

<p><b>TEST REPORT</b>  <b>IEC 61727: 2004</b>  <b>Photovoltaic (PV) systems - Characteristics of the utility interface</b>  <b>IEC 62116: 2014</b>  <b>Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters</b></p>	
<p><b>Report Reference No.</b> ..... ES160105020S  <b>Compiled by (name + signature)</b> ..... Simon Fan  <b>Approved by (name + signature)</b> ..... William Guo  <b>Date of issue</b> ..... April 05, 2016  <b>Total number of pages</b> ..... 18 pages</p>	
<p><b>Testing Laboratory name</b> ..... EMTEK(SHENZHEN) CO., LTD.  <b>Address</b> ..... Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen, Guangdong, China  <b>Testing location/ address</b> ..... Same as above</p>	
<p><b>Applicant's name</b> ..... Ningbo Ginlong Technologies Co.,Ltd.  <b>Address</b> ..... No. 57 Jintong Road, Seafont(Binhai) Industrial Park, Xiangshan, Ningbo, Zhejiang, 315712,P.R.China</p>	
<p><b>Test specification:</b>  <b>Standard</b>..... IEC 61727: 2004  IEC 62116: 2014  <b>Test procedure</b>..... IEC report  <b>Non-standard test method</b>.....: N/A</p>	
<p><b>Test Report Form No.</b> ..... IEC61727A  IEC62116A  <b>Test Report Form(s) Originator</b>..... EMTEK  <b>Master TRF</b> ..... Dated 2013-06</p>	
<p><b>Test item description</b>..... PV inverter  <b>Trade Mark</b>..... N/A  <b>Manufacturer</b>..... Ningbo Ginlong Technologies Co.,Ltd.  <b>Address</b> ..... No. 57 Jintong Road, Seafont(Binhai) Industrial Park, Xiangshan, Ningbo, Zhejiang, 315712,P.R.China  <b>Model/Type reference</b> ..... Solis-20K, Solis-20K-HV, Solis-25K, Solis-30K, Solis-36K-HV, Solis-40K-HV, URE-20K, URE-20K-HV, URE-25K, URE-30K, URE-36K-HV, URE-40K-HV  <b>Ratings</b> ..... See the rating labels.</p>	

**Possible test case verdicts:**

- test case does not apply to the test object ..... : N(/A, Not applicable)
- test object does meet the requirement..... : P (Pass)
- test object does not meet the requirement ..... : F (Fail)

**Testing** .....

Date of receipt of test item..... : January 07, 2016

Date (s) of performance of tests..... : January 07, 2016 to April 01, 2016




**General remarks:**




"(see Attachment #)" refers to additional information appended to the report.  
 "(see appended table)" refers to a table appended to the report.  
 The tests results presented in this report relate only to the object tested.  
 This report shall not be reproduced except in full without the written approval of the testing laboratory.  
 List of test equipment must be kept on file and available for review.  
 Additional test data and/or information provided in the attachments to this report.  
 Throughout this report a  comma /  point is used as the decimal separator.




**General product information:**




1. The Solar Inverter converts DC voltage into AC voltage.
2. The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output. The output is switched off redundant by the high power switching bridge and a two relays. This assures that the opening of the output circuit will also operate in case of one error.
3. All models are identical to model Solis-40K-HV in software and similar in hardware, except different Bus capacitor, type of IGBT and output power which de-rated by software. All tests were performed on the representative model Solis-40K-HV.
4. Solis (20-40)K series and URE(20-40)K series are same except for the model number.




