

Appendix to Certificate No: MCS PV0183 Issue: 15

Trina Solar Co., Ltd.

MCS 005 – Solar Photovoltaic Modules – Issue 3.1

Model	Description	Reference No.
TSM-390DE09.08 1754x1096x35	Monocrystalline Module	MCS PV0183/1813
TSM-395DE09.08 1754x1096x35	Monocrystalline Module	MCS PV0183/1814
TSM-400DE09.08 1754x1096x35	Monocrystalline Module	MCS PV0183/1815
TSM-405DE09.08 1754x1096x35	Monocrystalline Module	MCS PV0183/1816
TSM-380DE09.08 1754x1096x30	Monocrystalline Module	MCS PV0183/1817
TSM-385DE09.08 1754x1096x30	Monocrystalline Module	MCS PV0183/1818
TSM-390DE09.08 1754x1096x30	Monocrystalline Module	MCS PV0183/1819
TSM-395DE09.08 1754x1096x30	Monocrystalline Module	MCS PV0183/1820
TSM-400DE09.08 1754x1096x30	Monocrystalline Module	MCS PV0183/1821
TSM-405DE09.08 1754x1096x30	Monocrystalline Module	MCS PV0183/1822
TSM-380DE09.05 1754x1096x40	Monocrystalline Module	MCS PV0183/1823
TSM-385DE09.05 1754x1096x40	Monocrystalline Module	MCS PV0183/1824
TSM-390DE09.05 1754x1096x40	Monocrystalline Module	MCS PV0183/1825
TSM-395DE09.05 1754x1096x40	Monocrystalline Module	MCS PV0183/1826
TSM-400DE09.05 1754x1096x40	Monocrystalline Module	MCS PV0183/1827
TSM-405DE09.05 1754x1096x40	Monocrystalline Module	MCS PV0183/1828
TSM-380DE09.05 1754x1096x35	Monocrystalline Module	MCS PV0183/1829
TSM-385DE09.05 1754x1096x35	Monocrystalline Module	MCS PV0183/1830
TSM-390DE09.05 1754x1096x35	Monocrystalline Module	MCS PV0183/1831
TSM-395DE09.05 1754x1096x35	Monocrystalline Module	MCS PV0183/1832
TSM-400DE09.05 1754x1096x35	Monocrystalline Module	MCS PV0183/1833
TSM-405DE09.05 1754x1096x35	Monocrystalline Module	MCS PV0183/1834



Laura Critien

01 April 2021

14 April 2014

Signed for BRE Global Limited

Business Group Manager

Date of Issue

Date of First Issue



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Appendix to Certificate No: MCS PV0183 Issue: 15

Trina Solar Co., Ltd.

MCS 005 – Solar Photovoltaic Modules – Issue 3.1

Model	Description	Reference No.
TSM-380DE09.05 1754x1096x30	Monocrystalline Module	MCS PV0183/1835
TSM-385DE09.05 1754x1096x30	Monocrystalline Module	MCS PV0183/1836
TSM-390DE09.05 1754x1096x30	Monocrystalline Module	MCS PV0183/1837
TSM-395DE09.05 1754x1096x30	Monocrystalline Module	MCS PV0183/1838
TSM-400DE09.05 1754x1096x30	Monocrystalline Module	MCS PV0183/1839
TSM-405DE09.05 1754x1096x30	Monocrystalline Module	MCS PV0183/1840

Notes:

- Module sizes are presented in mm.



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APPENDIX 2

Solis-(25-40)K-5G, Solis-(40-50)K-HV-5G

Solis Three Phase Inverters



360 degree

Features:

- ▶ Over 98.8% Max. efficiency
- ▶ Wide voltage range and low startup voltage
- ▶ 3/4 MPPT design with precise MPPT algorithm
- ▶ THDi<3%, low harmonic distortion against grid
- ▶ Anti-resonance, supporting over 6MW paralleled in one transformer
- ▶ Perfect commercial site monitoring solution
- ▶ 130% DC overload ratio, 13A input for each PV string
- ▶ Strings intelligent monitoring, Smart I-V Curve Diagnosis supported
- ▶ Fuse free design to avoid fire hazard
- ▶ Type II surge arrester for both DC and AC
- ▶ Natural convection, Fan-less design, longer lifespan
- ▶ Leakage current repression technology
- ▶ Volt-watt work mode integrated
- ▶ DC input reverse alarm
- ▶ Intergrated Export Power Manager (EPM)



Model:

400V:	Solis-25K-5G	Solis-30K-5G
	Solis-33K-5G	Solis-36K-5G
	Solis-40K-5G	
480V:	Solis-40K-HV-5G	Solis-50K-HV-5G

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 A3-1 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.

Manufacturer's reference number		DQ1907091-01	
PGM technology		Solis-36K-5G	
Manufacturer name		Ningbo Ginlong Technologies Co., Ltd.	
Address		No. 57 Jintong Road, Seafront (Binhai) Industrial Park, Xiangshan, Ningbo, Zhejiang, 315712, P.R. China	
Tel	(+86) 574 6580 3377	Web site	www.ginlong.com
E:mail	kun.zhang@ginlong.com		
Registered Capacity		39.6 kVA	

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules

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).

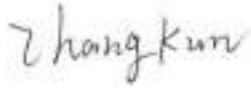
Tested option:	1. Fully Type Tested	2. Partially Type Tested	3. One-off Man. Info.	4. Tested on Site at time of Commissioning
0. Fully Type Tested - all tests detailed below completed and evidence attached to this submission	Yes	N/A	N/A	N/A
1. Operating Range	N/A			
2. PQ – Harmonics				
3. PQ – Voltage 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)*				
* may be carried out at the time of commissioning (Form A.2-4). Document reference(s) for Manufacturers' Information:				

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules



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	 06. Feb.2020	On behalf of Manufacturer stamp	
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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.

A2-3 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 $\pm 5\%$ 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.

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 **Inverter/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 20s	Tested with the specified conditions, in the 20 seconds period of time, the inverters operate normally
Test 2 Voltage = 85% of nominal (195.5 V), Frequency = 47.5 Hz, Power Factor = 1, Period of test 90 minutes	Tested with the specified conditions, in the 90 minutes period of time, the inverters operate normally
Test 3 Voltage = 110% of nominal (253 V), Frequency = 51.5 Hz, Power Factor = 1, Period of test 90 minutes	Tested with the specified conditions, in the 90 minutes period of time, the inverters operate normally
Test 4 Voltage = 110% of nominal (253 V), Frequency = 52.0 Hz, Power Factor = 1, Period of test 15 minutes	Tested with the specified conditions, in the 15 minutes period of time, the inverters operate normally
Test 5 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.	Tested with the specified conditions, the inverters operate normally

