TEST REPORT
IEC 62116

Test procedure of islanding prevention measures for utility-interconnected photovoltaic inverters

Report reference number .....:	**PV190627N026-1**
Date of issue .....::	2019-07-23
Total number of pages .....::	24
Testing laboratory name .....:	**Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch**
Address .....:	No. 34, Chenwulu Section, Guantai Rd., Houjie Town, Dongguan City, Guangdong 523942, China
Applicant's name.....:	**EVOLVE ENERGY GROUP CO., LIMITED**
Address .....:	RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
Test specification	
Standard.....:	IEC 62116:2014
Certificate.....:	**Certificate of compliance**
Test report form number .....:	IEC 62116
Master TRF .....:	Bureau Veritas Consumer Products Services Germany GmbH
Test item description .....:	**PV Grid inverter**
Trademark.....:	EVVO
Model / Type .....:	**EVVO 50000TL3P, EVVO 60000TL3P, EVVO 70000TL3P-HV**

Ratings ..... :	**EVVO 50000TL3P**	**EVVO 60000TL3P**	**EVVO 70000TL3P-HV**
Full load MPP DC voltage range [V] :	600-800		700-800
Input DC voltage range [V]..... :	250-950, Max. 1000		
Input DC current [A] ..... :	Max. 40/30/30	Max. 40/40/40	
Output AC voltage [V] ..... :	3~/N/PE, 230/400Vac, 50Hz		3~/PE, 480Vac, 50Hz
Output AC current [A]..... :	Max. 80	Max. 90	
Nominal output power [W]..... :	50000	60000	70000
Max. output power [VA]..... :	50000	60000	75000

Testing Location ..... :	**Shenzhen Academy of Metrology & Quality Inspection**
Address ..... :	No. 4 Tongfa Rd.,Nanshan, Shenzhen, China
Tested by (name and signature) ..... :	Dora Zhang 
Approved by (name and signature) ..... :	James Huang 
Manufacturer's name ..... :	**EVOLVE ENERGY GROUP CO., LIMITED**
Manufacturer address ..... :	RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
Factory's name ..... :	**Dongguan SOFAR SOLAR Co.,Ltd.**
Factory address	1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City

Document History			
Date	**Internal reference**	**Modification / Change / Status**	**Revision**
2019-07-23	Dora Zhang	This is a copy test report	--
Supplementary information:			

Test items particulars	
Equipment mobility ..... :	Permanent connection
Operating condition ..... :	Continuous
Class of equipment ..... :	Class I
Mass of equipment [kg] ..... :	EVVO 50000TL3P, EVVO 60000TL3P: 68kg; EVVO 70000TL3P-HV: 70kg
Test case verdicts	
Test case does not apply to the test object ..... :	N/A
Test item does meet the requirement ..... :	P(ass)
Test item does not meet the requirement ..... :	F(ail)
Testing	
Date of receipt of test item ..... :	2017-12-21
Date(s) of performance of test ..... :	2017-12-21 to 2018-01-11

General remarks:

The test result presented in this report relate only to the object(s) tested.
This report must not be reproduced, in part or in full, without the written approval of the issuing testing laboratory.

”(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

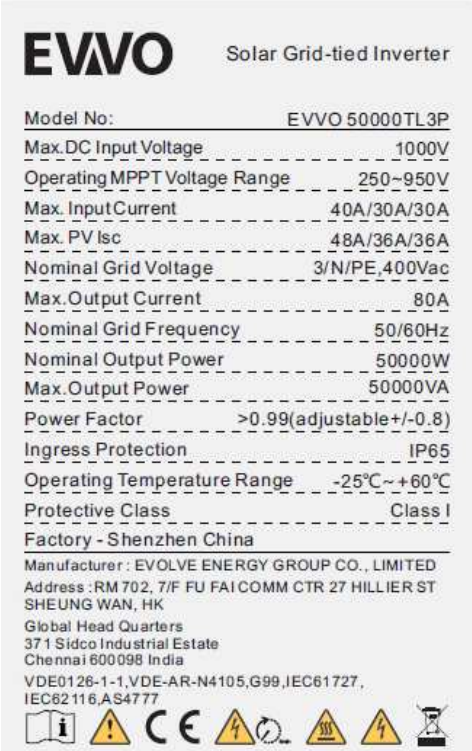
The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Throughout this report a comma is used as the decimal separator.

This Test Report consists of the following documents:

1. Test Results
2. Annex No. 1 – Pictures of the unit
3. Annex No. 2 – Test equipment list

Copy of marking plates:

