05 Hz	2980	50.45		-
Step g) 50.00 Hz ±0.01 Hz	3005	50		
Test sequence at <b>Registered Capacity 40% - 60%</b>	Measured <b>Active Power</b> Output	Frequency	Primary Power Source	<b>Active Power</b> Gradient
Step a) 50.00 Hz ±0.01 Hz	1521	50	NA	-
Step b) 50.45 Hz ±0.05 Hz	1495	50.45		-
Step c) 50.70 Hz ±0.10 Hz	1446	50.70		-
Step d) 51.15 Hz ±0.05 Hz	1351	51.15		-
Step e) 50.70 Hz ±0.10 Hz	1447	50.70		-
Step f) 50.45 Hz ±0.05 Hz	1490	50.45		-
Step g) 50.00 Hz ±0.01 Hz	1515	50		

Steps as defined in EN 50438

Power output with falling frequency test: This test should be carried out in accordance with EN 50438 Annex D.3.2 active power feed-in at under-frequency.

# Declaration

Test sequence	Measured <b>Active Power</b> Output	Frequency	Primary power source
Test a) 50 Hz $\pm$ 0.01 Hz	3011	50	NA
Test b) Point between 49.5 Hz and 49.6 Hz	2998	49.6	NA
Test c) Point between 47.5 Hz and 47.6 Hz	2995	47.6	NA

NOTE: The operating point in Test (b) and (c) shall be maintained for at least 5 minutes

Limited Frequency Sensitive Mode – Overfrequency test: This test should be carried out in accordance with EN 50438 Annex D.3.3 Power response to over- frequency. The test should be carried out using the specific threshold frequency of 50.4 Hz and Droop of 10%.

### Test: LXP 5K hybrid

Test sequence at <b>Registered Capacity &gt;80%</b>	Measured <b>Active Power</b> Output	Frequency	Primary Power Source	<b>Active Power</b> Gradient
Step a) 50.00 Hz $\pm$ 0.01 Hz	5012	50	NA	-0
Step b) 50.45 Hz $\pm$ 0.05 Hz	4984	50.45		-
Step c) 50.70 Hz $\pm$ 0.10 Hz	4811	50.70		-
Step d) 51.15 Hz $\pm$ 0.05 Hz	4495	51.15		-
Step e) 50.70 Hz $\pm$ 0.10 Hz	4806	50.70		-
Step f) 50.45 Hz $\pm$ 0.05 Hz	4989	50.45		-
Step g) 50.00 Hz $\pm$ 0.01 Hz	5011	50		-
Test sequence at <b>Registered Capacity 40% - 60%</b>	Measured <b>Active Power</b> Output	Frequency	Primary Power Source	<b>Active Power</b> Gradient
Step a) 50.00 Hz $\pm$ 0.01 Hz	2535	50	NA	-
Step b) 50.45 Hz $\pm$ 0.05 Hz	2499	50.45		-

# Declaration

Step c) 50.70 Hz $\pm$ 0.10 Hz	2415	50.70		-
Step d) 51.15 Hz $\pm$ 0.05 Hz	2265	51.15		-
Step e) 50.70 Hz $\pm$ 0.10 Hz	2420	50.70		-
Step f) 50.45 Hz $\pm$ 0.05 Hz	2499	50.45		-
Step g) 50.00 Hz $\pm$ 0.01 Hz	2525	50		

Steps as defined in EN 50438

Power output with falling frequency test: This test should be carried out in accordance with EN 50438 Annex D.3.2 active power feed-in at under-frequency.

Test sequence	Measured <b>Active Power</b> Output	Frequency	Primary power source
Test a) 50 Hz $\pm$ 0.01 Hz	2526	50	NA
Test b) Point between 49.5 Hz and 49.6 Hz	2511	49.6	NA
Test c) Point between 47.5 Hz and 47.6 Hz	2505	47.6	NA

NOTE: The operating point in Test (b) and (c) shall be maintained for at least 5 minutes

The tests had been performed on the LXP-5K hybrid and LXP-3K hybrid are valid for the LXP-3.6K hybrid, LXP-4K hybrid and LXP- 4.6K hybrid, since it is same as in hardware and just power derated by software.

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 2.						
Time delay setting	Measured delay		Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 2.			
20	28		At 266.2 V	At 196.1 V	At 47.4 Hz	At 52.1 Hz
Confirmation that the <b>Micro-generator</b> re-connects.		does not	No reconnection	No reconnection	No reconnection	No reconnection

Fault level contribution: These tests shall be carried out in accordance with EREC G98 Annex A1 A.1.3.5 (Inverter connected) and Annex A2 A.2.3.4 (Synchronous).						
For machines with electro-magnetic output			For <b>Inverter</b> output			
Parameter	Symbol	Value	Time after fault	Volts	Amps	
Peak Short Circuit current	$i_p$	NA	20 ms	162.5	22.2	
Initial Value of aperiodic current	$A$	NA	100 ms	129.8	21.0	
Initial symmetrical short-circuit current*	$I_k$	NA	250 ms	59.3	0.8	
Decaying (aperiodic) component of short circuit current*	$i_{DC}$	NA	500 ms	0	0	
Reactance/Resistance Ratio of source*	$X/R$	NA	Time to trip	0.318	In seconds	
For rotating machines and linear piston machines the test should produce a 0 s – 2 s plot of the short circuit current as seen at the <b>Micro-generator</b> terminals.						
* Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot						

# Declaration

<b>Logic Interface.</b>	Yes
<b>Self-Monitoring solid state switching:</b> No specified test requirements. Refer to EREC G98 Annex A1 A.1.3.6 ( <b>Inverter</b> connected).	Yes/or NA
It has been verified that in the event of the solid state switching device failing to disconnect the <b>Micro-generator</b> , the voltage on the output side of the switching device is reduced to a value below 50 V within 0.5 s.	NA
Additional comments	