**Copy of marking plate:**




 Made in China by Ginlong Technologies	
Model Number	Solis-20K-HV
P <sub>DC</sub> max	23kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3~480Va.c.
F <sub>AC</sub> norm	60Hz
P <sub>AC</sub> norm	20kW
I <sub>AC</sub> max	25Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 4 5 0 1 5 0 6 1 3 9 2
	




 Made in China by Ginlong Technologies	
Model Number	Solis-20K
P <sub>DC</sub> max	23kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3~400Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	20kW
I <sub>AC</sub> max	30.3Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 5 1 0 1 5 0 6 2 3 0 0
	




 Made in China by Ginlong Technologies	
Model Number	Solis-25K
P <sub>DC</sub> max	28.8kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3~400Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	25kW
I <sub>AC</sub> max	37.8Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 3 5 0 1 5 0 4 3 0 7 6
	




 Made in China by Ginlong Technologies	
Model Number	Solis-30K
P <sub>DC</sub> max	34kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3~400Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	30kW
I <sub>AC</sub> max	45.4Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 7 1 0 1 5 0 7 0 4 3 4
	




 Made in China by Ginlong Technologies	
Model Number	Solis-36K-HV
P <sub>DC</sub> max	41.4kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3~480Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	36kW
I <sub>AC</sub> max	47.8Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 8 1 0 1 5 0 5 3 8 5 3
	




 Made in China by Ginlong Technologies	
Model Number	Solis-40K-HV
P <sub>DC</sub> max	45kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3~480Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	40kW
I <sub>AC</sub> max	48.1Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 8 1 0 1 5 0 5 3 8 5 3
	

	
Model Number	URE-25K
P <sub>DC</sub> max	28.8kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3-400Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	25kW
I <sub>AC</sub> max	37.8Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 3 5 0 1 5 0 4 3 0 7 6
	

	
Model Number	URE-20K
P <sub>DC</sub> max	23kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3-400Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	20kW
I <sub>AC</sub> max	30.3Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 5 1 0 1 5 0 6 2 3 0 0
	

	
Model Number	URE-30K
P <sub>DC</sub> max	34kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3-400Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	30kW
I <sub>AC</sub> max	45.4Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 7 1 0 1 5 0 7 0 4 3 4
	

	
Model Number	URE-36K-HV
P <sub>DC</sub> max	41.4kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3-480Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	36kW
I <sub>AC</sub> max	47.8Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 8 1 0 1 5 0 5 3 8 5 3
	

	
Model Number	URE-40K-HV
P <sub>DC</sub> max	45kW
U <sub>DC</sub> max	1000Vd.c.
I <sub>DC</sub> max (each MPPT)	18A/18A/18A/18Ad.c.
U <sub>DC</sub> startup	350Vd.c.
V <sub>DC</sub> MPPT range	200-800V
V <sub>AC</sub> norm	3-480Va.c.
F <sub>AC</sub> norm	50Hz
P <sub>AC</sub> norm	40kW
I <sub>AC</sub> max	48.1Aa.c.
PF	1
Ambient temperature	-25~60°C
Ingress protection	IP65
Protective class	Class I
Overvoltage category	III(MAINS)II(PV)
Certifications	IEC62109-1/2, AS3100 VDE 0126-1-1, G59/3 AS4777.2/3, C10/11 RD1699, EN50438
S/N:	 4 8 1 0 1 5 0 5 3 8 5 3
	

IEC 61727			
Clause	Requirement – Test	Result - Remark	Verdict
4	Utility compatibility		P
4.1	Voltage, current and frequency	(see appended table)	P
4.2	Normal voltage operating range		P
4.3	Flicker	(see appended table)	P
	The operation of the PV system should not cause voltage flicker in excess of limits stated in the relevant sections of IEC 61000-3-3 for systems less than 16 A or IEC 61000-3-5 for systems with current of 16 A and above		P
4.4	DC injection	(see appended table)	P
	The PV system shall not inject DC current greater than 1 % of the rated inverter output current, into the utility AC interface under any operating condition.		P
4.5	Normal frequency operating range	(see appended table)	P
	The PV system shall operate in synchronism with the utility system, and within the frequency trip limits defined in 5.2.2.		P
4.6	Harmonics and waveform distortion	(see appended table)	P
	Total harmonic current distortion shall be less than 5 % at rated inverter output. Each individual harmonic shall be limited to the percentages listed in Table 1		P
	Table 1 – Current distortion limits		
	Odd harmonics	Distortion limit	
	3rd through 9th	Less than 4,0 %	
	11th through 15th	Less than 2,0 %	
	17th through 21st	Less than 1,5 %	
	23rd through 33rd	Less than 0,6 %	
	Even harmonics	Distortion limit	
	2rd through 8th	Less than 1,0 %	
	10th through 32nd	Less than 0,5 %	
4.7	Power factor	(see appended table)	P
	The PV system shall have a lagging power Factor greater than 0.9 when the output is Greater than 50% of the rated inverter		P
	Output power		P
5	Personnel safety and equipment protection		P
5.1	Loss of utility voltage		P

