CERTIFICATE OF CONFORMITY

CERTIFICATO DI CONFORMITÀ

Issued to:	Huawei Technologies Co., Ltd. Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, Guangdong, 518129, China
For the product:	SOLAR INVERTER
Trade name:	HUAWEI
Type/Model:	SUN2000-100KTL-M2, SUN2000-115KTL-M2
Ratings:	SUN2000-100KTL-M2: PV input: Max 1100 Vdc, MPPT voltage range: 200-1000 Vdc, Isc PV: 40 A × 10, Max 30 A × 10 AC output: 3/N/PE, 400 Vac, 50Hz, rated 144.4 A, 100 kW, max 160.4 A, Max 110 kVA 3/PE, 480 Vac, 50Hz, rated 120.3 A, 100 kW, max 133.7 A, Max 110 kVA SUN2000-115KTL-M2: PV input: Max 1100 Vdc, MPPT voltage range: 200-1000 Vdc, Isc PV: 40 A × 10, Max 30 A × 10 AC output: 3/N/PE, 400 Vac, 50 Hz, rated 166.0 A, 115 kW, max 182.3 A, Max 125 kVA 3/PE, 480 Vac, 50Hz, rated 138.4 A, 115 kW, max 151.9 A, Max 125 kVA
Manufactured by:	Huawei Technologies Co., Ltd. Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, Guangdong, 518129, China
Requirements:	Engineering Recommendation G99 Issue 1 – Amendment 9: 2022 (G99/1-9)

This Test Certificate is granted on account of an examination by DEKRA, the results of which are laid down in a confidential file no. 6187089.50

The examination has been carried out on one single specimen or several specimens of the product, submitted by the manufacturer. The certificate does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by DEKRA is not the responsibility of DEKRA.

This Test Certificate expires at the latest on 26 April 2029 or expires upon withdrawal of one of the above mentioned standards.

Shanghai, 26 April 2024 Certificate Number: 6187089.01COC

DEKRA Testing and Certification (Shanghai) Ltd.

