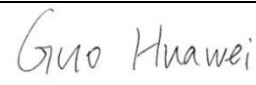


Manufacture Declaration for RD1699

Micro-generator Type reference	X1-0.7-S-D(L) X1-0.7-S-N(L)	X1-1.1-S-D(L) X1-1.1-S-N(L)	X1-1.5-S-D(L) X1-1.5-S-N(L)	X1-2.0-S-D(L) X1-2.0-S-N(L)
Maximum continuous rating	700VA	1100VA	1500VA	2000VA
Voltage (nominal)	MAX. PV input: 400Vdc Nominal AC voltage: 230Vac			
Rated power	According to model: 0.7KW, 1.1KW, 1.5KW, 2.0KW			
Manufacturer	SolaX Power Network Technology (Zhe jiang) Co. , Ltd.			
Address	No.288 Shizhu Road,Tonglu Economic Development Zone, Dongxing District,Tonglu City, Zhejiang Province, China.			
Tel	+86(0571)-56260011			
Fax	+86(0571)-56075753			
Email	info@solaxpower.com			
Web site	www.solaxpower.com			
Reference standard No.	RD1699:2011 with modification according to RD413:2014 for RD1699			
Signed				
On behalf of	SolaX Power Network Technology (Zhe jiang) Co. , Ltd.			
<p>SSEG manufacturer/supplier declaration.</p> <p>I certify on behalf of the company named above as a manufacturer/supplier of Small Scale Embedded Generators, that all products manufactured/supplied by the company with the above SSEG Type reference number will be manufactured and tested to ensure that they perform as stated in this Type Verification Test Report, prior to shipment to site and that no site modifications are required to ensure that the product meets all the requirements of RD1699:2011.</p> <p>These inverters incorporate a residual current monitoring unit (RCMU: Residual Current, RCMU: Residual Current Monitoring Unit), sensitive to all leakage currents, which acts with a response threshold of 30 mA.</p> <p>Alternating current relays safely disconnect the mains in the event of a fault.They also have an Insulation monitoring device and an earth detector on the direct current side before connection to the mains.</p> <p>These functions have been tested and certified according to DIN V VDE V 0126-1-1:2006:02.</p> <p>The direct current fed into the distribution network by the inverter is less than 0.5% of the RMS value of the inverter. nominal output current, measured as indicated in the "Separation Equivalence Interpretation Note galvanic".</p> <p>The reconnection time of the inverters is at least 3 minutes according to IEC 61727:2001, once the inverter has been reconnected. that the network parameters are again within the allowed margins. There is no possibility that the users can modify the setting values of the protections by means of software. The equipment has protection against island operation.</p>				

Under/over frequency

	Under frequency		Over frequency	
Parameter	Frequency	Time	Frequency	Time
Protection limit (RD1699)	48.0Hz	≥3.0s	50.5Hz	≤0.5s
Actual Setting	48.0Hz		50.5Hz	
Trip value (test result)	48.00Hz	3.31s	50.51Hz	0.433s

Under /Over voltage

	Under Voltage (stage 2)		Over Voltage (stage 1)		Over Voltage (stage 2)	
Parameter	Voltage	Time	Voltage	Time	Voltage	Time
Protection limit	195.5V	≤1.5s	253.0V	≤1.5s	264.5V	≤0.2s
Actual Setting	195.5V		253.0V		264.5V	
Trip value (test result)	195.4V	1.440s	253.1V	1.435s	264.6V	0.172s

DC injection

P_{Emax} in %		33% ±5% Trip Time	66% ±5% Trip Time	100% ±5% Trip Time	Limit	Result
2.0KW	+1A	166ms	164ms	166ms	200 ms	P
	-1A	164ms	184ms	164ms	200 ms	P

Power factor

Output power model	25%Pn	50% Pn	75% Pn	100% Pn	Limit	Result
2.0KW	0.9963	0.9996	0.9995	0.9991	1	P

Reconnection

Reconnection generate electrical power		P	
Setting value	Min.voltage for connected to grid.....:	195.5V	
	Max.voltage for connected to grid.....:	253.0 V	
	Min.Frequency for connected to grid.....:	48.0Hz	
	Max.Frequency for connected to grid.....:	50.0Hz	
	Observation time(180s).....:	180s	
Test:			
Voltage conditions			
In voltage range after voltage failure	85%U _N for twice of setting observation time	110%U _N for twice of setting observation time	
Reconnection time[s]	195.4V	210s	253.1V 209s
Limit:	Reconnection after setting observation time(180s)		
Frequency conditions			
In frequency range after frequency	48,0Hz for twice of setting observation time	50,00Hz for twice of setting observation time	
Reconnection time[s]	48.01Hz	208.5	50.01Hz 209.5s
Limit:	Reconnection after setting observation time(180s)		
Recover power gradient 11.8s			