IEC 61727															
Clause	Requirement – Test	Result - Remark	Verdict												
	To prevent islanding ,a utility connected PV system shall cease to energize the utility System from a de-energized. Distribution line irrespective of connected loads or other generators within specified time limits	See clause 5.3	P												
	A utility distribution line can become de-energized for several reasons. For example a substation breaker opening due to fault conditions or the distribution line switched out during maintenance	AC relay is used	P												
	If inverters (single or multiple) have DC SELV Input and have accumulated power below 1 KW then no mechanical disconnect (relay) is required		N												
5.2	Over/under voltage and frequency		P												
5.2.1	Over/under voltage	See appended table	P												
	<p>When the interface voltage deviates Outside the conditions specified in Table 2, the photovoltaic system shall cease to energize the utility distribution system. This applies to any phase of a multiphase system</p> <table border="1" style="width: 100%; margin: 10px 0;"> <thead> <tr> <th style="width: 40%;">Table 2 – Response to abnormal voltages Voltage (at point of utility connection)</th> <th style="width: 60%;">Maximum trip time*</th> </tr> </thead> <tbody> <tr> <td><math>V &lt; 0,5 \times V \text{ nominal}</math></td> <td>0,1 s</td> </tr> <tr> <td><math>50 \% \leq V &lt; 85 \%</math></td> <td>2,0 s</td> </tr> <tr> <td><math>85 \% \leq V \leq 110 \%</math></td> <td>Continuous operation</td> </tr> <tr> <td><math>110 \% &lt; V &lt; 135 \%</math></td> <td>2,0 s</td> </tr> <tr> <td><math>135 \% \leq V</math></td> <td>0,05 s</td> </tr> </tbody> </table> <p>* Trip time refers to the time between the abnormal condition occurring and the inverter ceasing to energize the utility line. The PV system control circuits shall actually remain connected to the utility to allow sensing of utility electrical conditions for use by the “reconnect” feature.</p>	Table 2 – Response to abnormal voltages Voltage (at point of utility connection)	Maximum trip time*	$V < 0,5 \times V \text{ nominal}$	0,1 s	$50 \% \leq V < 85 \%$	2,0 s	$85 \% \leq V \leq 110 \%$	Continuous operation	$110 \% < V < 135 \%$	2,0 s	$135 \% \leq V$	0,05 s		P
Table 2 – Response to abnormal voltages Voltage (at point of utility connection)	Maximum trip time*														
$V < 0,5 \times V \text{ nominal}$	0,1 s														
$50 \% \leq V < 85 \%$	2,0 s														
$85 \% \leq V \leq 110 \%$	Continuous operation														
$110 \% < V < 135 \%$	2,0 s														
$135 \% \leq V$	0,05 s														
5. 2. 2	Over/under frequency	See appended table	P												