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 61000-3-12 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)			12	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	
Phase 1						
	Measured Value MV in Amps	%	Measured Value MV in Amps	%	1 phase	3 phase
2	0.0792	0.1518	0.1310	0.2511	8%	8%
3	0.0331	0.0634	0.0864	0.1656	21.6%	Not stated
4	0.0485	0.0930	0.1123	0.2152	4%	4%
5	0.4826	0.9250	0.5071	0.9719	10.7%	10.7%
6	0.0212	0.0406	0.0512	0.0981	2.67%	2.67%
7	0.6981	1.3380	1.0953	2.0993	7.2%	7.2%
8	0.0365	0.0700	0.0765	0.1466	2%	2%
9	0.0231	0.0443	0.0443	0.0849	3.8%	Not stated
10	0.0276	0.0529	0.0625	0.1198	1.6%	1.6%
11	0.1920	0.3680	0.4231	0.8109	3.1%	3.1%
12	0.0223	0.0427	0.0364	0.0698	1.33%	1.33%
13	0.3724	0.7138	0.3743	0.7174	2%	2%
THD ¹	---	1.83	---	2.60	23%	13%

¹ THD = Total Harmonic Distortion

Engineering Recommendation G99 Form A2-3
Type A Power Generating Modules

PWHD ²	---	3.64	---	4.51	23%	22%
Phase 2						
	Measured Value MV in Amps	%	Measured Value MV in Amps	%	1 phase	3 phase
2	0.0926	0.1775	0.1197	0.2294	8%	8%
3	0.0527	0.1010	0.0653	0.1252	21.6%	Not stated
4	0.0312	0.0598	0.0986	0.1890	4%	4%
5	0.4564	0.8748	0.5312	1.0181	10.7%	10.7%
6	0.0395	0.0757	0.0693	0.1328	2.67%	2.67%
7	0.6753	1.2943	1.064	2.0393	7.2%	7.2%
8	0.0532	0.1020	0.0572	0.1096	2%	2%
9	0.0418	0.0801	0.0654	0.1254	3.8%	Not stated
10	0.0464	0.0889	0.0416	0.0797	1.6%	1.6%
11	0.3758	0.7203	0.4510	0.8644	3.1%	3.1%
12	0.0136	0.0261	0.0672	0.1288	1.33%	1.33%
13	0.3572	0.6846	0.3537	0.6779	2%	2%
THD ³	---	1.88	---	2.57	23%	13%
PWHD ⁴	---	3.67	---	4.45	23%	22%
Phase 3						
	Measured Value MV in Amps	%	Measured Value MV in Amps	%	1 phase	3 phase
2	0.0685	0.1313	0.1532	0.2936	8%	8%
3	0.0246	0.0472	0.0976	0.1871	21.6%	Not stated
4	0.0654	0.1254	0.1325	0.2540	4%	4%

²PWHD = Partial Weighted Harmonic Distortion

³ THD = Total Harmonic Distortion

⁴PWHD = Partial Weighted Harmonic Distortion

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules

5	0.5032	0.9645	0.4886	0.9365	10.7%	10.7%
6	0.0373	0.0715	0.0365	0.0700	2.67%	2.67%
7	0.7175	1.3752	1.0731	2.0568	7.2%	7.2%
8	0.0232	0.0445	0.0955	0.1830	2%	2%
9	0.0407	0.0780	0.0332	0.0636	3.8%	Not stated
10	0.0384	0.0736	0.0763	0.1462	1.6%	1.6%
11	0.3841	0.7362	0.3996	0.7659	3.1%	3.1%
12	0.0354	0.0679	0.0584	0.1119	1.33%	1.33%
13	0.3951	0.7573	0.3968	0.7605	2%	2%
THD ⁵	---	2.00	---	2.56	23%	13%
PWHD ⁶	---	3.81	---	4.43	23%	22%

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 It 2 hours
Measured Values at test impedance	0.35%	0.31%	0	0.37%	0.32%	0	0.22	0.12
Normalised to standard impedance	0.35%	0.31%	0	0.37%	0.32%	0	0.22	0.12
Normalised to required maximum impedance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

⁵ THD = Total Harmonic Distortion

⁶PWHD = Partial Weighted Harmonic Distortion

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules

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	XI	0.15	Ω			
Standard Impedance	R	0.24 * 0.4 ^	Ω	XI	0.15 * 0.25 ^	Ω			
Maximum Impedance	R	N/A	Ω	XI	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 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 XI 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	27.Jan.2020			Test end date	3. Feb.2020				
Test location	Ningbo Ginlong Technologies Co.,Ltd.								
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 36 kW three phase Inverter has a current output of 51.9A so DC limit is 129.7 mA. These tests should be undertaken in accordance with Annex A.7.1.4.4.									
Test power level	10%			55%			100%		
	L1	L2	L3	L1	L2	L3	L1	L2	L3
Recorded value in Amps(mA)	40.0	44.6	46.7	55.0	57.1	59.2	77.9	79.9	83.0
as % of rated AC current	0.077	0.086	0.090	0.106	0.110	0.114	0.150	0.154	0.160

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules

Limit	0.25%		0.25%		0.25%	
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	0.9988		0.9981		0.9983	
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	47.54Hz	20.048s	47.7Hz 30s	Yes
U/F stage 2	47 Hz	0.5 s	46.96Hz	0.535s	47.2Hz 19.5s	Yes
					46.8Hz 0.45s	Yes
O/F	52 Hz	0.5 s	52.03Hz	0.545s	51.8Hz 120s	Yes
					52.2Hz 0.45s	Yes
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.						
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”	
U/V	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
L1-N	0.8 pu (184 V)	2.5 s	183.4 V	2.538s	188V 5s	Yes
L2-N			183.5 V	2.541s		Yes

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules

L3-N			183.9 V	2.544s		Yes
					180V 2.45s	Yes
O/V stage 1	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
L1-N	1.14 pu (262.2 V)	1.0 s	262.5V	1.047s	258.2V 5.0s	Yes
L2-N			262.8V	1.039s		Yes
L3-N			263.0V	1.033s		Yes
O/V stage 2	Voltage	Time delay	Voltage	Time delay	Voltage /time	Confirm no trip
L1-N	1.19 pu (273.7 V)	0.5 s	274.5V	0.537s	269.7V 0.95s	Yes
L2-N			274.1V	0.545s		Yes
L3-N			273.9V	0.547s		Yes
					277.7V 0.45s	Yes

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	0.32s	0.37s	0.27s	0.32s	0.31s	0.35s

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	Yes
Negative Vector Shift	50.5 Hz	- 50 degrees	Yes

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	Yes
51.0 Hz to 49.0 Hz	-0.95 Hzs ⁻¹	2.1 s	Yes

9. Limited Frequency Sensitive Mode – Over frequency test: The test is using the specific threshold frequency of 50.4 Hz and Droop of 5%.
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.