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Certification Manager

IAS ACCREDITED Product Certification Agency

PCA-141

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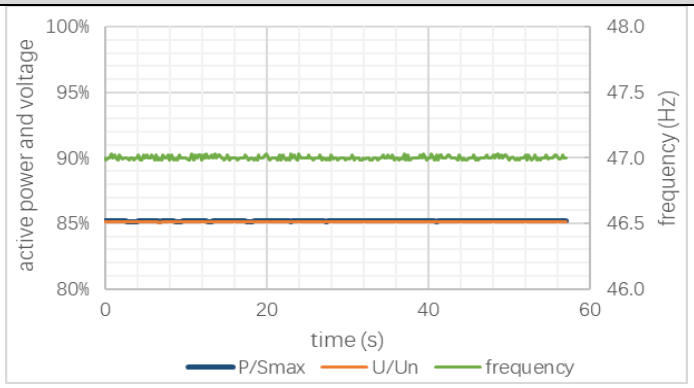
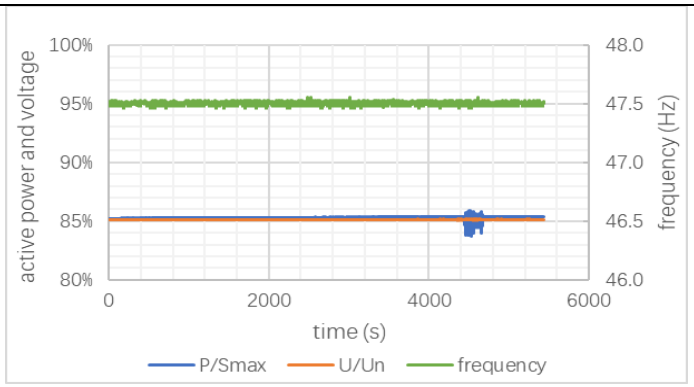
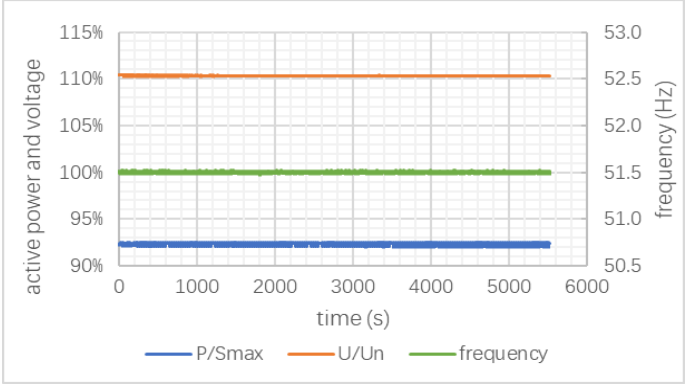
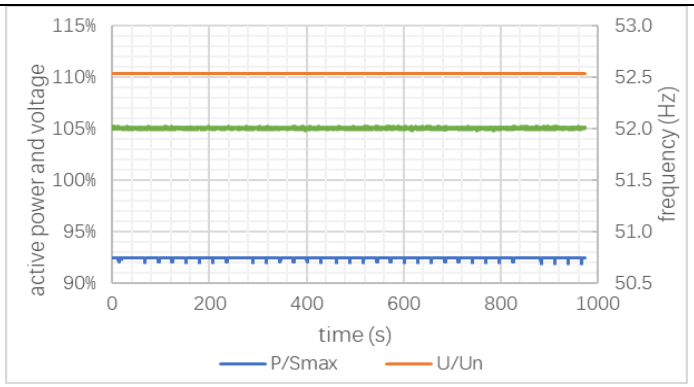
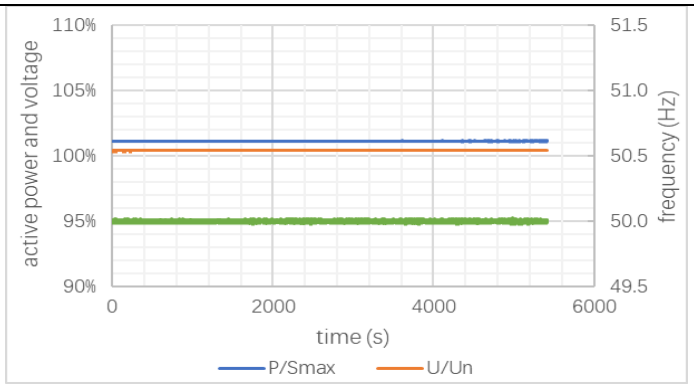
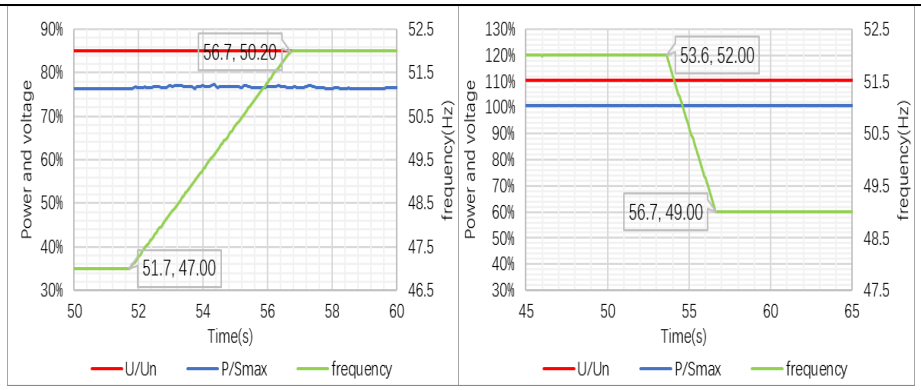
Document no. : 6187089.01COC

G99/1-9 Compliance Verification Report –Tests for Inverter Connected Power Generating Modules	
Extract form test report number.:	**6187089.50**

Operating Range	**P**
Operating Range: Five 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	
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	
Test 5 Voltage = 100% of nominal (230 V), Frequency = 50.0 Hz, **Power Factor** = 1, Period of test = 90 minutes	
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.	