IEC 61727			
Clause	Requirement – Test	Result - Remark	Verdict
	When the utility frequency deviates outside the specified conditions the photovoltaic system shall cease to energize the utility line. The unit does not have to cease to energize if the frequency returns to the normal utility continuous operation condition within the specified trip time.		P
	When the utility frequency is outside the range of $\pm 1$ Hz, the system shall cease to energize the utility line within 0,2 s. The purpose of the allowed range and time delay is to allow continued operation for short-term disturbances and to avoid excessive nuisance tripping in weak-utility system conditions.		P
5.3	Islanding protection	See appended table	P
	The PV system must cease to energize the utility line within 2 s of loss of utility.	The test is performed in accordance with IEC62116	P
5.4	Response to utility recovery		P
	Following an out-of-range utility condition that has caused the photovoltaic system to cease energizing, the photovoltaic system shall not energize the utility line for 20 s to 5 min after the utility service voltage and frequency have recovered to within the specified ranges.	90S	P
5.5	Earthing		P
	The utility interface equipment shall be earthed/grounded in accordance with IEC 60364-7-712.	Protective bonding conductors are installed and they are parallel to and in close contacts with DC cables and AC cables	P
5.6	Short circuit protection		P
	The photovoltaic system shall have short-circuit Protection in accordance with IEC 60634-7-712		P
5.7	Isolation and switching		P
	A method of isolation and switching shall be provided in accordance with IEC 60634-7-712		P

IEC 61727			
Clause	Requirement – Test	Result - Remark	Verdict

Table 4.1a Voltage					
	Measure(V)	Rated(V)	deviation	limit	Verdict
Solis-30K					
A-B	383.5	380	0.9%	+7%,-7%	P
B-C	384.2	380	1.1%	+7%,-7%	P
C-A	383.6	380	0.9%	+7%,-7%	P
Solis-40K-HV					
A-B	481.4	480	0.2%	+7%,-7%	P
B-C	482.2	480	0.4%	+7%,-7%	P
C-A	482.6	480	0.5%	+7%,-7%	P
Remark: This measured is signal phase voltage and at 100% load					

4.1b	TABLE: Frequency				P
Solis-30K					
Location	Measured (Hz)	Rated (Hz)	Deviation (Hz)	Limit (Hz)	
A	50.005	50	0.005	±0.5	
B	50.005	50	0.005	±0.5	
C	50.006	50	0.006	±0.5	
Solis-40K-HV					
Location	Measured (Hz)	Rated (Hz)	Deviation (Hz)	Limit (Hz)	
A	50.005	50	0.005	±0.5	
B	50.005	50	0.005	±0.5	
C	50.006	50	0.006	±0.5	
Supplementary information: This measured at 100% load.					

TABLE 4.3: Flicker					P
Interval(10min)	Pst			Limits	
1	0.61	0.62	0.49	1	
2	0.40	0.41	0.49		
3	0.25	0.26	0.49		
4	0.22	0.21	0.46		
5	0.28	0.27	0.49		
6	0.26	0.28	0.49		
7	0.28	0.28	0.55		
8	0.28	0.26	0.47		
9	0.26	0.27	0.42		
10	0.26	0.27	0.48		



IEC 61727					
Clause	Requirement – Test			Result - Remark	Verdict
11	0.26	0.27	0.44		
12	0.26	0.27	0.49		
Plt			Limits		
0.35	0.36	0.35	0.65		
Dmax(%)			Limits (%)		
0.28			7		
Supplementary information: This measured at 100% load.					

4.4	TABLE: DC Current Injection			P
Solis-30K				
Max output current (A)	DC Current Injection (mA)			Required limit (mA)
	10% output power	50% output power	100% output power	
45.5	40.4	141.9	61.1	2275
	66.2	148.7	135.1	
	35.2	152.3	138.1	
Solis-40K-HV				
Max output current (A)	DC Current Injection (mA)			Required limit (mA)
	10% output power	50% output power	100% output power	
48.1	65.3	121.7	121.1	2405
	66.9	138.5	115.5	
	65.9	122.8	131.1	
Supplementary information: This measured at 100% load.				