Yes

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	36136W	50.00Hz	36873W	-
Step b) 50.45Hz ±0.05Hz	35406W	50.45Hz		-
Step c) 50.70Hz ±0.10Hz	31452W	50.70Hz		-
Step d) 51.15Hz ±0.05Hz	24317W	51.15Hz		-
Step e) 50.70Hz ±0.10Hz	31468W	50.70Hz		-
Step f) 50.45Hz ±0.05Hz	35388W	50.45Hz		-
Step g) 50.00Hz ±0.01Hz	36211W	50.00Hz		216kW/min
Test sequence at Registered Capacity 40% - 60%	Measured Active Power Output	Frequency	Primary Power Source	Active Power Gradient
Step a) 50.00Hz ±0.01Hz	18176W	50.00Hz	18496W	-
Step b) 50.45Hz ±0.05Hz	17360W	50.45Hz		-
Step c) 50.70Hz ±0.10Hz	13431W	50.70Hz		-
Step d) 51.15Hz ±0.05Hz	6282W	51.15Hz		-
Step e) 50.70Hz ±0.10Hz	13392W	50.70Hz		-
Step f) 50.45 Hz ±0.05 Hz	17377W	50.45Hz	36873W	0kW/min
Step g) 50.00 Hz ±0.01 Hz	36287W	50.00Hz	36873W	216kW/min

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.			
30s	45.6s	At 1.16 pu (266.2 V)	At 0.78 pu (180V)	At 47.4 Hz	At 52.1 Hz
Confirmation that the Power Generating Module does not re-connect.		Yes	Yes	Yes	Yes
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	52.6V		65.25A		
100ms	52.1V		0A		
250ms	51.0V		0A		
500ms	51.0V		0A		
Time to trip	0.065ms		In seconds		
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.			N/A (Solid state switch means electronic switch, Solis inverter uses mechanical dual relay protection with relay checks, which drops the voltage below 50V in 0.5s)		
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(Not applicable. Refer to 15.2.1, inverter is using special connector for wiring)		
14. Logic interface (input port).					
Confirm that an input port is provided and can be used to shut down the module.			Yes (Logic interface is marked as “DRM” either on inverter or on external DRM device depending on inverter model. Please see inverter or external DRM device manual for detail.		
Additional comments.					

Engineering Recommendation G99 Form A2-3

Type A Power Generating Modules



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SOLIS INVERTER WARRANTY

Ginlong(Ningbo) Technologies Co., Ltd.

No. 57 Jintong Road, Binhai Industrial Park, Xiangshan, Ningbo, Zhejiang 315712, China
Tel: (+86) 574 6578 1806 Email: sales@ginlong.com

Solis Inverter are manufactured by Ginlong (Ningbo) Technologies Co., Ltd. (The Company) (referred to as Ginlong) provides the following Warranty to the purchaser (The Customer) of the Inverter (The Goods). (The Customer is deemed to be the owner of the installed Goods at first sale.

1. Warranty Terms

The Company warrants all Goods to be free from defects in material or workmanship under normal use and service for a period of 5 years from the date of sale to the Customer.

The Warranty covers the cost of repairs or replacement parts. The Goods must be returned to the Company for inspection.

The company may repair or replace faulty components at its discretion.

This warranty extends the Customer's statutory rights and cannot be construed so as to diminish such statutory rights.

2. Warranty Extension

The purchaser may apply for a warranty extension within 12 months of purchase by providing the serial number of the unit along with proof of purchase. An extended warranty can be purchased for a further 5 years (Total 10 years).

3. Warranty Limitations

The Warranty is valid only for Goods purchased either directly from the Company or from an authorized reseller of the company.

The Warranty is not transferable and applies to brand new Goods only.

Defective parts replaced under Warranty become the property of the Company.

The Warranty does not cover:

- (a) Access or transport costs;
- (b) Consequential damages including but not limited to loss of revenue;
- (c) Claims by third parties other than the Customer;
- (d) Defects of installation. (Except where the installation is performed by the Company);
- (e) Goods damaged as a consequence of incorrect installation. (Except where the installation is performed by the Company);
- (f) Items ancillary to installation not supplied by the Company;
- (g) Duties, import/export fees or costs and other general administrative costs;
- (h) Damage to Goods caused by misuse, improper handling or unauthorized modification;
- (i) Loss or damage occurring whilst in transit;
- (j) Accidental or willful damage;
- (k) Any Goods described in a quotation or delivery note as 'ex-display' or 'reconditioned'. (A separate Warranty extension may have been issued to cover such Goods.)

Labour, travel and delivery (to and from customer) will be charged if goods returned found to be not faulty following a warranty claim.