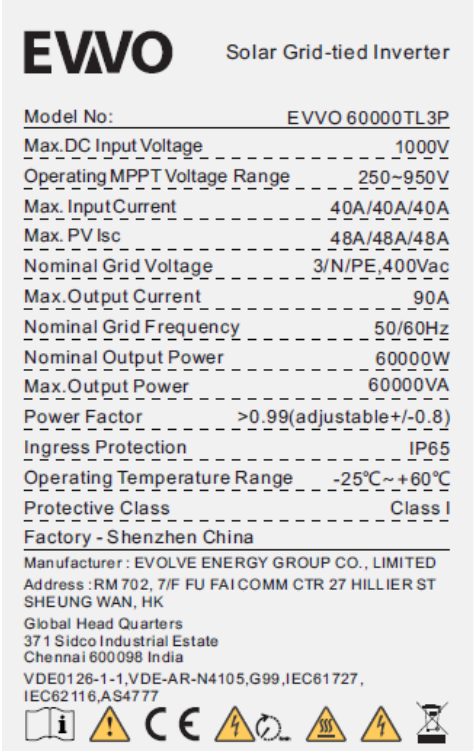


EVVO Solar Grid-tied Inverter

Model No:	EVVO 50000TL3P
Max.DC Input Voltage	1000V
Operating MPPT Voltage Range	250~950V
Max. Input Current	40A/30A/30A
Max. PV Isc	48A/36A/36A
Nominal Grid Voltage	3/N/PE,400Vac
Max.Output Current	80A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	50000W
Max.Output Power	50000VA
Power Factor	>0.99(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25℃~+60℃
Protective Class	Class I

Factory - Shenzhen China

Manufacturer : EVOLVE ENERGY GROUP CO., LIMITED
Address :RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
Global Head Quarters
371 Sidco Industrial Estate
Chennai 600098 India
VDE0126-1-1,VDE-AR-N4105,G99,IEC61727, IEC62116,AS4777

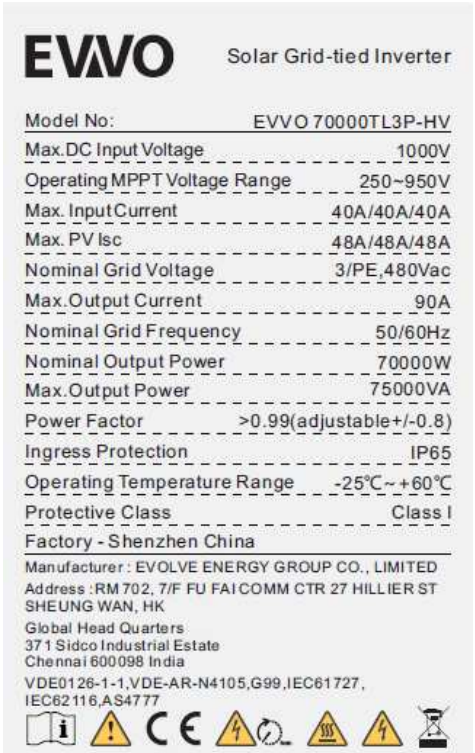


EVVO Solar Grid-tied Inverter

Model No:	EVVO 60000TL3P
Max.DC Input Voltage	1000V
Operating MPPT Voltage Range	250~950V
Max. Input Current	40A/40A/40A
Max. PV Isc	48A/48A/48A
Nominal Grid Voltage	3/N/PE,400Vac
Max.Output Current	90A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	60000W
Max.Output Power	60000VA
Power Factor	>0.99(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25℃~+60℃
Protective Class	Class I

Factory - Shenzhen China

Manufacturer : EVOLVE ENERGY GROUP CO., LIMITED
Address :RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
Global Head Quarters
371 Sidco Industrial Estate
Chennai 600098 India
VDE0126-1-1,VDE-AR-N4105,G99,IEC61727, IEC62116,AS4777



EVVO Solar Grid-tied Inverter

Model No:	EVVO 70000TL3P-HV
Max.DC Input Voltage	1000V
Operating MPPT Voltage Range	250~950V
Max. Input Current	40A/40A/40A
Max. PV Isc	48A/48A/48A
Nominal Grid Voltage	3/PE,480Vac
Max.Output Current	90A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	70000W
Max.Output Power	75000VA
Power Factor	>0.99(adjustable+/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25℃~+60℃
Protective Class	Class I

Factory - Shenzhen China

Manufacturer : EVOLVE ENERGY GROUP CO., LIMITED
Address :RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
Global Head Quarters
371 Sidco Industrial Estate
Chennai 600098 India
VDE0126-1-1,VDE-AR-N4105,G99,IEC61727, IEC62116,AS4777

General product information:

The Solar Grid-tied inverter converts DC voltage into AC voltage.

The unit is providing EMC filtering at the output toward mains. The unit does not provide galvanic separation from input to output (transformerless). The output is switched off redundant by the high power switching bridge and two relays for each phases in series. This assures that the opening of the output circuit will also operate in case of one error. Block diagram as following:

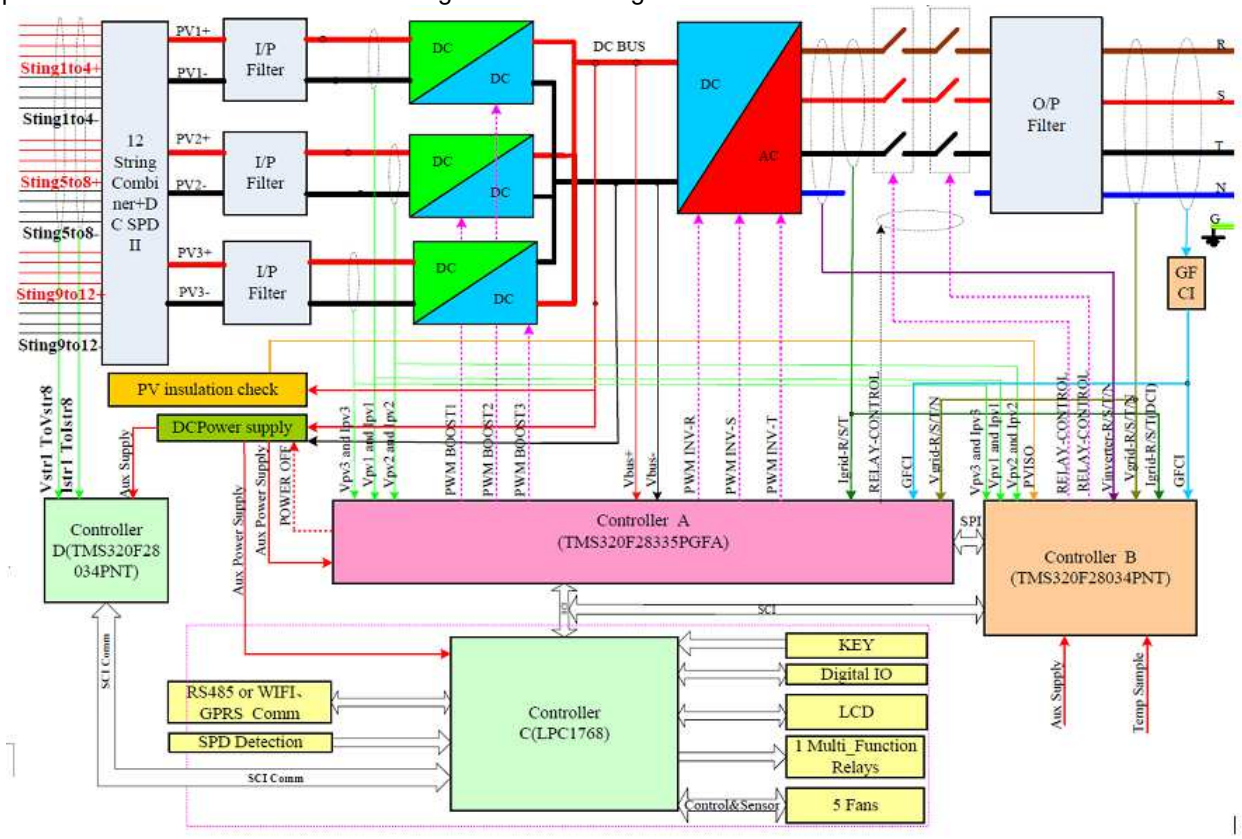


Figure 1 Block diagram

The internal control is redundant built. It consists of master DSP (UC20) and slave DSP (UC73).

The master DSP (UC20) can control the relays, measures voltage, and frequency, AC current with injected DC, array insulation resistance and residual current and the RCMU circuit before each start up.

The slave DSP (UC73) is using for sample the grid voltage, frequency, DC voltage, current and residual current, also can open the relays independently and communicate with master DSP (UC20) each other.

The grid voltage is measured before the relays. The voltage between polarity is calculated. The voltage signals are sent to both DSP. In addition this signal is used for the frequency measurement.

The unit provides two relays in series in each phase. The relays are tested before each start up. Each DSP switch off each relays.

The current is measured by a current sensor. The AC current signal and the injected DC current signal are sent to the main DSP (UC20). The main DSP (UC20) tests and calibrates before each start up all current sensors.

The RCMU is located at the AC output. The RCMU is tested before each start up by the main DSP (UC20). While unit working, if a high level residual current occurs, the RCMU will give signal to DSP assuring that unit grid-off from AC mains.

The model EVVO 70000TL3P-HV is identical to EVVO 50000TL3P and EVVO 60000TL3P except the numbers of the input PV terminals, Sic diodes, Sis MOS, BOOST inductors and INV inductors, the output ac voltage and output power derated by software.

The product was tested on:

Hardware version: V1.00
Software version: V2.00

Test overview:		
IEC 62116:2014		
Clause	**Test**	**Result**
	Type test:	
6.1	Islanding protection according table 6 - Load imbalance (real, reactive load) for test condition A (EUT ouput = 100%)	**P**
6.1	Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)	**P**
6.1	Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)	**P**

6.1 Islanding protection

Test circuit and parameters

Parameter	Symbol	Units
EUT DC Input		
DC voltage	V_{DC}	V
DC Current	I_{DC}	A
DC Power	P_{DC}	W
EUT AC ouput		
AC voltage	V_{EUT}	V
AC current	I_{EUT}	A
Real power	P_{EUT}	W
Reactive power	Q_{EUT}	VAr
Test Load		
Resistive load current	I_R	A
Inductive load current	I_L	A
Capacitive load current	I_C	A
AC (utility) power source		
Utility real power	P_{AC}	W
Utility reactive power	Q_{AC}	VAr
Utility current	I_{AC}	A