4.6	TABLE: Harmonic			P
Solis-30K				
Order	Measurements (%)			Limits (%)
	A	B	C	
2	0.9164	0.8760	0.9166	1.0
3	0.2147	0.2216	0.3419	4.0
4	0.2598	0.3533	0.3297	1.0
5	0.6964	0.7431	0.5455	4.0
6	0.2619	0.2481	0.2040	1.0
7	0.4573	0.5272	0.3497	4.0
8	0.0465	0.0427	0.0922	1.0
9	0.2033	0.2279	0.1555	4.0

IEC 61727				
Clause	Requirement – Test		Result - Remark	Verdict
10	0.0947	0.1100	0.1538	0.5
11	0.3168	0.3384	0.3332	2.0
12	0.1300	0.1405	0.0769	0.5
13	0.1965	0.2359	0.1549	2.0
14	0.1484	0.1063	0.1974	0.5
15	0.0350	0.0420	0.0492	2.0
16	0.1322	0.1449	0.1608	0.5
17	0.1851	0.1908	0.1563	1.5
18	0.0637	0.0761	0.0381	0.5
19	0.2331	0.2409	0.1981	1.5
20	0.0657	0.0268	0.1214	0.5
21	0.0619	0.0425	0.0695	1.5
22	0.0651	0.0612	0.0516	0.5
23	0.1356	0.1519	0.1774	0.6
24	0.0498	0.0560	0.0583	0.5
25	0.1139	0.0886	0.0933	0.6
26	0.0734	0.0672	0.0786	0.5
27	0.0350	0.0434	0.0327	0.6
28	0.0946	0.0744	0.0810	0.5
29	0.1194	0.1198	0.1062	0.6
30	0.0462	0.0332	0.0381	0.5
31	0.1443	0.1449	0.1462	0.6
32	0.0297	0.0427	0.0625	0.5
33	0.0309	0.0403	0.0563	0.6
THD	3.32	3.41	3.29	5.0
Solis-40K-HV				
Order	Measurements (%)			Limits (%)
	A	B	C	
2	0.9235	0.8801	0.8134	1.0
3	0.2504	0.4677	0.3460	4.0
4	0.3623	0.3856	0.4677	1.0
5	0.9060	0.8658	1.0951	4.0
6	0.1274	0.2489	0.0829	1.0
7	0.5407	0.7652	0.9021	4.0

IEC 61727				
Clause	Requirement – Test		Result - Remark	Verdict
8	0.0764	0.0992	0.0838	1.0
9	0.1459	0.1950	0.2972	4.0
10	0.2670	0.1867	0.1621	0.5
11	0.6313	0.5056	0.5352	2.0
12	0.1185	0.1764	0.1636	0.5
13	0.3194	0.3233	0.3796	2.0
14	0.1298	0.2413	0.2089	0.5
15	0.0593	0.0522	0.0675	2.0
16	0.1747	0.2101	0.2059	0.5
17	0.1850	0.2424	0.2762	1.5
18	0.0611	0.0895	0.0520	0.5
19	0.2077	0.2837	0.2927	1.5
20	0.2329	0.1654	0.1468	0.5
21	0.0598	0.0717	0.0774	1.5
22	0.1090	0.0667	0.0577	0.5
23	0.2104	0.2160	0.1783	0.6
24	0.0592	0.0736	0.0954	0.5
25	0.1162	0.1153	0.1413	0.6
26	0.1273	0.1227	0.1211	0.5
27	0.0397	0.0474	0.0506	0.6
28	0.0940	0.1145	0.0987	0.5
29	0.1049	0.1484	0.1504	0.6
30	0.0361	0.0546	0.0328	0.5
31	0.1383	0.1825	0.1778	0.6
32	0.0724	0.0843	0.0431	0.5
33	0.0358	0.0515	0.0427	0.6
THD	3.11	3.14	3.08	5.0
Supplementary information: This measured at 100% load.				