Model: SUN2000-115KTL-M2				P
Test 1:				
Measured Voltage (V)	Measured Frequency (Hz)	Measured Power (W)	Measured Power factor	Test Time (seconds)
195.73	47.00	106509.4	1.000	> 20
Test 2:				
Measured Voltage (V)	Measured Frequency (Hz)	Measured Power (W)	Measured Power factor	Test Time (Minutes)
195.83	47.50	106701.3	1.000	> 90
Test 3:				
Measured Voltage (V)	Measured Frequency (Hz)	Measured Power (W)	Measured Power factor	Test Time (Minutes)
253.81	51.50	115535.8	1.000	> 90
Test 4:				
Measured Voltage (V)	Measured Frequency (Hz)	Measured Power (W)	Measured Power factor	Test Time (Minutes)
253.82	52.00	115547.1	1.000	> 15
Test 5:				
Measured Voltage (V)	Measured Frequency (Hz)	Measured Power (W)	Measured Power factor	Test Time (Minutes)
230.93	50.00	126416.7	1.000	> 90
Test 6:				
Measured Voltage (V)	Ramp range	Test frequency ramp	Test Duration	Confirm no trip
195.5	47.0 Hz to 52.0 Hz	+1 Hzs^{-1}	5.0 s	no trip
253.0	52.0 Hz to 49.0 Hz	-1 Hzs^{-1}	3.1 s	no trip

Power Quality – Harmonics:			**P**
For **Power Generating Module**s 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 Module**s 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 Module**s of **Registered Capacity** of greater than 75 A per phase (ie 50 kW) the installation shall be designed in accordance with EREC G5.			
Model: SUN2000-115KTL-M2			
Power Generating Module tested to BS EN 61000-3-12			
Power Generating Module rating per phase (rpp)	41.67	kVA	Harmonic % = Measured Value (A) x 23/rating per phase (kVA)
Single or three phase measurements (for single phase measurements, only complete L1 columns below)	three phase PV inverter		

Annex

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Harmonic	At 45-55% of **Registered Capacity**						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %				
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
2	0.080	0.199	0.193	0.048	0.120	0.116	8%	8%
3	0.183	0.126	0.146	0.110	0.076	0.088	21.6%	Not stated
4	0.136	0.073	0.101	0.082	0.044	0.061	4%	4%
5	0.033	0.044	0.045	0.020	0.026	0.027	10.7%	10.7%
6	0.038	0.039	0.066	0.023	0.024	0.039	2.67%	2.67%
7	0.040	0.049	0.041	0.024	0.030	0.025	7.2%	7.2%
8	0.036	0.037	0.050	0.022	0.022	0.030	2%	2%
9	0.057	0.057	0.059	0.034	0.034	0.035	3.8%	Not stated
10	0.046	0.039	0.053	0.028	0.023	0.032	1.6%	1.6%
11	0.088	0.065	0.065	0.053	0.039	0.039	3.1%	3.1%
12	0.045	0.046	0.058	0.027	0.028	0.035	1.33%	1.33%
13	0.050	0.100	0.080	0.030	0.060	0.048	2%	2%
THD	-	-	-	0.17	0.18	0.19	23%	13%
PWHD	-	-	-	0.39	0.40	0.42	23%	22%
Harmonic	At 100% of **Registered Capacity**						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %				
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
2	0.200	0.233	0.307	0.120	0.140	0.185	8%	8%
3	0.480	0.681	0.415	0.289	0.410	0.250	21.6%	Not stated
4	0.112	0.070	0.139	0.067	0.042	0.084	4%	4%
5	0.108	0.110	0.117	0.065	0.066	0.070	10.7%	10.7%
6	0.066	0.053	0.065	0.040	0.032	0.039	2.67%	2.67%
7	0.216	0.158	0.155	0.130	0.095	0.093	7.2%	7.2%
8	0.046	0.049	0.055	0.028	0.029	0.033	2%	2%
9	0.121	0.069	0.146	0.073	0.041	0.088	3.8%	Not stated
10	0.066	0.051	0.049	0.040	0.031	0.030	1.6%	1.6%
11	0.129	0.129	0.077	0.078	0.078	0.046	3.1%	3.1%
12	0.053	0.061	0.058	0.032	0.037	0.035	1.33%	1.33%
13	0.109	0.127	0.094	0.066	0.076	0.057	2%	2%
THD	-	-	-	0.38	0.47	0.37	23%	13%
PWHD	-	-	-	0.81	0.91	0.74	23%	22%