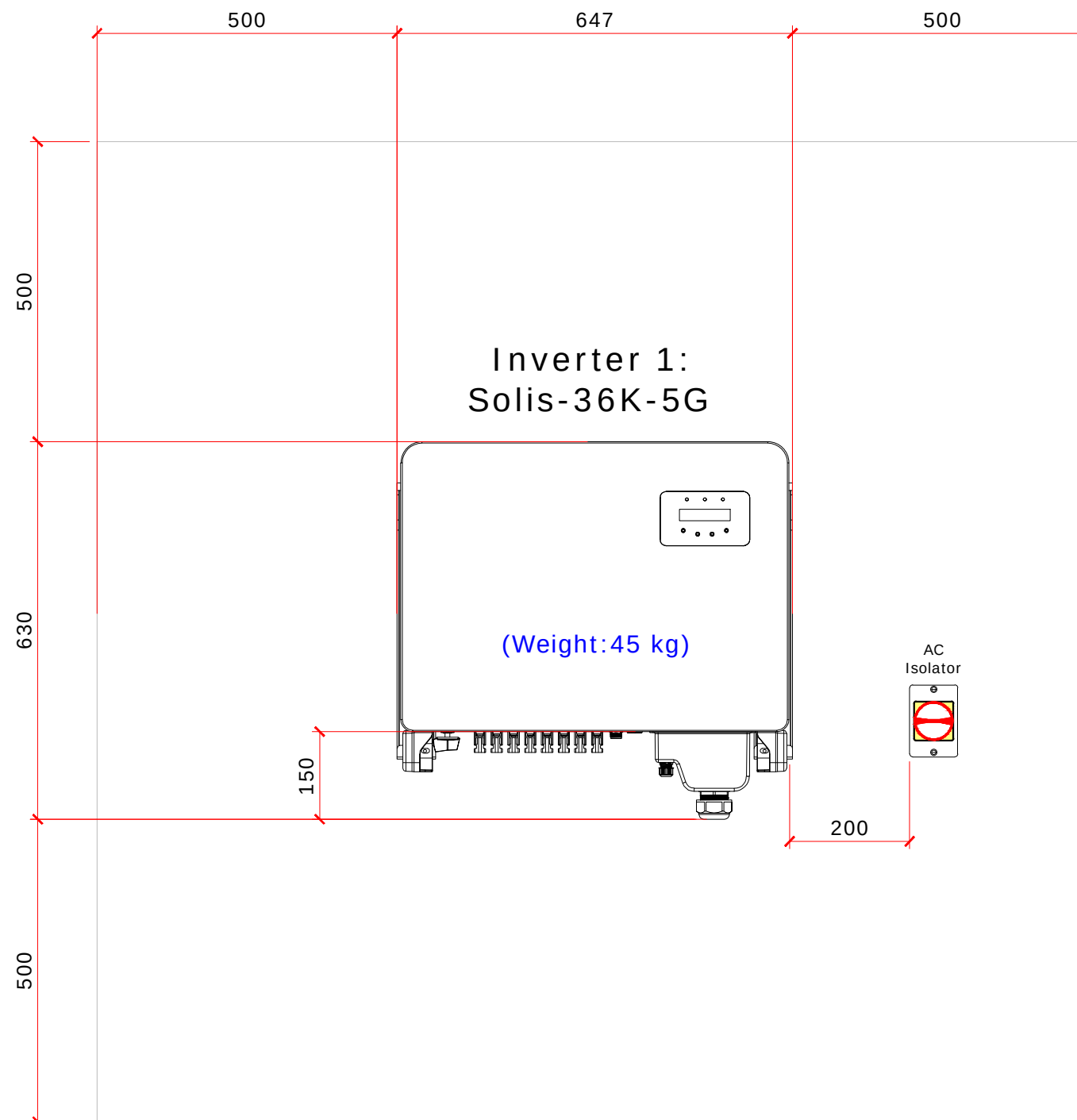
4. Warranty Claims Procedure

To make a warranty claim the following information needs to be provided:

- Completed RTM Inspection Form
- Product Model (ie. Solis 1.5kW) and Product Serial Number (ie. A1110011)
- Copy of the invoice for the inverter
- Copy of the installation report and installation certificate

The authorised reseller will liaise with the Company regarding repair or replacement. The cost of repair or replacement will be borne by the Company provided the Warranty has been validated and the Warranty period has not expired.

Where repairs must be effected at the Company's headquarters, the Company will endeavor to minimize the down time for the Goods.



Notes

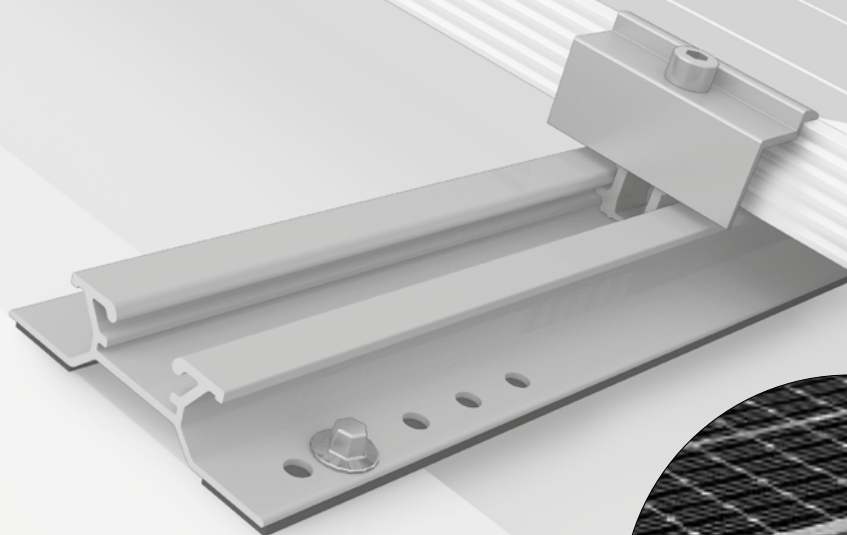
1. Inverter installation must adhere to the clearance distances defined in this drawing.
2. The inverter must be installed vertically within $\pm 5^\circ$. If the inverter is tilted from the vertical plane heat dissipation can be inhibited. This may reduce system performance or reduce service life of the inverter
3. A minimum of 500mm clearance is required top, bottom, left and right of the inverter (isolator enclosures excepted) for air flow and cooling
4. Though the clearance distance in front of the plant is not specifically defined, a minimum of 500mm is advised to allow for maintenance and access purposes.

Rev	Description	Dwn	Chck	Date
 PHOTON ENERGY				
© Photon Energy Ltd 8 Windsor Square Silver Street Reading, RG1 2TH		Tel +44 118 997 7470 info@photonenergy.co.uk www.photonenergy.co.uk All rights reserved		
Project Number: 11825				
Project Name: Abraham Moss				
Drawing By: Thomas Bray		Scale: 1:10 @A3		
Checked By: Theodoros Kefalopoulos		Date: 20/08/2021		
Drawing Name: Inverter Layout				
Drawing No: 11894-200-02		Rev: -		

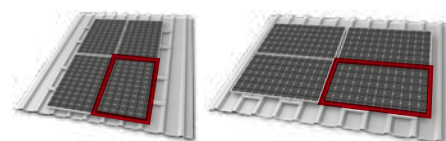
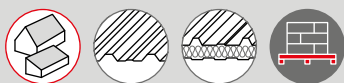
APPENDIX 3



MiniRail System



- ▶ Innovative and statically optimised short rail system that is quick and easy to mount
- ▶ Universal module clamps and suitable for portrait and landscape orientation
- ▶ 5° elevation with MiniFive: significantly more output thanks to improved ventilation and optimised module angle
- ▶ Optimised for storage and transport



The MiniRail System allows portrait and landscape mounting in the form of grid mounting thanks to the universal module clamps, which are rotatable by 90°.

Components



MiniRail

Landscape and portrait mounting with MiniClamp MC/EC



MiniClamp MC/EC 30 - 50 mm

- ▶ Universal module clamp
- ▶ Clamp is rotatable



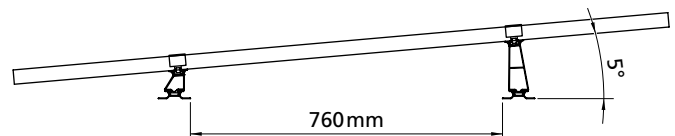
Self-tapping screws

- ▶ Included in MiniRail MC/EC set
- ▶ With sealing washers



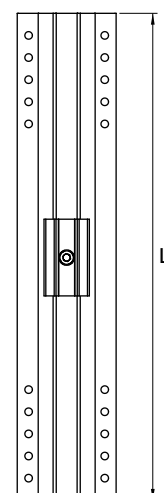
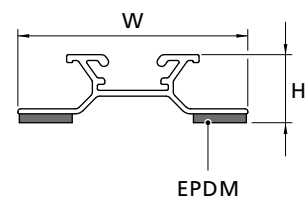
MiniFive front and end

- ▶ Single-sided easy elevation with insertable supporting element
- ▶ Improved ventilation and higher yield
- ▶ Optimised module angle



Technical data

	MiniRail System
Scope of application	Pitched roofs with trapezoidal sheet metal or sandwich panels Roof inclination: 5 - 75°
Fastening type / roof fixture	Screws in roofing with self-tapping thin sheet screws
Requirements	▶ Sheet thickness: ≥ 0.4 mm steel and ≥ 0.5 mm aluminium ▶ Sandwich panel: Approval from manufacturer required ▶ Crest width: At least 22 mm * ▶ Crest spacing: 101 - 350 mm depending on crest width ▶ Flush area surrounding the bore hole: $\varnothing \geq 20$ mm ▶ Module frame height: 30 - 50 mm
Module orientation	Vertical or horizontal
Material	Aluminium (EN AW-6063 T66/ EN AW-6082 T6); EPDM
Dimensions MiniRail W x H x L [mm]	78.2 x 23 x 385
Elevation with MiniFive	approx. 5°



* The project-specific minimum high crest width dimension can be found in the Base report.