Block diagram test circuit IEC 62116:2014

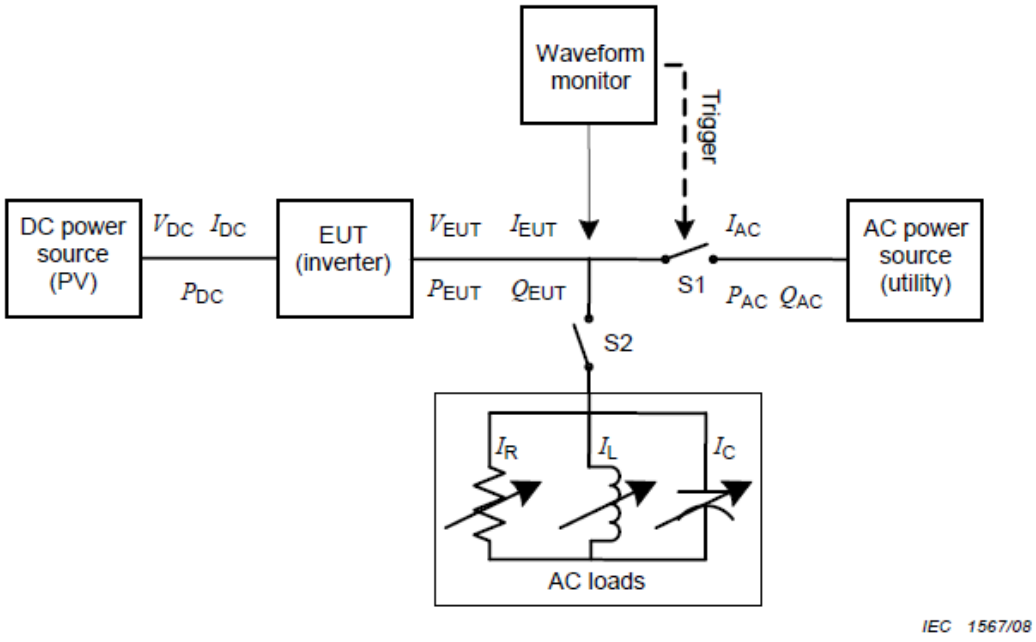


Figure 1 – Test circuit for islanding detection function in a power conditioner (inverter)

6.1 Islanding protection according table 6 - Load imbalance (real, reactive load) for test condition A (EUT ouput = 100%)	P

EVVO 60000TL3P

Test conditions			Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality = 1							
Disconnection limit			2s							
No	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	I_{AC} 4) [A]	P_{EUT} [kW per phase]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks 5)
1	100	100	0	0	0,041	19,890	663	0,994	1017	BL
4	100	100	-5	-5	4,300	19,890	663	1,020	422	IB
5	100	100	-5	0	4,360	19,890	663	1,046	950	IB
6	100	100	-5	+5	4,206	19,890	663	1,072	554	IB
7	100	100	0	-5	0,103	19,890	663	0,969	397	IB
8	100	100	0	+5	0,192	19,890	663	1,018	210	IB
9	100	100	+5	-5	4,424	19,890	663	0,922	455	IB
10	100	100	+5	0	4,370	19,890	663	0,946	933	IB
11	100	100	+5	+5	4,508	19,890	663	0,970	178	IB

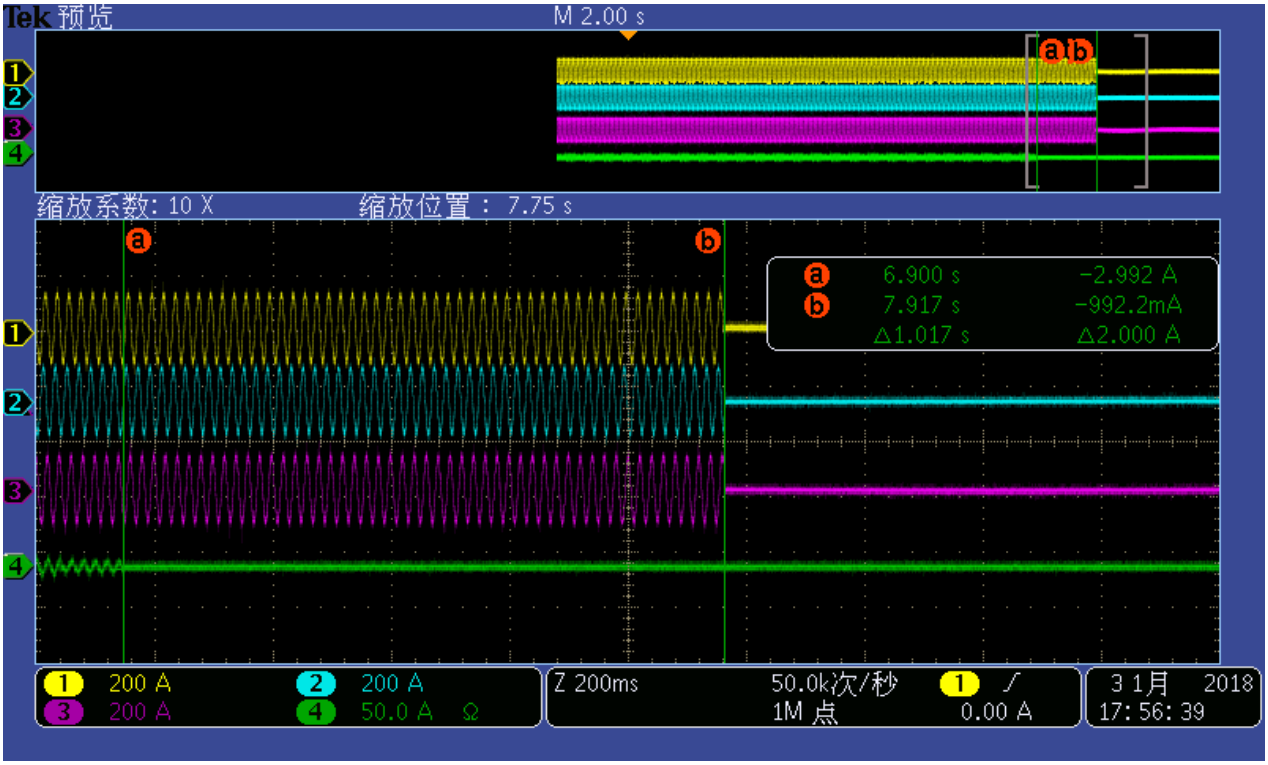
Parameter at 0%	L= 8,83 mH	R= 2,74 Ω	C= 1160,12 µF