Annex

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Model: SUN2000-100KTL-M2								
Power Generating Module tested to BS EN 61000-3-12								
Power Generating Module rating per phase (rpp)				36.67	kVA		Harmonic % = Measured Value (A) x 23/rating per phase (kVA)	
Single or three phase measurements (for single phase measurements, only complete L1 columns below)				three phase PV inverter				
Harmonic	At 45-55% of **Registered Capacity**						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %				
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
2	0.059	0.083	0.079	0.041	0.058	0.055	8%	8%
3	0.124	0.098	0.132	0.086	0.068	0.091	21.6%	Not stated
4	0.057	0.052	0.040	0.039	0.036	0.028	4%	4%
5	0.046	0.048	0.054	0.032	0.033	0.037	10.7%	10.7%
6	0.051	0.065	0.039	0.036	0.045	0.027	2.67%	2.67%
7	0.054	0.058	0.050	0.037	0.040	0.034	7.2%	7.2%
8	0.040	0.040	0.043	0.028	0.028	0.030	2%	2%
9	0.058	0.068	0.060	0.040	0.047	0.041	3.8%	Not stated
10	0.059	0.063	0.061	0.041	0.043	0.042	1.6%	1.6%
11	0.075	0.111	0.081	0.052	0.077	0.056	3.1%	3.1%
12	0.063	0.064	0.059	0.044	0.045	0.041	1.33%	1.33%
13	0.068	0.062	0.079	0.047	0.043	0.055	2%	2%
THD	-	-	-	0.16	0.17	0.17	23%	13%
PWHD	-	-	-	0.42	0.46	0.43	23%	22%
Harmonic	At 100% of **Registered Capacity**						Limit in BS EN 61000-3-12	
	Measured Value (MV) in Amps			Measured Value (MV) in %				
	L1	L2	L3	L1	L2	L3	1 phase	3 phase
2	0.087	0.150	0.119	0.060	0.103	0.082	8%	8%
3	0.370	0.349	0.233	0.255	0.241	0.161	21.6%	Not stated
4	0.076	0.140	0.076	0.052	0.096	0.052	4%	4%
5	0.116	0.045	0.109	0.080	0.031	0.075	10.7%	10.7%
6	0.088	0.096	0.039	0.060	0.067	0.027	2.67%	2.67%
7	0.170	0.176	0.161	0.118	0.121	0.111	7.2%	7.2%
8	0.049	0.081	0.084	0.033	0.056	0.058	2%	2%
9	0.075	0.165	0.105	0.052	0.114	0.073	3.8%	Not stated
10	0.066	0.051	0.054	0.045	0.035	0.037	1.6%	1.6%
11	0.169	0.086	0.149	0.116	0.059	0.103	3.1%	3.1%
12	0.057	0.050	0.061	0.039	0.035	0.042	1.33%	1.33%
13	0.047	0.185	0.178	0.033	0.128	0.123	2%	2%