1. Warranty

1.1. We provide a warranty for end customers under the requirements of these warranty terms and conditions that the products sold under our brand name "K2" will be free of defects in material and workmanship for a period of twelve (12) years from the date of commissioning.

1.2. This warranty applies to our products delivered between 01-11-2019 and the day on which the new warranty terms and conditions come into force. The existing rules apply for our products delivered before 01.11.2019.

1.3. This warranty is intended solely for end customers. It does not apply to distributors, installation companies or second-hand owners. End customers are the purchasers of our products, who have purchased them for their own requirements and not for the purpose of resale or who have purchased a solar system (possibly in combination with a building) with our products installed in it. Our warranty does not apply to products that have been removed and reinstalled, except for repair purposes, or used for any other purpose.

1.4. This warranty is an independent, voluntary and free benefit provided for end customers, which has no influence on possible quality agreements between the end customer and the seller of our products (if this is not us).

1.5. Claims under this warranty may not be transferred to third parties.

1.6. This product warranty applies within the European Union or within the third country in which our product was first put on the market by us. Warranty claims can only be asserted within the twelve-year warranty period. An extension of the warranty period is excluded, regardless of the legal grounds.

1.7. This warranty is only extended to the seller of our products irrespective of statutory warranty claims. Such claims are neither limited nor justified against us, in so far as no direct purchase contract exists with us.

2. Warranty services

2.1. In the case of a warranty claim, we will at our own discretion either repair the product free of charge, supply a free replacement or reimburse you at the product's current market value. An equivalent of the original component is also deemed to be a replacement.

2.2. A repair and replacement delivery or a reimbursement at the current market value are the sole and exclusive services provided under this warranty. Other services are not provided under this warranty. In particular, we accept no costs for the removal of a defective component, the return transport to us or the authorised seller as well as delivery and reinstallation on the basis of this warranty.

3. Exclusions and limitations

3.1. Claims under this warranty may not be asserted for a defect on one of our products

- due to forces of nature, force majeure and other unforeseeable circumstances outside our direct control, such as earthquakes, typhoons, hurricanes, volcanic eruptions, floods, lightning, snow damage or nuclear incidents
- due to improper maintenance, in particular a repair or modification made by third parties not expressly authorised by us
- in the case of a purely visual defect or normal wear and tear through use
- as a result of failure to observe the applicable rules based on the latest technology, the applicable standards and building regulations and information from the static calculation for the mounting system or guidelines in the assembly instructions

3.2. The assertion of this warranty also presupposes that our products are used properly for their intended purposes and they do not show signs of wear and tear or external damage that exceed the amount expected for normal use. Furthermore, it is essential to observe our assembly instructions. It is a mandatory prerequisite for the assertion of this warranty to comply with the safety instructions and warnings contained therein and observe the assembly and operating instructions.

3.3. Excluded from the warranty are rubber components or plastic components that have no function and parts that are exclusively a mounting aid and have no effect on the function of the products.

3.4. Our total liability under this warranty is limited to the purchase price of the defective product. We accept no liability in particular on the basis of this warranty for incidental damages, loss of profits, consequential damages or indirect damages, any failure of electrical capacity and/or compensation from an energy supply company. Statutory warranty claims or tortious claims against us as well as claims under the Product Liability Act remain unaffected.

4.6. This warranty and legal disputes related to this warranty are governed by the law of Federal Republic of Germany with the exclusion of the UN Convention on Contracts for the International Sale of Goods (CISG).

Version 6 (dated: 01-11-2019)

4. Warrantor, assertion of the warranty, complaint periods

4.1. The warrantor is
K 2 Systems GmbH,
Industriestr. 18, 71272 Renningen, Germany
(<https://www.k2-systems.com>).

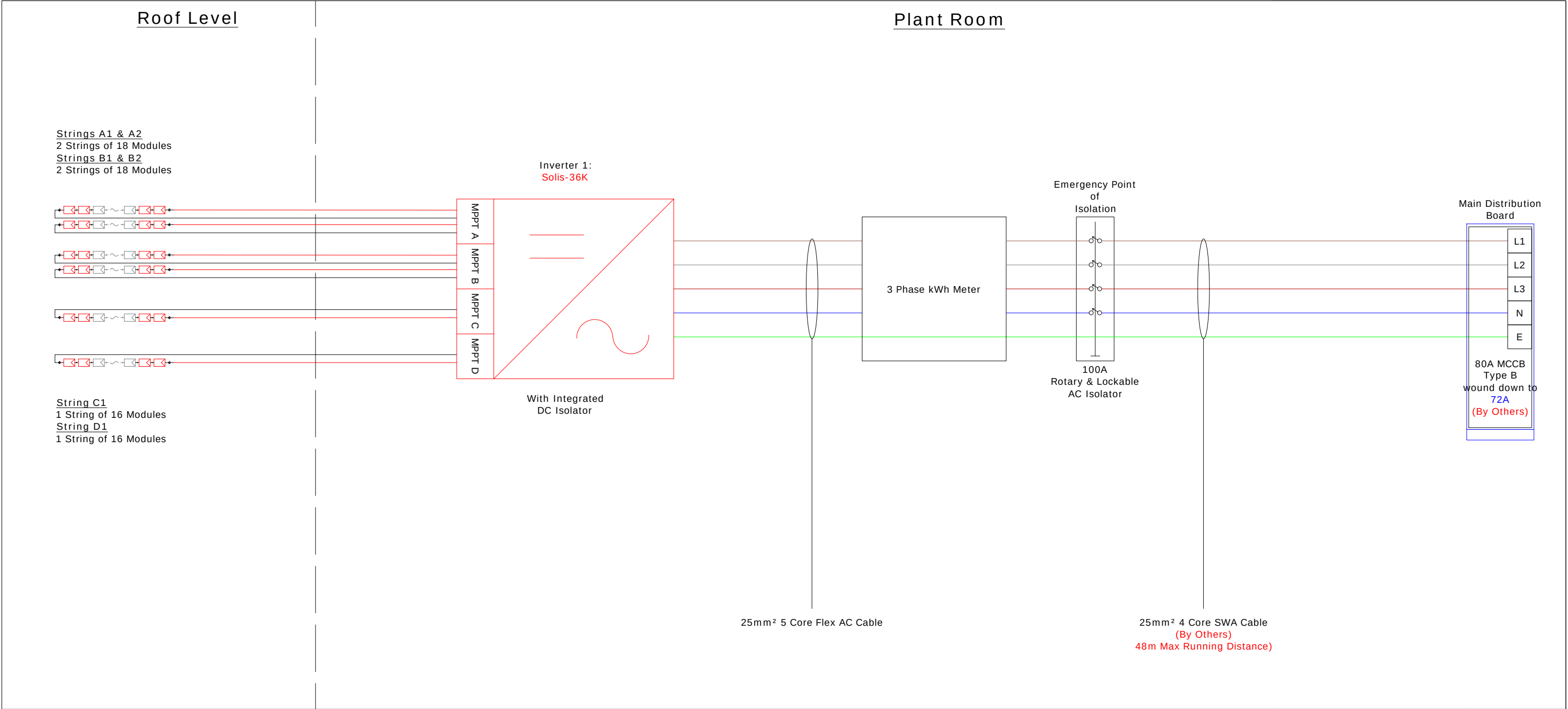
4.2. Claims under or in connection with this warranty must be asserted within the twelve-year warranty period at the latest six weeks after the occurrence of the event triggering the claims and notified to us in text form (e.g. by letter or E-mail) (if necessary, through the customer's contractual partner as a provider/messenger). Late complaints are not taken into account. The decisive factor for compliance with the warranty period is the timely receipt of the notification by us or by the customer's contractual partner, provided that they pass the complaint on to us immediately.