Harmonic

Harmonic	At 100% of rated output		At 50% of rated output		2.0KW Limit in BS EN 61000-3-2 in Amps	P Limit of percent (%)
	Measured Value (MV) in Amps	Measured Value in lhdf (%)	Measured Value (MV) in Amps	Measured Value in lhdf (%)		
2	0.022	0.253	0.019	0.428	1.080	1
3	0.063	0.736	0.069	1.579	2.300	4
4	0.005	0.059	0.006	0.147	0.430	1
5	0.039	0.46	0.026	0.601	1.140	4
6	0.008	0.091	0.009	0.201	0.300	1
7	0.061	0.713	0.052	1.189	0.770	4
8	0.005	0.059	0.006	0.131	0.230	1
9	0.096	1.120	0.080	1.832	0.400	4
10	0.007	0.085	0.008	0.186	0.184	1
11	0.093	1.086	0.066	1.519	0.330	2
12	0.004	0.051	0.009	0.204	0.153	0.5
13	0.079	0.920	0.047	1.086	0.210	2
14	0.006	0.071	0.006	0.136	0.131	0.5
15	0.066	0.765	0.031	0.715	0.150	2
16	0.006	0.073	0.005	0.121	0.115	0.5
17	0.053	0.614	0.021	0.49	0.132	1.5
18	0.006	0.069	0.005	0.116	0.102	0.375
19	0.038	0.439	0.015	0.356	0.118	1.5
20	0.007	0.078	0.011	0.248	0.092	0.375
21	0.029	0.333	0.011	0.245	0.107	1.5
22	0.01	0.121	0.01	0.229	0.084	0.375
23	0.022	0.255	0.01	0.24	0.098	0.6
24	0.007	0.081	0.007	0.156	0.077	0.15
25	0.016	0.191	0.007	0.171	0.090	0.6
26	0.009	0.110	0.006	0.140	0.071	0.15
27	0.009	0.107	0.006	0.145	0.083	0.6
28	0.007	0.081	0.003	0.078	0.066	0.15
29	0.011	0.130	0.006	0.128	0.078	0.6
30	0.006	0.075	0.004	0.094	0.061	0.15
31	0.01	0.117	0.005	0.124	0.073	0.6
32	0.005	0.061	0.004	0.093	0.058	0.15
33	0.011	0.131	0.006	0.126	0.068	0.6
34	0.006	0.066	0.003	0.068	0.054	0.15
35	0.014	0.161	0.006	0.131	0.064	0.3
36	0.006	0.069	0.003	0.067	0.051	0.075
37	0.016	0.189	0.005	0.110	0.061	0.3
38	0.009	0.100	0.003	0.075	0.048	0.075
39	0.019	0.222	0.006	0.147	0.058	0.3
40	0.008	0.075	0.003	0.061	0.046	0.075
lthd		2.399		3.389	5	5