THD	-	-	-	0.34	0.37	0.30	23%	13%
PWHD	-	-	-	0.77	0.89	0.80	23%	22%

1.THD = Total Harmonic Distortion
2.PWHD = Partial Weighted Harmonic Distortion

Power Quality – Voltage fluctuations and Flicker:									**P**
Model:		SUN2000-115KTL-M2							
Test start date		2022-08-11			Test end date			2022-10-21	
Test location		No.99, Hongye Road, Suzhou Industrial Park, Suzhou, Jiangsu, P.R. China							
		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	L1	0.45	0.16	0	1.11	0.18	0	0.25	0.22
	L2	0.60	0.15	0	1.04	0.20	0	0.25	0.23
	L3	0.53	0.16	0	1.00	0.29	0	0.25	0.23
Normalised to standard impedance		4%	3.3%	3.3%	4%	3.3%	3.3%	1.0	0.65
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	Xl	0.15	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

* 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. Delete as appropriate.

Power Quality – Voltage fluctuations and Flicker:									**P**
Model:		SUN2000-100KTL-M2							
Test start date		2022-08-12			Test end date			2022-10-24	
Test location		No.99, Hongye Road, Suzhou Industrial Park, Suzhou, Jiangsu, P.R. China							
		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	L1	0.76	0.18	0	0.57	0.17	0	0.14	0.14
	L2	0.64	0.17	0	0.53	0.19	0	0.17	0.16
	L3	0.63	0.23	0	0.66	0.28	0	0.17	0.17
Normalised to standard impedance		4%	3.3%	3.3%	4%	3.3%	3.3%	1.0	0.65

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	Xl	0.15	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

* 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. Delete as appropriate.

4. Power quality – DC injection:				**P**
Model: SUN2000-115KTL-M2				
Test power level		10%	55%	100%
Recorded DC injection value (mA)	L1	-120	-120	-70
	L2	-200	-190	-150
	L3	-240	-250	-220
as % of rated AC current	L1	0.072	0.072	0.042
	L2	0.120	0.114	0.090
	L3	0.145	0.151	0.133
Limit		0.25%	0.25%	0.25%
Model: SUN2000-100KTL-M2				
Test power level		10%	55%	100%
Recorded DC injection value(mA)	L1	-90	-100	40
	L2	-140	-180	70
	L3	-190	-240	60
as % of rated AC current	L1	-0.062	-0.069	0.028
	L2	-0.097	-0.125	0.048
	L3	-0.132	-0.166	0.042
Limit		0.25%	0.25%	0.25%

Power Factor:			**P**
Model: SUN2000-115KTL-M2			
Voltage	0.94 pu (216.2 V)	1 pu (230 V)	1.1 pu (253 V)
Measured value	1.000	1.000	1.000
Power Factor Limit	>0.95	>0.95	>0.95
Model: SUN2000-1100KTL-M2			
Voltage	0.94 pu (216.2 V)	1 pu (230 V)	1.1 pu (253 V)
Measured value	1.000	1.000	1.000
Power Factor Limit	>0.95	>0.95	>0.95

Protection – Frequency tests:						**P**
Model: SUN2000-115KTL-M2						
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	47.40 Hz	20.02 s	47.7 Hz 30 s	no trip
U/F stage 2	47.0 Hz	0.5 s	47.00 Hz	0.540 s	47.2 Hz 19.5 s	no trip
					46.8 Hz 0.45 s	no trip
O/F	52.0 Hz	0.5 s	52.01 Hz	0.532 s	51.8 Hz 120.0 s	no trip
					52.2 Hz 0.45 s	no trip