4.7	TABLE: Power Factor			P
Solis-30K				
Load (%)	Location	Measured	Limit	
50	A	0.9979	>0.9	
	B	0.9989	>0.9	

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Clause	Requirement – Test	Result - Remark	Verdict
	C	0.9989	>0.9
100	A	0.9993	>0.9
	B	0.9995	>0.9
	C	0.9994	>0.9
	<b>Solis-40K-HV</b>		
Load (%)	Location	Measured	Limit
50	A	0.9979	>0.9
	B	0.9969	>0.9
	C	0.9989	>0.9
100	A	0.9992	>0.9
	B	0.9991	>0.9
	C	0.9994	>0.9
Supplementary information:			

5.2.1	TABLE: Under / Over Voltage	P
<b>Solis-30K</b>		
Voltage (V)	Time (ms)	Limit (s)
$(U < 0.5 \times U_{nominal})$	40.3	0.1
$(0.5 \times U_{nominal} < U < 0.85 \times U_{nominal})$	1760	2.0
$(U < 0.85 \times U_{nominal})$	Continuous operation	Continuous operation
$(U < 1.1 \times U_{nominal})$	Continuous operation	Continuous operation
$(1.1 \times U_{nominal} < U < 1.35 \times U_{nominal})$	1720	2.0
$(1.35 \times U_{nominal} < U)$	38.2	0.05
<b>Solis-40K-HV</b>		
Voltage (V)	Time (ms)	Limit (s)
$(U < 0.5 \times U_{nominal})$	39.5	0.1
$(0.5 \times U_{nominal} < U < 0.85 \times U_{nominal})$	1720	2.0
$(U < 0.85 \times U_{nominal})$	Continuous operation	Continuous operation
$(U < 1.1 \times U_{nominal})$	Continuous operation	Continuous operation
$(1.1 \times U_{nominal} < U < 1.35 \times U_{nominal})$	1750	2.0
$(1.35 \times U_{nominal} < U)$	39.1	0.05
Supplementary information:		

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Clause	Requirement – Test	Result - Remark	Verdict

5.2.2	TABLE: Under / Over Frequency			P	
Solis-30K					
Frequency (Hz)	Time (ms)			Limit (s)	Reconnection time (s)
	20% Load	50% Load	100% Load		
51	174	175	174	0.2	39.8
49	173	168	177	0.2	39.6
Solis-40K-HV					
Frequency (Hz)	Time (ms)			Limit (s)	Reconnection time (s)
	20% Load	50% Load	100% Load		
51	175	175	173	0.2	90
49	174	171	174	0.2	90
Supplementary information:					

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Clause	Requirement – Test	Result - Remark	Verdict

5.3		TABLE: Islanding Protection						P
Solis-30K								
No.	P <sub>EUT</sub> (% of EUT rating)	Reactive load (% of Q <sub>L</sub> )	P <sub>AC</sub> (% of nominal)	Q <sub>AC</sub> (% of nominal)	Run on time (ms)	P <sub>EUT</sub> (W)	V <sub>DC</sub> (V)	Remarks
1	100	100	0	0	770	29.9	500	Test A at BL
2	66	66	0	0	676	20.1	650	Test B at BL
3	33	33	0	0	389	10.0	720	Test C at BL
4	100	100	-5	-5	361	30.0	500	Test A at BL
5	100	100	-5	0	563	29.9	500	Test A at BL
6	100	100	-5	+5	999	30.0	500	Test A at BL
7	100	100	0	-5	359	30.0	500	Test A at BL
8	100	100	0	+5	1372	30.0	500	Test A at BL
9	100	100	+5	-5	321	30.0	500	Test A at BL
10	100	100	+5	0	386	30.0	500	Test A at BL
11	100	100	+5	+5	788	29.9	500	Test A at BL
12	66	66	0	-5	432	20.1	650	Test B at BL
13	66	66	0	-4	363	20.2	650	Test B at BL
14	66	66	0	-3	458	20.6	650	Test B at BL
15	66	66	0	-2	494	20.1	650	Test B at BL
16	66	66	0	-1	547	20.1	650	Test B at BL
17	66	66	0	1	599	20.0	650	Test B at BL
18	66	66	0	2	687	20.1	650	Test B at BL
19	66	66	0	3	904	20.2	650	Test B at BL
20	66	66	0	4	1429	20.1	650	Test B at BL
21	66	66	0	5	642	20.1	650	Test B at BL
22	33	33	0	-5	290	10.1	720	Test C at BL
23	33	33	0	-4	304	10.1	720	Test C at BL
24	33	33	0	-3	320	9.9	720	Test C at BL
25	33	33	0	-2	400	10.1	720	Test C at BL
26	33	33	0	-1	372	10.1	720	Test C at BL
27	33	33	0	1	486	10.1	720	Test C at BL
28	33	33	0	2	454	10.0	720	Test C at BL
29	33	33	0	3	551	10.1	720	Test C at BL