Harmonic	At 100% of rated output		At 50% of rated output		0.7KW Limit in BS EN 61000-3-2 in Amps	P Limit of percent (%)
	Measured Value (MV) in Amps	Measured Value in Ihdf (%)	Measured Value (MV) in Amps	Measured Value in Ihdf (%)		
2	0.012	0.383	0.013	0.833	1.080	1
3	0.026	0.863	0.026	1.704	2.300	4
4	0.006	0.202	0.005	0.308	0.430	1
5	0.01	0.344	0.01	0.653	1.140	4
6	0.006	0.200	0.006	0.375	0.300	1
7	0.02	0.660	0.014	0.920	0.770	4
8	0.007	0.236	0.006	0.409	0.230	1
9	0.034	1.102	0.02	1.303	0.400	4
10	0.006	0.192	0.004	0.250	0.184	1
11	0.027	0.886	0.012	0.763	0.330	2
12	0.003	0.088	0.003	0.171	0.153	0.5
13	0.017	0.558	0.005	0.336	0.210	2
14	0.003	0.112	0.003	0.191	0.131	0.5
15	0.01	0.322	0.004	0.232	0.150	2
16	0.003	0.086	0.002	0.115	0.115	0.5
17	0.007	0.217	0.004	0.250	0.132	1.5
18	0.004	0.120	0.002	0.124	0.102	0.375
19	0.006	0.183	0.004	0.276	0.118	1.5
20	0.003	0.115	0.001	0.094	0.092	0.375
21	0.004	0.143	0.004	0.269	0.107	1.5
22	0.002	0.070	0.003	0.166	0.084	0.375
23	0.002	0.059	0.003	0.193	0.098	0.6
24	0.002	0.073	0.002	0.124	0.077	0.15
25	0.002	0.066	0.003	0.169	0.090	0.6
26	0.002	0.049	0.002	0.118	0.071	0.15
27	0.002	0.076	0.003	0.206	0.083	0.6
28	0.002	0.077	0.002	0.111	0.066	0.15
29	0.002	0.076	0.003	0.203	0.078	0.6
30	0.002	0.074	0.002	0.107	0.061	0.15
31	0.003	0.089	0.003	0.189	0.073	0.6
32	0.002	0.064	0.002	0.106	0.058	0.15
33	0.003	0.089	0.003	0.205	0.068	0.6
34	0.002	0.068	0.001	0.075	0.054	0.15
35	0.003	0.083	0.003	0.197	0.064	0.3
36	0.002	0.074	0.002	0.075	0.051	0.075
37	0.002	0.078	0.003	0.182	0.061	0.3
38	0.002	0.052	0.002	0.073	0.048	0.075
39	0.003	0.111	0.003	0.208	0.058	0.3
40	0.002	0.071	0.001	0.072	0.046	0.075
lthd		1.951		2.625	5	5

Active anti-islanding protection

Result				P						
Islanding protection - Load imbalance (real, reactive load) for test condition A (EUT output = 100%)										
Disconnection limit:				2s						
No	PEUT [% of EUT rating]	Reactive load [% of QL in 6.1.d)	PAC [% of nominal]	QAC [% of nominal]	IAC [A]	PEUT [W per phase]	VDC [V]	Qf [1]	Run on Time [ms]	Remarks
1	100	100	0	0	8.648	1989	313.8	0.99	126.0	BL
2	100	100	-10	-10	8.630	1985	313.9	1.04	113.0	BL
3	100	100	-10	-5	8.630	1985	314.0	1.07	113.0	BL
4	100	100	-10	0	8.639	1987	313.8	1.09	158.4	BL
5	100	100	-10	+5	8.643	1988	313.9	1.12	231.0	BL
6	100	100	-10	+10	8.643	1988	313.8	1.14	181.0	BL
7	100	100	-5	-10	8.635	1986	313.9	0.98	101.0	BL
8	100	100	-5	-5	8.635	1986	313.8	1.01	109.0	BL
9	100	100	-5	0	8.639	1987	313.9	1.03	102.0	BL
10	100	100	-5	+5	8.648	1989	313.8	1.06	203.0	BL
11	100	100	-5	+10	8.630	1985	314.0	1.08	195.2	BL
12	100	100	0	-10	8.630	1985	314.1	0.94	95.20	BL
13	100	100	0	-5	8.639	1987	314.2	0.96	109.0	BL
14	100	100	0	+5	8.643	1988	314.1	1.01	142.0	BL
15	100	100	0	+10	8.643	1988	313.8	1.03	198.0	BL
16	100	100	+5	-10	8.635	1986	314.1	0.89	96.40	BL
17	100	100	+5	-5	8.635	1986	313.9	0.92	71.80	BL
18	100	100	+5	0	8.639	1987	313.8	0.94	96.60	BL
19	100	100	+5	+5	8.648	1989	313.9	0.96	170.0	BL
20	100	100	+5	+10	8.630	1985	313.9	0.98	190.0	BL
21	100	100	+10	-10	8.630	1985	314.0	0.85	82.60	BL
22	100	100	+10	-5	8.639	1987	313.9	0.87	122.0	BL
23	100	100	+10	0	8.643	1988	313.9	0.90	109.0	BL
24	100	100	+10	+5	8.643	1988	314.1	0.91	106.4	BL
25	100	100	+10	+10	8.635	1986	314.0	0.92	98.40	BL

Note:

RLC is adjusted to min, +/-1% of the inverter rated output power

1) PEUT: EUT output power

2) PAC: Real power flow at S1 in Figure 1, Positive means power from EUT to utility, Nominal is the 0 % test condition value,