Protection – Voltage tests (LV Protection)						**P**
Model: SUN2000-115KTL-M2						
Phase L1						
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	184.43 V	2.530 s	188 V 5.0 s	no trip
					180 V 2.45 s	no trip
O/V stage 1	1.14 pu (262.2 V)	1.0 s	263.88 V	1.038 s	258.2 V 5.0 s	no trip
O/V stage 2	1.19 pu (273.7 V)	0.5 s	273.01 V	0.510 s	269.7 V 0.95 s	no trip
					277.7 V 0.45 s	no trip
Phase L2						
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	184.35 V	2.525 s	188 V 5.0 s	no trip
					180 V 2.45 s	no trip
O/V stage 1	1.14 pu (262.2 V)	1.0 s	263.90 V	1.028 s	258.2 V 5.0 s	no trip
O/V stage 2	1.19 pu (273.7 V)	0.5 s	273.71 V	0.526 s	269.7 V 0.95 s	no trip
					277.7 V 0.45 s	no trip
Phase L3						
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	184.24 V	2.515 s	188 V 5.0 s	no trip
					180 V 2.45 s	no trip
O/V stage 1	1.14 pu (262.2 V)	1.0 s	262.93 V	1.034 s	258.2 V 5.0 s	no trip
O/V stage 2	1.19 pu (273.7 V)	0.5 s	273.41 V	0.522 s	269.7 V 0.95 s	no trip
					277.7 V 0.45 s	no trip

Protection – Voltage tests (HV Protection)						**P**
Model: SUN2000-115KTL-M2						
L1 Phase						
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)	2.5s	184.43 V	2.532 s	188 V 5.0 s	No trip
					180 V 2.45 s	No trip
O/V stage 1	1.10 pu (253 V)	1.0s	253.39 V	1.029 s	249 V 5.0 s	No trip
O/V stage 2	1.13 pu (259.9 V)	0.5s	260.07 V	0.525 s	254.9 V 0.95 s	No trip
					263.9 V 0.45 s	No trip
L2 Phase						
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)	2.5s	184.09 V	2.532 s	188 V 5.0 s	No trip
					180 V 2.45 s	No trip
O/V stage 1	1.10 pu (253 V)	1.0s	253.36 V	1.029 s	249 V 5.0 s	No trip
O/V stage 2	1.13 pu (259.9 V)	0.5s	259.96 V	0.525 s	254.9 V 0.95 s	No trip
					263.9 V 0.45 s	No trip
L3 Phase						
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)	2.5s	184.24 V	2.532 s	188 V 5.0 s	No trip
					180 V 2.45 s	No trip
O/V stage 1	1.10 pu (253 V)	1.0s	253.12 V	1.037 s	249 V 5.0 s	No trip
O/V stage 2	1.13 pu (259.9 V)	0.5s	260.09 V	0.526 s	254.9 V 0.95 s	No trip
					263.9 V 0.45 s	No trip

Protection – Loss of Mains test:	**P**
These tests should be carried out in accordance with BS EN 62116. Annex A.7.1.2.4. For test condition A, EUT output = 100 % P_n, test condition B, EUT output = 50 % to 66 % P_n, and test condition C, EUT output = 25 % to 33 % P_n.	

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Model: SUN2000-115KTL-M2						
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	212.06 ms	195.26 ms	215.55 ms	201.56 ms	200.43 ms	331.69 ms

Loss of Mains Protection, Vector Shift Stability test			**P**
This test should be carried out in accordance with Annex A.7.1.2.6.			
Model: SUN2000-115KTL-M2			
Vector Shift	Start Frequency	Change	Confirm no trip
Positive Vector Shift	49.5 Hz	+50 degrees	No trip
Negative Vector Shift	50.5 Hz	- 50 degrees	No trip

Loss of Mains Protection, RoCoF Stability test			**P**
This test should be carried out in accordance with Annex A.7.1.2.6.			
Model: SUN2000-115KTL-M2			
Ramp range	Test frequency ramp:	Test Duration	Confirm no trip
49.0 Hz to 51.0 Hz	+0.95 Hzs^{-1}	2.2 s	No trip
51.0 Hz to 49.0 Hz	-0.95 Hzs^{-1}	2.2 s	No trip