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
1) P_{EUT}: EUT output power
2) P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
3) Q_{AC}: 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 I_{AC} 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 × (Y – X). Y shall not exceed 0,8 × 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.
The test had been performed on the EVVO 60000TL3P is valid for the EVVO 50000TL3P since it is similar in hardware and just power derated by software.
The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Disconnection at P_{AC} 0% and Q_{AC} 0% reactive load and 100% nominal power



6.1 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)	P

EVVO 60000TL3P

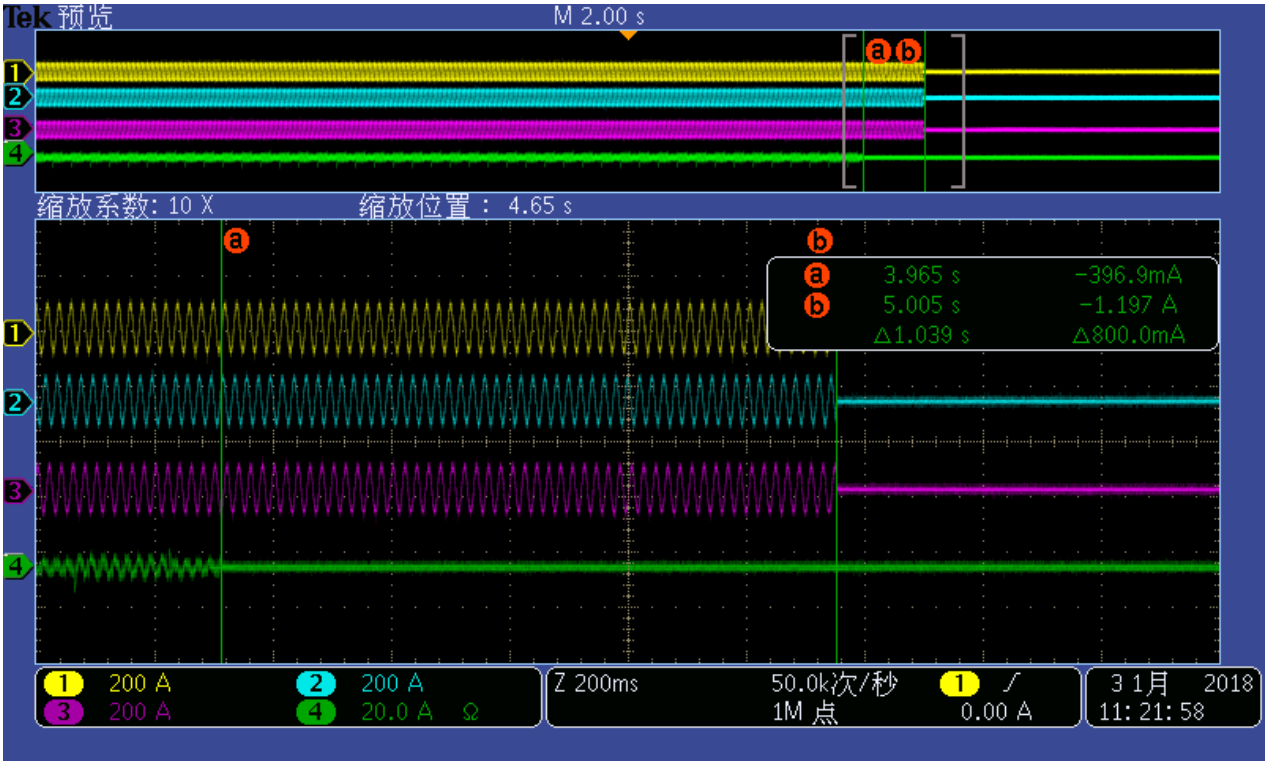
Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s

No	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	I_{AC} 4) [A]	P_{EUT} [kW per phase]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks 5)
12	66	66	0	-5	0,110	13,180	525	0,988	429	IB
13	66	66	0	-4	0,082	13,180	525	0,993	460	IB
14	66	66	0	-3	0,059	13,180	525	0,998	396	IB
15	66	66	0	-2	0,042	13,180	525	1,003	474	IB
16	66	66	0	-1	0,029	13,180	525	1,008	424	IB
2	66	66	0	0	0,020	13,180	525	1,013	1039	BL
17	66	66	0	1	0,020	13,180	525	1,018	946	IB
18	66	66	0	2	0,023	13,180	525	1,023	936	IB
19	66	66	0	3	0,032	13,180	525	1,028	956	IB
20	66	66	0	4	0,045	13,180	525	1,033	964	IB
21	66	66	0	5	0,064	13,180	525	1,038	946	IB