4.3. The customer is only entitled to return products under complaint with our prior written consent.

4.4. The assertion of warranty claims must be accompanied by the following documents and information: contact details of the end customer, date of commissioning, K2 Base project report (if available), sufficiently detailed photos (overall view of the system and detailed picture of the defect) as well as the original quotation for the installation of the system or the order confirmation related to this.

APPENDIX 4

APPENDIX 5



- Notes
1. 41.6 kWp System No of modules = 104 x Trina TSM-400-DE09.08 Inverter = 1 x Solis-36K-5G

2. The PV arrays achieve adequate electrical connection with the roof metal sheet via the self-tapping screws. The final bonding of the of metal sheet with the buildings LPS is to be carried by others.

3. The PV array is connected to the distribution network under G99 Engineering Recommendation

4. Inverter is EA approved for connection to UK grid. It includes

a. Over voltage protection stage 1: 262.2 V (1s) stage 2 : 273.7 (0.5s)

b. Under voltage protection stage 1: 184 V (2.5s)

c. Over frequency protection stage 1: 52 Hz (0.5s)

d. Under frequency protection stage 1: 47.50 Hz (20s) stage 2 : 47 Hz (0.5s)

e. Loss of mains protection (by means of Scandia Frequency Shift)

f. 20s delay from return of mains after fault to start of self initialize procedure.

4. Start-up / shut down procedure - it is recommended that the main rotary isolator is used to shut down the system, and is the last switch closed when the system is restarted. Any of the switches can be used at any time to isolate the relevant part of the system, but it is not recommended to operate the DC Isolator under load.

Note 1 : Recommended AC Voltage Drop is 1% for solar installations to avoid nuisance tripping from the G99 protection integrated in the inverter. The maximum limit is 3%. At 2-3% Voltage Drop on the AC side if grid voltage is high there may be nuisance tripping of the G99 protection integrated into the inverter. If there is a long cable run, AC cables can be sized for 2% Voltage Drop.

Rev

Description

Dwn

Chck

Date

P H O T O N

E N E R G Y

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Silver Street
Reading, RG1 2TH

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Project Number:
11894

Project Name:
Abraham Moss Leisure

Drawing By:
Thomas Bray

Checked By:
Theodoros Kefalopoulos

Drawing Name:
PV Electrical Schematic

Scale:
NTS

Date:
20/08/2021

Drawing No:
11894-200-01

Rev:
-

Three Phase Whole Current Meter



The emlite EMP1 Three phase metering range offers high quality accurate meters that are suitable for direct connected domestic, commercial, Solar PV and light industrial applications.

Features -

- Fully MID approved
- 4 quadrant power measurement (Import and Export, Active and Reactive Energy)
- Optional Power Quality Information - Volts, Current, Power etc.
- Optional pulsed outputs
- Optical communications port
- Solid brass terminals



The EMP1.az and EMP1.av are the entry models of the emlite three phase metering range. They are suitable for a host of different applications where basic consumption or generation metering is required. The EMP1.az and EMP1.av variants covered in this information sheet are of solid high quality construction and benefit from features normally found in more expensive metering.

- Accuracy Class A or B (MID) [active energy] and Cl 2 [reactive energy*]
- 4 quadrant energy measurement
- Optional power quality information*
- Configurable pulsed outputs**
- Multiple terminal cover options (Short, Extended(Standard), Extended plus)
- Clear easy to read 8 digit LCD with specific symbols for different quantities.
- Solid Brass terminals
- Optional finger guard for main terminals

NB: * denotes standard setting, ** pulse set for kWh import as standard

Three Phase Whole Current Meter

EMP1.AV only

Pulsed Output

An opto-isolated pulse output can provide data for collection by an energy management system or AMR data logger. These pulses are output via the meter's auxiliary terminals.

The output conforms to IEC 62053-31.



Technical Data - Meter

Electrical

Voltage	Nominal voltage	3 x 230v
	Voltage withstand	400V continuously
Frequency	Nominal frequency	50Hz, variation $\pm 5\%$
Current	Basic current (Iref)	5, 10, 15 and 20*
	Maximum (Imax)	100A

Metrology

Accuracy	Active energy	Class B, to EN 50470 1-3*
	Reactive energy	Class 2, to IEC 62053-23