Limited Frequency Sensitive Mode – Over frequency test	**P**
The test should be carried out using the specific threshold frequency of 50.4 Hz and **Droop** of 10%.	
Active Power response to rising frequency/time plots are attached if frequency injection tests are undertaken in accordance with Annex B.6.2	**Yes**

Model: SUN2000-115KTL-M2

Test sequence at **Registered Capacity** >80%	Measured **Active Power** Output (W)	Frequency (Hz)	Calculate droop (%)	Primary Power Source	**Active Power** Gradient
Step a) 50.00 Hz ±0.01 Hz	115310.0	50.00	--	Photovoltaic array simulator	-
Step b) 50.45 Hz ±0.05 Hz	114063.9	50.45	9.54		P
Step c) 50.70 Hz ±0.10 Hz	107813.0	50.70	9.26		P
Step d) 51.15 Hz ±0.05 Hz	96538.3	51.15	9.21		P
Step e) 50.70 Hz ±0.10 Hz	107808.0	50.70	9.25		P
Step f) 50.45 Hz ±0.05 Hz	114045.9	50.45	9.41		P
Step g) 50.00 Hz ±0.01 Hz	115279.0	50.00	--		-
Test sequence at **Registered Capacity** 40% - 60%	Measured **Active Power** Output (W)	Frequency (Hz)	Calculate droop (%)	Primary Power Source	**Active Power** Gradient
Step a) 50.00 Hz ±0.01 Hz	57558.3	50.00	--	Photovoltaic array simulator	-
Step b) 50.45 Hz ±0.05 Hz	56331.9	50.45	9.79		P
Step c) 50.70 Hz ±0.10 Hz	50087.6	50.70	9.29		P
Step d) 51.15 Hz ±0.05 Hz	38854.9	51.15	9.24		P
Step e) 50.70 Hz ±0.10 Hz	49975.8	50.70	9.15		P
Step f) 50.45 Hz ±0.05 Hz	56266.2	50.45	9.21		P
Step g) 50.00 Hz ±0.01 Hz	57556.5	50.00	--		-

Note:
The resulting overall tolerance range for a nominal 10% Droop is +2.8% and – 1.5%, ie a Droop less than 12.8% and greater than 8.5%.

Power output with falling frequency test	**P**
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 11.2.3.1, 12.2.3.1	

Model: SUN2000-115KTL-M2

Test sequence	Measured **Active Power** Output (W)	Acceptable **Active Power**	Frequency (Hz)	Primary power source
50.5 Hz for 5 minutes	114821.4	100% **Registered Capacity**	50.50	Photovoltaic array simulator
50.0 Hz for 5 minutes	114834.4	100% **Registered Capacity**	50.00	Photovoltaic array simulator
49.5 Hz for 5 minutes	114859.2	100% **Registered Capacity**	49.00	Photovoltaic array simulator
49.0 Hz for 5 minutes	114857.2	99% **Registered Capacity**	48.00	Photovoltaic array simulator
48.0 Hz for 5 minutes	114878.7	97% **Registered Capacity**	47.60	Photovoltaic array simulator

47.6 Hz for 5 minutes	114858.1	96.2% **Registered Capacity**	47.10	Photovoltaic array simulator
47.1 Hz for 20 s	114821.4	95% **Registered Capacity**	50.50	Photovoltaic array simulator

Protection – Re-connection timer.					**P**
Model: SUN2000-115KTL-M2					
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.			
60 s	68 s	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 **generator** does not re-connect.		No reconnection	No reconnection	No reconnection	No reconnection

Fault level contribution:		**P**
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	8.68 V	110.77 A
100ms	4.23 V	50.60 A
250ms	3.02 V	32.79 A
500ms	2.32 V	23.99 A
Time to trip	6 ms	In seconds