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Clause	Requirement – Test				Result - Remark			Verdict
30	33	33	0	4	622	10.1	720	Test C at BL
31	33	33	0	5	576	9.9	720	Test C at BL
<b>Solis-40K-HV</b>								
No.	P <sub>EUT</sub> (% of EUT rating)	Reactive load (% of Q <sub>L</sub> )	P <sub>AC</sub> (% of nominal)	Q <sub>AC</sub> (% of nominal)	Run on time (ms)	P <sub>EUT</sub> (W)	V <sub>DC</sub> (V)	Remarks
1	100	100	0	0	749	39.9	500	Test A at BL
2	66	66	0	0	655	26.5	650	Test B at BL
3	33	33	0	0	368	13.3	720	Test C at BL
4	100	100	-5	-5	340	40	500	Test A at BL
5	100	100	-5	0	542	39.9	500	Test A at BL
6	100	100	-5	+5	978	40	500	Test A at BL
7	100	100	0	-5	338	40	500	Test A at BL
8	100	100	0	+5	1351	40	500	Test A at BL
9	100	100	+5	-5	300	40	500	Test A at BL
10	100	100	+5	0	365	40	500	Test A at BL
11	100	100	+5	+5	767	39.9	500	Test A at BL
12	66	66	0	-5	411	26.5	650	Test B at BL
13	66	66	0	-4	342	26.6	650	Test B at BL
14	66	66	0	-3	437	26.6	650	Test B at BL
15	66	66	0	-2	473	26.5	650	Test B at BL
16	66	66	0	-1	526	26.5	650	Test B at BL
17	66	66	0	1	578	26.4	650	Test B at BL
18	66	66	0	2	666	26.5	650	Test B at BL
19	66	66	0	3	883	26.6	650	Test B at BL
20	66	66	0	4	1408	26.5	650	Test B at BL
21	66	66	0	5	621	26.5	650	Test B at BL
22	33	33	0	-5	269	13.3	720	Test C at BL
23	33	33	0	-4	283	13.3	720	Test C at BL
24	33	33	0	-3	299	13.1	720	Test C at BL
25	33	33	0	-2	379	13.3	720	Test C at BL
26	33	33	0	-1	351	13.3	720	Test C at BL
27	33	33	0	1	465	13.3	720	Test C at BL
28	33	33	0	2	433	13.2	720	Test C at BL

IEC 62116								
Clause	Requirement – Test				Result - Remark			Verdict
29	33	33	0	3	530	13.3	720	Test C at BL
30	33	33	0	4	601	13.3	720	Test C at BL
31	33	33	0	5	555	13.1	720	Test C at BL
Supplementary information: The PV system must cease to energize the utility line within 2 s of loss of utility.								



Pictures



Pictures