Environmental

Temperature Range -25°C to +55°C

Ingress protection IP54, to BS EN 60529

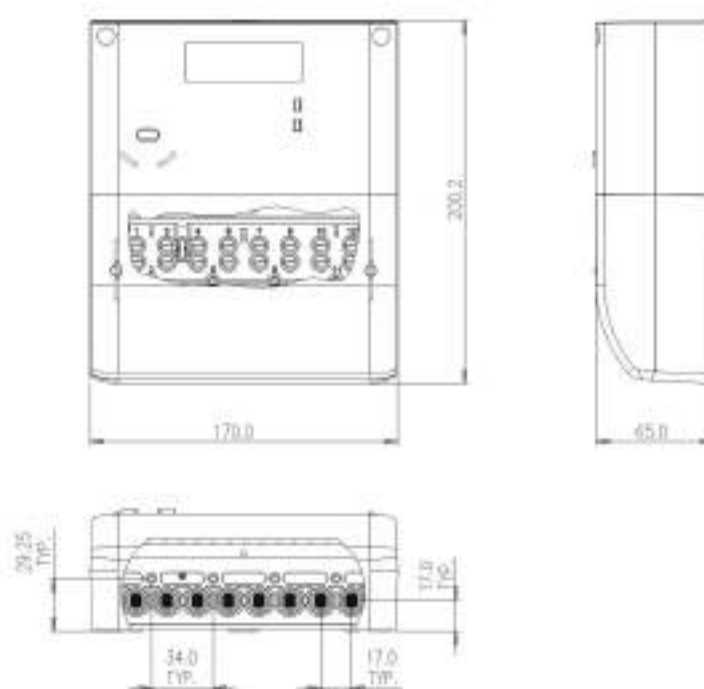
Physical

Terminal arrangement DIN43857-Part 2, fixing centres of 150 $\pm$ 1mm

Main Terminal size 8.2mm $\varnothing \pm 0.2$

Terminal Construction Solid brass

Dimensions



NB * denotes standard setting

APPENDIX 6

MCS 2013 Methodology for PV Energy Performance

I1894		
Energy Output Prediction - V1-0		
MCS 2013 Methodology for PV Energy Performance		
A. Installation data		Please Refer to Appendix 1
Installed capacity of PV system	41.60 kWp	
Orientation of the PV system - degrees from South	35 deg	
Inclination of system - degrees from horizontal	5 deg	
Postcode region	7E	
B. Calculations		Please Refer to Appendix 2 SF of 1 Indicates No Shading
kWh/kWp (Kk)from table	760 kWh/kWp	
Shade factor (SF)	1	
Estimated annual output (kWp x Kk x SF)	31.610 kWh	

Appendix 1: UK Post Code Zones



Postcode	Zone	Postcode	Zone	Postcode	Zone	Postcode	Zone
AG	10	G	14	N	1	SK	70
AL	1	GL	16	NE	16	SK13	0
B	8	GU	1	NG	11	SK17	8
BA	50	GU11-12	3	NN	6	SK23-29	0
BR	28	GU14	3	NP	5W	SL	1
BD	11	GU16-20	2	NPS	13	SM	1
BD23-24	10	GU16-35	3	NR	12	SN	10
BH	3	GLHS	3	NW	1	SN7	1
BL	28	GL51-52	3	OL	70	SO	3
BN	2	HA	1	OX	1	SP	50
BR	2	HD	11	PA	14	SP6-11	3
BS	50	HG	10	PE	12	SR	10
BT	21	HR	1	PE9-12	11	SR7-8	10
CA	50	HR	6	PE20-28	11	SS	12
CR	13	HS	16	PH	15	ST	0
CF	50W	HU	11	PH19-25	17	SW	1
CH	28	HK	11	PH26	16	SY	0
CH5-8	2W	HQ	12	PH33-44	17	SY14	70
CM	13	IR	12	PH49	14	SY15-25	13
CM21-22	1	IV	17	PH50	14	TA	50
CO	12	N30-32	16	PL	1	TD	00
CR	1	N36	16	PO	3	TD12	10
CT	2	KA	14	PO10-23	2	TD15	10
CV	6	KT	1	PR	70	TF	0
CW	70	KW	12	RG	1	TH	2
DA	2	KW15-17	10	RG21-29	3	TD	4
DD	15	KY	15	RH	1	TH	4
DE	0	L	70	RH10-20	2	TS	10
DO	60	LA	70	RH77	3	TW	1
DH	10	LA7-23	10	RM	12	UB	1
DH4-5	10	LD	13	S	11	W	1
DL	10	LE	6	S18	4	WA	70
DH	11	LL	7W	S32-33	8	WC	1
DT	3	LL23-27	13	S40-45	8	WD	1
DY	6	LL30-78	13	S46	8	WF	11
E	1	LN	11	SA	5W	WN	70
EG	1	LO	11	SA14-26	13	WN	0
EH	15	L224	10	SA21-45	13	WS	0
EH43-45	10	LU	1	SA61-73	13	WV	0
EN	1	M	70	SE	1	VO	10
ENG	13	ME	2	SG	1	VO15-16	11
EX	4	MM	1			VO20	11
FK	14	MO	14			ZE	20

Appendix 2: MCS Irradiance Figures for Zone 7E

Steps	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
0	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704	704
1	741	741	741	741	741	741	740	740	740	739	739	738	738	737	737	736	736	735	735	734	734
2	767	767	767	767	767	766	766	766	765	764	764	763	762	761	760	759	758	757	756	755	754
3	783	783	783	783	783	782	782	782	781	780	780	779	778	777	776	775	774	773	772	771	770
4	799	799	799	799	798	798	797	796	795	794	793	792	791	790	789	788	787	786	785	784	783
5	815	815	815	814	814	813	812	811	810	809	808	807	806	805	804	803	802	801	800	799	798
6	831	831	831	830	830	829	828	827	826	825	824	823	822	821	820	819	818	817	816	815	814
7	847	847	847	846	846	845	844	843	842	841	840	839	838	837	836	835	834	833	832	831	830
8	863	863	863	862	862	861	860	859	858	857	856	855	854	853	852	851	850	849	848	847	846
9	879	879	879	878	878	877	876	875	874	873	872	871	870	869	868	867	866	865	864	863	862
10	895	895	895	894	894	893	892	891	890	889	888	887	886	885	884	883	882	881	880	879	878
11	911	911	911	910	910	909	908	907	906	905	904	903	902	901	900	899	898	897	896	895	894
12	927	927	927	926	926	925	924	923	922	921	920	919	918	917	916	915	914	913	912	911	910
13	943	943	943	942	942	941	940	939	938	937	936	935	934	933	932	931	930	929	928	927	926
14	959	959	959	958	958	957	956	955	954	953	952	951	950	949	948	947	946	945	944	943	942
15	975	975	975	974	974	973	972	971	970	969	968	967	966	965	964	963	962	961	960	959	958
16	991	991	991	990	990	989	988	987	986	985	984	983	982	981	980	979	978	977	976	975	974
17	1007	1007	1007	1006	1006	1005	1004	1003	1002	1001	1000	999	998	997	996	995	994	993	992	991	990
18	1023	1023	1023	1022	1022	1021	1020	1019	1018	1017	1016	1015	1014	1013	1012	1011	1010	1009	1008	1007	1006
19	1039	1039	1039	1038	1038	1037	1036	1035	1034	1033	1032	1031	1030	1029	1028	1027	1026	1025	1024	1023	1022
20	1055	1055	1055	1054	1054	1053	1052	1051	1050	1049	1048	1047	1046	1045	1044	1043	1042	1041	1040	1039	1038
21	1071	1071	1071	1070	1070	1069	1068	1067	1066	1065	1064	1063	1062	1061	1060	1059	1058	1057	1056	1055	1054
22	1087	1087	1087	1086	1086	1085	1084	1083	1082	1081	1080	1079	1078	1077	1076	1075	1074	1073	1072	1071	1070
23	1103	1103	1103	1102	1102	1101	1100	1099	1098	1097	1096	1095	1094	1093	1092	1091	1090	1089	1088	1087	1086
24	1119	1119	1119	1118	1118	1117	1116	1115	1114	1113	1112	1111	1110	1109	1108	1107	1106	1105	1104	1103	1102
25	1135	1135	1135	1134	1134	1133	1132	1131	1130	1129	1128	1127	1126	1125	1124	1123	1122	1121	1120	1119	1118

Zone 7E - Manchester

Appendix 7

Appendix 2

MODEL FORM OF LETTER OF AUTHORITY

To whom it may concern

Re: [Address of property] grid application

We [insert name] of [address of property] confirm that we are the legal and registered owner/occupier of the land situated at [address of property], as outlined red within the plan below.