Parameter at 0%	L= 13,31 mH	R= 4,26 Ω	C= 754,56 µF

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
1) P_{EUT}: EUT output power
2) P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
3) Q_{AC}: 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 I_{AC} when RLC is adjusted
5) BL: Balance condition, IB: Imbalance condition.
Condition B:
EUT output power P_{EUT} = 50 % – 66 % of maximum
EUT input voltage 6) = 50 % of rated input voltage range, ±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 × (Y – X). Y shall not exceed 0,8 × 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.
The test had been performed on the EVVO 60000TL3P is valid for the EVVO 50000TL3P since it is similar in hardware and just power derated by software.
The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Disconnection at P_{AC} 0% and Q_{AC} -0% reactive load and 66% nominal power



6.1 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)

P

EVVO 60000TL3P

Test conditions	Frequency: 50+/-0,1Hz U_N=230+/-3Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s

No	P_{EUT} [1] [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	I_{AC} [4] [A]	P_{EUT} [kW per phase]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks [5]
22	33	33	0	-5	0,057	6,560	360	0,988	939	IB
23	33	33	0	-4	0,044	6,560	360	0,994	963	IB
24	33	33	0	-3	0,033	6,560	360	0,999	937	IB
25	33	33	0	-2	0,025	6,560	360	1,004	935	IB
26	33	33	0	-1	0,020	6,560	360	1,009	957	IB
3	33	33	0	0	0,018	6,560	360	1,014	986	BL
27	33	33	0	1	0,019	6,560	360	1,019	957	IB
28	33	33	0	2	0,022	6,560	360	1,024	961	IB
29	33	33	0	3	0,028	6,560	360	1,029	539	IB
30	33	33	0	4	0,037	6,560	360	1,034	460	IB
31	33	33	0	5	0,049	6,560	360	1,039	402	IB

Parameter at 0%	L= 25,91 mH	R= 8,27 Ω	C= 389,91 µF

Note:

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

[1] P_{EUT}: EUT output power

[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

[3] Q_{AC}: 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 I_{AC} 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

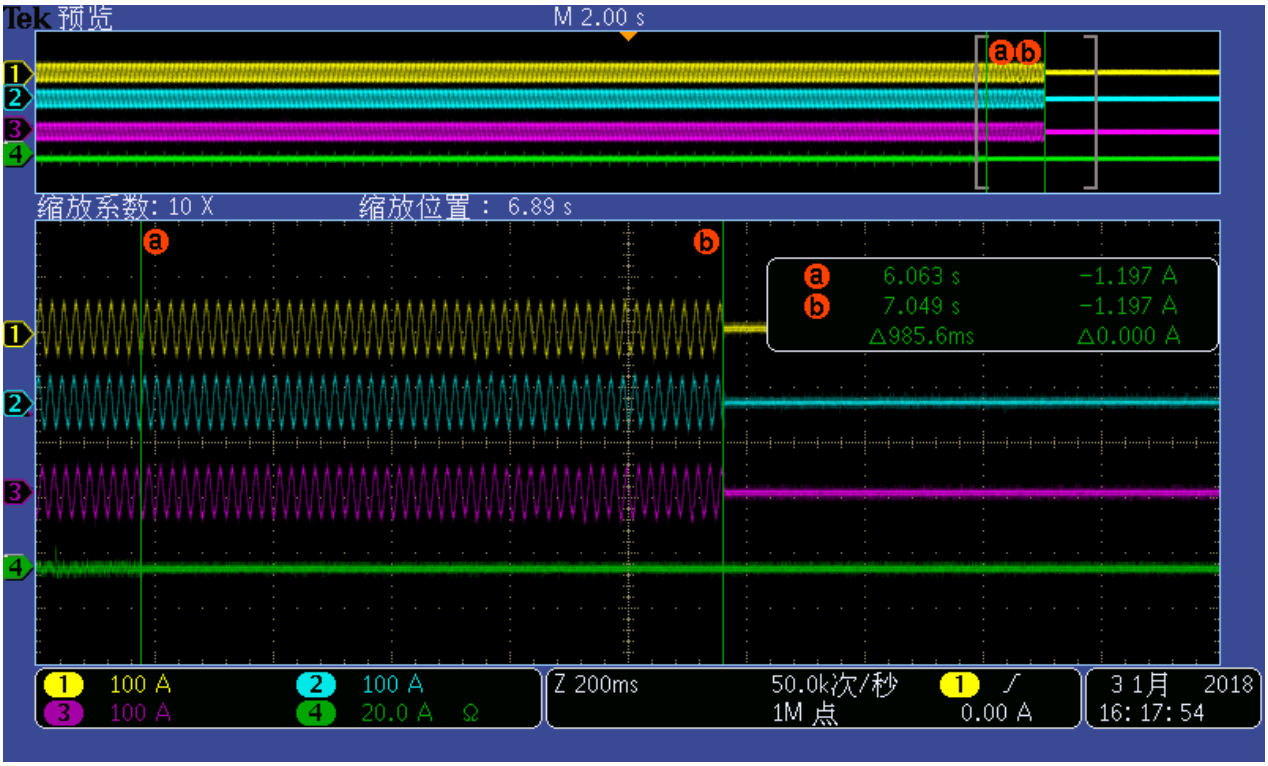
[6] Or minimum allowable EUT output level if greater than 33 %.