3) QAC: Reactive power flow at S1 in Figure 1, Positive means power from EUT to utility, Nominal is the 0 % test condition value,

4) Fundamental of IAC when RLC is adjusted

5) BL: Balance condition, IB: Imbalance condition,

Condition A:

EUT output power PEUT = Maximum 6)

EUT input voltage 6) = >75% of rated input voltage range

6) Maximum EUT output power condition should be achieved using the maximum allowable input power, Actual output power may exceed nominal rated output,

7) Based on EUT rated input operating range, For example, If range is between X volts and Y volts, 90 % of range = $X + 0,75 \times (Y - X)$, Y shall not exceed $0,8 \times$ EUT maximum system voltage (i.e., maximum allowable array open circuit voltage), In any case, the EUT should not be operated outside of its allowable input voltage range.

Result				P						
Islanding protection – Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)										
Disconnection limit:				2s						
No	P [% of EUT rating]	Reactive load [% of QL in 6.1.d)	PAC [% of nominal]	QAC [% of nominal]	IAC [A]	PEUT [W per phase]	VDC [V]	Qf [1]	Run on Time [ms]	Remarks
1	66	66	0	-5	5.765	1326	226.7	1.00	201.8	IB
2	66	66	0	-4	5.774	1328	226.3	1.00	226.6	IB
3	66	66	0	-3	5.774	1328	224.5	1.01	259.8	IB
4	66	66	0	-2	5.774	1328	225.0	1.01	292.6	IB
5	66	66	0	-1	5.770	1327	225.5	1.02	337.8	IB
6	66	66	0	0	5.778	1329	226.4	1.01	225.8	IB
7	66	66	0	1	5.774	1328	224.3	1.02	174.4	IB
8	66	66	0	2	5.765	1326	224.1	1.02	158.4	IB
9	66	66	0	3	5.765	1326	226.9	1.03	147.4	IB
10	66	66	0	4	5.761	1325	227.9	1.04	105.8	IB
11	66	66	0	5	5.761	1325	227.6	1.04	105.4	IB

Note:

RLC is adjusted to min, +/-1% of the inverter rated output power

1) PEUT: EUT output power

2) PAC: Real power flow at S1 in Figure 1, Positive means power from EUT to utility, Nominal is the 0 % test condition value,

3) QAC: Reactive power flow at S1 in Figure 1, Positive means power from EUT to utility, Nominal is the 0 % test condition value,

4) Fundamental of IAC when RLC is adjusted

5) BL: Balance condition, IB: Imbalance condition,

Condition B:

EUT output power PEUT = 50 % – 66 % of maximum

EUT input voltage 6) = 50 % of rated input voltage range, $\pm 10\%$

6) Based on EUT rated input operating range, For example, If range is between X volts and Y volts, 50 % of range = $X + 0,5 \times (Y - X)$, Y shall not exceed $0,8 \times$ EUT maximum system voltage (i.e., maximum allowable array open circuit voltage), In any case, the EUT should not be operated outside of its allowable input voltage range.

Result				P						
Islanding protection - Load imbalance (real, reactive load) for test condition C (EUT output = 25%-33%)										
Disconnection limit:				2s						
No	PEUT [% of EUT rating]	Reactive load [% of QL in 6.1.d]	PAC [% of nominal]	QAC [% of nominal]	IAC [A]	PEUT [W per phase]	VDC [V]	Qf [1]	Run on Time [ms]	Remarks
1	33	33	0	-5	1.043	239.8	101.3	0.98	239.8	IB
2	33	33	0	-4	1.217	279.8	101.5	0.99	279.8	IB
3	33	33	0	-3	1.204	277.0	101.7	0.98	277.0	IB
4	33	33	0	-2	1.239	285.0	100.1	0.99	285.0	IB
5	33	33	0	-1	1.237	284.6	102.6	0.99	284.6	IB
6	33	33	0	0	1.643	377.8	103.1	1.01	377.8	BL
7	33	33	0	1	0.9965	229.2	101.1	1.02	229.2	IB
8	33	33	0	2	0.7609	175.0	100.7	1.02	175.0	IB
9	33	33	0	3	0.6565	151.0	101.5	1.02	151.0	IB
10	33	33	0	4	0.6357	146.2	102.4	1.02	146.2	IB
11	33	33	0	5	0.6322	145.4	100.5	1.03	145.4	IB