We would like to confirm that we have appointed Photon Energy Ltd to develop a Solar PV system on our land and hereby grant permission for them or any consultant that they may authorise to seek and apply for a grid connection on our land for the purpose of connecting a Solar PV project to the local electricity distribution network.

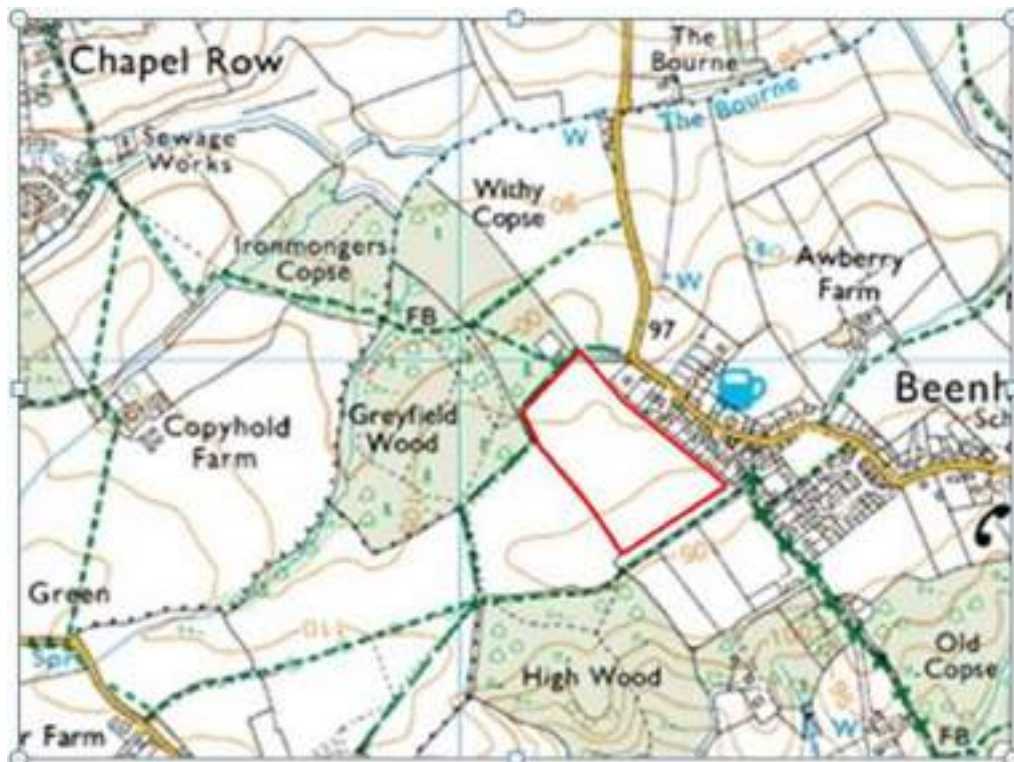
Signed.....

Name (CAPITALS).....

Date.....

[insert plan]

Sample Plan (shown below) to be OS based clearly showing the boundaries of the land referred to above.



Appendix 8



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Abraham Moss Leisure PV System Technical Submission v1-0 Date: 20/08/2021

Design

The PV Systems is designed to meet the 31,035 kWh/year generation requirement stated in the BRUKL Report.

The PV system comprises 104 Trina TSM 400 DE09.08 PV modules, 400Wp each for a total of 41.6kWp PV power and a Solis 36k 5G inverter with a rated output power of 36kW. The modules will be installed using the K2 Systems Minirail mounting system, flush with the roof i.e. at a slope of 5 degrees. The roof covering is KS1000RW and **we have assumed (it is stated in the Datasheet we have found ourselves) that trapezoidal sheet is made out of steel 235 with a thickness of 0.5mm. This will need to be confirmed by the building's structural engineer.** The DC cables will run across the roof where required in a 75mm medium duty cable tray. The DC cables will go down the roof via hockey stick roof penetration (to be provided by others) at the location shown in Appendix 4A. The containment internal to the building is to be provided by others.

1. PV Modules

The PV modules listed below are examples of the type of PV modules typically used. The final make and type will depend on availability at the date of installation. Photon Energy will ensure that all parts of the specification are complied with.

1.1 PV Module Type 1

- a. Manufacturer: Trina
- b. Type and number of module: 104 x TSM-400-DE09.08
- c. Module data sheet: enclosed in Appendix 1A
- d. Module warranty: enclosed in Appendix 1B
- e. MCS certificate: enclosed in Appendix 1C

2. Inverters

- a. Manufacturer: Solis
- b. Type and number of inverter: Solis-36K-5G
- c. Inverter data sheet: enclosed in Appendix 2A
- d. Inverter G99 certificate: enclosed in Appendix 2B
- e. Inverter warranty : enclosed in Appendix 2C
- f. Inverter location: Plant Room
- g. Inverter layout drawing: enclosed in Appendix 2D

3. Mounting system

- a. Manufacturer: K2
- b. Type of mounting system: Mini Rail
- c. Data sheet: enclosed in Appendix 3A
- d. Mounting warranty: enclosed in Appendix 3B

4. Proposed PV Module Layout & Weight to be added to the roof

- a. PV roof layout: enclosed in Appendix 4A
- b. Roof penetration for PV cable entry by others (See 4A for proposed location)

Weight to be added to the roof

- c. PV module weight (including mounting kit): 2,280kg
- d. Load per unit roof area: 12kg/m²

5. Electrical design & Equipotential Bonding

- a. PV Electrical schematic: enclosed in Appendix 5A
- b. Size of four core AC cable (by others): 25mm² (48m maximum distance)
- c. Generation meter: typical datasheet enclosed in Appendix 5B

Equipotential Bonding

- d. The PV aluminium rails are fixed to the roof metal sheet using self-tapping screws. This achieves adequate equipotential bonding/electrical connection of the PV system to the roof metal sheet. The final bonding of the roof metal sheet to the LPS/earthing system is to be done by others.
- e. Where there is no LPS earth connection point provided on the roof, the PV mounting system rails will be earth bonded to the main LV board Earthing system.

6. Energy output prediction

- a. Predicted energy output: 31,610 kWh/year. Please see calculation details enclosed in Appendix 6A.
- b. Methodology used: MCS 2013 Methodology for PV Energy Performance

7. Application for permission to connect to DNO

- a. Upon receipt of a letter of Authority (Template in Appendix 7A) and MPAN, Photon Energy will apply to the Distribution Network Operator (Electricity North West) for permission to connect the PV system to the electricity grid under Engineering Recommendation G99.
- b. Please note that that DNO requires 45 working days before they can respond to any application for connection. It could be considerably longer for HV MPAN.
- c. Any costs the DNO may charge for their design assessment are not included.