[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 × (Y – X). Y shall not exceed 0,8 × 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.

The test had been performed on the EVVO 60000TL3P is valid for the EVVO 50000TL3P since it is similar in hardware and just power derated by software.

The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Disconnection at P_{AC} 0% and Q_{AC} -0% reactive load and 33% nominal power



6.1 Islanding protection according table 6 - Load imbalance (real, reactive load) for test condition A (EUT ouput = 100%)	P

EVVO 70000TL3P-HV

Test conditions			Frequency: 50+/-0,1Hz U_N=400+/-4Vac Distortion factor of chokes < 2% Quality = 1							
Disconnection limit			2s							
No	P_{EUT} 1) [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} 2) [% of nominal]	Q_{AC} 3) [% of nominal]	I_{AC} 4) [A]	P_{EUT} [kW per phase]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks 5)
1	100	100	0	0	0,014	23,300	663	0,999	987	BL
4	100	100	-5	-5	4,997	23,300	663	1,025	495	IB
5	100	100	-5	0	5,073	23,300	663	1,051	935	IB
6	100	100	-5	+5	4,879	23,300	663	1,077	965	IB
7	100	100	0	-5	0,092	23,300	663	0,974	412	IB
8	100	100	0	+5	0,204	23,300	663	1,024	552	IB
9	100	100	+5	-5	5,154	23,300	663	0,927	428	IB
10	100	100	+5	0	5,085	23,300	663	0,951	936	IB
11	100	100	+5	+5	5,260	23,300	663	0,975	542	IB

Parameter at 0%	L=7,26 mH	R= 2,27 Ω	C= 1411,03 µF

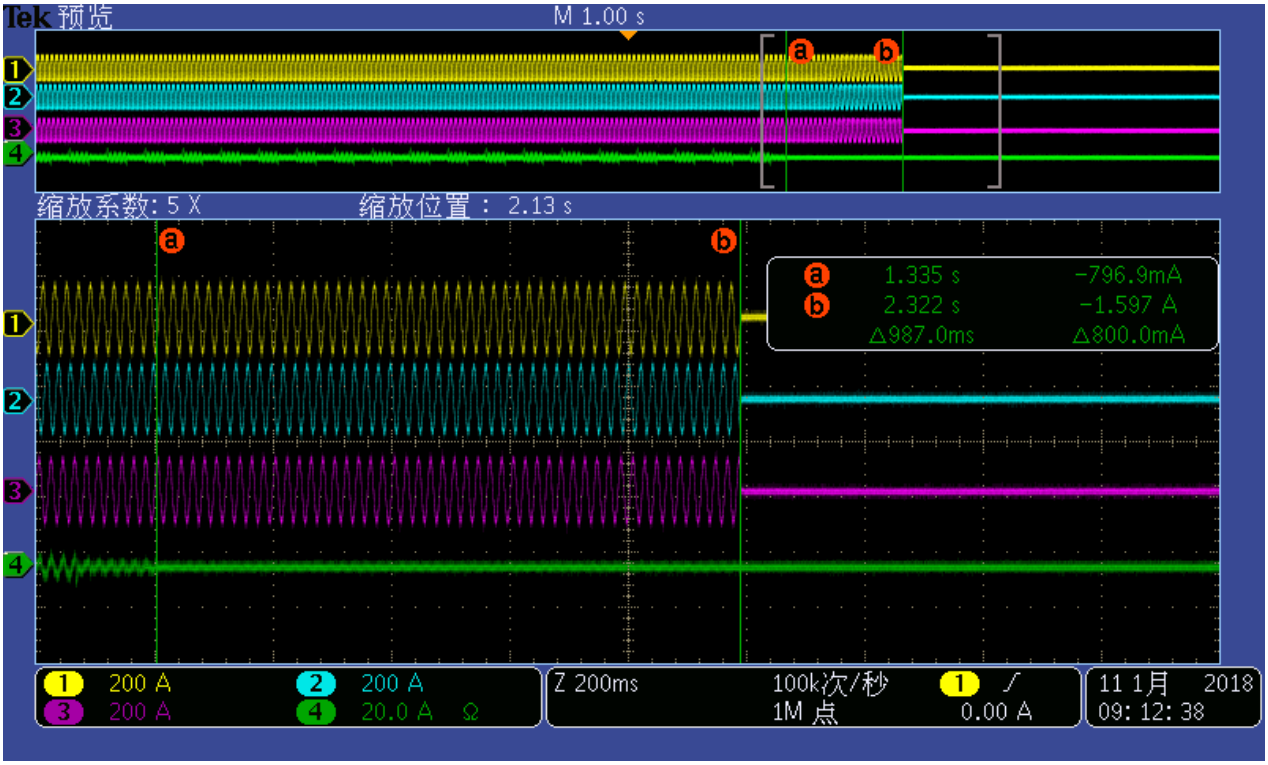
Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
1) P_{EUT}: EUT output power
2) P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
3) Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
4) Fundamental of I_{AC} 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 × (Y – X). Y shall not exceed 0,8 × 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.