12. Self-Monitoring solid state switching: No specified test requirements. Refer to Annex A.7.1.6.	
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.	N/A
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)	N/A
14. Logic interface (input port).	
Confirm that an input port is provided and can be used to shut down the module.	Yes
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
15. Cyber security	
Confirm that the Power Generating Module has been designed to comply with cyber security requirements, as detailed in 9.1.7.	Yes Manufacturer's declaration provided

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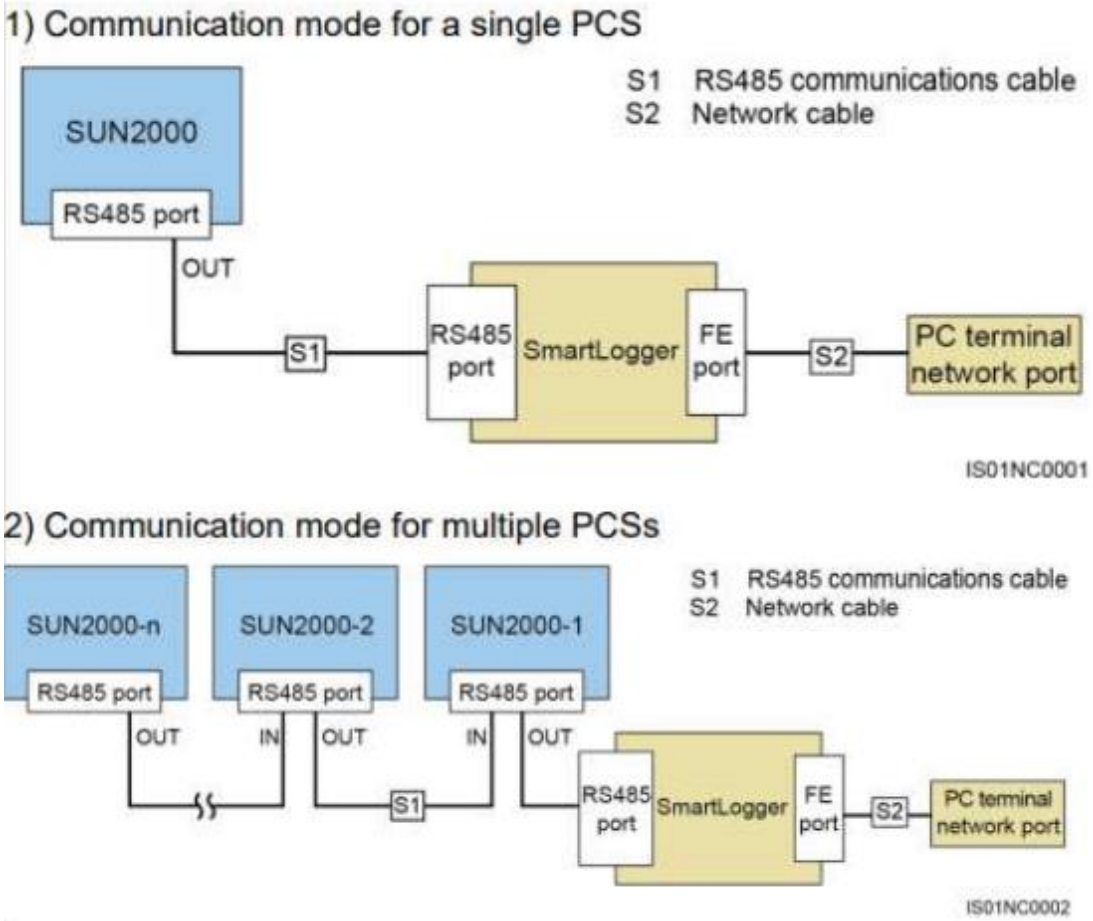
Additional comments.
Remark: The PCSs can connect to the SmartLogger over RS485 or to a PC through the SmartLogger to implement communication. You can use the SUN2000 app, SmartLogger, embedded WebUI, or the network management software (such as the NetEco) on the PC to query information about the PCSs, such as energy yield, alarms, and running status. For example: 

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