Note:

RLC is adjusted to min, +/-1% of the inverter rated output power

1) PEUT: EUT output power

2) PAC: Real power flow at S1 in Figure 1, Positive means power from EUT to utility, Nominal is the 0 % test condition value,

3) QAC: Reactive power flow at S1 in Figure 1, Positive means power from EUT to utility, Nominal is the 0 % test condition value,

4) Fundamental of IAC when RLC is adjusted

5) BL: Balance condition, IB: Imbalance condition,

Condition B:

EUT output power PEUT = 25 % – 33 % 6) of maximum

EUT input voltage 7) = <20 % of rated input voltage range

6) Or minimum allowable EUT output level if greater than 33 %,

7) Based on EUT rated input operating range, For example, If range is between X volts and Y volts, 10 % of range = $X + 0,2 \times (Y - X)$, Y shall not exceed $0,8 \times$ EUT maximum system voltage (i.e., maximum allowable array open circuit voltage), In any case, the EUT should not be operated outside of its allowable input voltage range.

Residual current monitoring test

Test for detection of excessive continuous residual current			P
Fault Current (mA)		Disconnection time (ms)	
Measured Fault Current	Limit 300mA for output power ≤ 30 kVA 10mA per kVA for output power >30 kVA	Measured Disconnection time	Limit
+ PV to N:			
181.7	300	152.5	300
182.4	300	157.0	300
184.7	300	169.0	300
186.7	300	172.2	300
187.7	300	173.2	300
- PV to N:			
192.3	300	159.5	300
194.5	300	148.0	300
194.7	300	155.5	300
195.5	300	150.0	300
195.7	300	152.1	300

Note:

- maximum 300mA for inverters with continuous output power rating ≤ 30 kVA;
- maximum 10mA per kVA of rated continuous output power for inverters with continuous output power rating > 30 kVA.

This test shall be repeated 5 times, and for all 5 tests the time to disconnect shall not exceed 0,3s.

The test is repeated for each PV input terminal. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.

Test for detection of sudden changes in residual current			P
+PV to N			
Limit (mA)	Un		Limit (ms)
	Disconnection time (ms)		
30	152.5		300
30	165.0		300
30	157.5		300
30	105.0		300
30	140.0		300
60	91.0		150
60	93.0		150
60	92.0		150
60	112.0		150
60	92.0		150
150	19.5		40
150	21.0		40
150	26.0		40
150	7.5		40
150	13.5		40
-PV to N			
Limit (mA)	Un		Limit (ms)
	Disconnection time (ms)		
30	164.0		300
30	170.0		300
30	162.0		300
30	172.0		300
30	180.0		300
60	111.0		150
60	113.0		150
60	101.0		150
60	112.0		150
60	106.0		150
150	8.0		40
150	27.0		40
150	35.0		40
150	25.0		40
150	31.0		40

Note:

The capacitive current is raised until disconnection.

Test condition: $I_c + 30/60/150\text{mA} \leq I_{c\text{max}}$. R₁ is set that 30/60/150mA Flow and switch S is closed.

Isolation measurement

DC Voltage below minimum operating voltage(V)	DC Voltage for inverter begin operation(V)	Resistance between ground and PV input terminal(MΩ)	Required Insulation resistance $R = (V_{MAX PV} / 30mA)$ (KΩ)	Result
DC+				
50	55	2.3	13.3	P
50	306	2.3	13.3	P
50	360	2.3	13.3	P
50	380	2.3	13.3	P
50	400	2.3	13.3	P
DC-				
50	55	1.9	13.3	P
50	306	1.9	13.3	P
50	360	1.9	13.3	P
50	380	1.9	13.3	P
50	400	1.9	13.3	P
Note: For isolated inverters, shall indicate a fault in accordance with 13.9 (operation is allowed); the fault indication shall be maintained until the array insulation resistance has recovered to a value higher than the limit above. For non-isolated inverters, or inverters with isolation not complying with the leakage current limits in the minimum inverter isolation requirements in Table 30, shall indicate a fault in accordance with 13.9, and shall not connect to the mains; the inverter may continue to make the measurement, may stop indicating a fault and may connect to the mains if the array insulation resistance has recovered to a value higher than the limit above. It is not required to test all PV input terminals if analysis of the design indicates that one or more terminals can be expected to have the same result, for example where multiple PV string inputs are in parallel.				
Supplementary information:				

Additional comments