The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Disconnection at P_{AC} 0% and Q_{AC} 0% reactive load and 100% nominal power



6.1 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition B (EUT output = 50 % – 66 %)	P

EVVO 70000TL3P-HV

Test conditions	Frequency: 50+/-0,1Hz U_N=400+/-4Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s

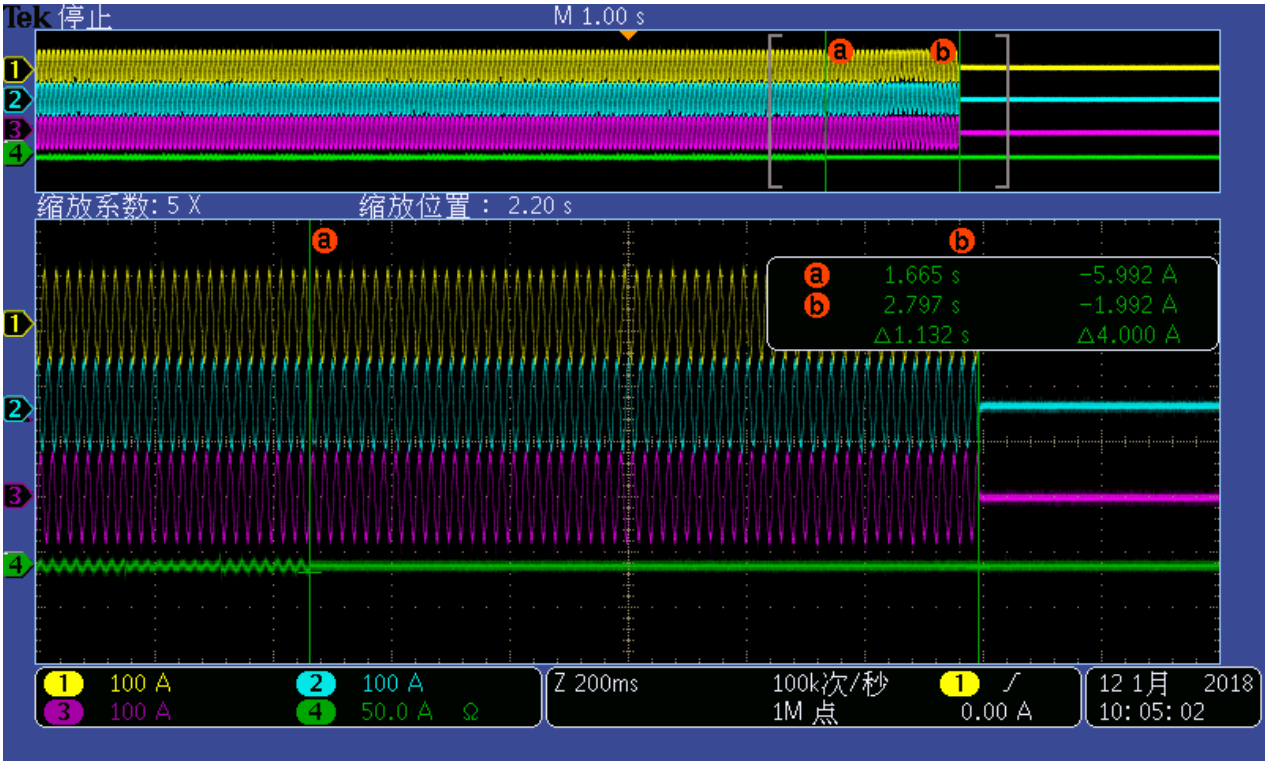
No	P_{EUT} [1] [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	I_{AC} [4] [A]	P_{EUT} [kW per phase]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks [5]
12	66	66	0	-5	0,446	15,500	525	0,981	370	IB
13	66	66	0	-4	0,377	15,500	525	0,986	498	IB
14	66	66	0	-3	0,315	15,500	525	0,991	480	IB
15	66	66	0	-2	0,260	15,500	525	0,996	964	IB
16	66	66	0	-1	0,212	15,500	525	1,001	982	IB
2	66	66	0	0	0,073	15,500	525	1,006	1132	BL
17	66	66	0	1	0,138	15,500	525	1,011	990	IB
18	66	66	0	2	0,111	15,500	525	1,016	936	IB
19	66	66	0	3	0,091	15,500	525	1,021	962	IB
20	66	66	0	4	0,079	15,500	525	1,026	963	IB
21	66	66	0	5	0,073	15,500	525	1,031	960	IB

Parameter at 0%	L= 10,06 mH	R= 3,35 Ω	C= 956,73 µF

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
[1] P_{EUT}: EUT output power
[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[3] Q_{AC}: 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 I_{AC} when RLC is adjusted
[5] BL: Balance condition, IB: Imbalance condition.
Condition B:
EUT output power P_{EUT} = 50 % – 66 % of maximum
EUT input voltage [6] = 50 % of rated input voltage range, ±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 × (Y – X). Y shall not exceed 0,8 × 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.

The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Disconnection at P_{AC} 0% and Q_{AC} -0% reactive load and 66% nominal power



6.1 Islanding protection according Table 7 – Load imbalance (reactive load) for test condition C (EUT output = 25 % – 33 %)	P

EVVO 70000TL3P-HV

Test conditions	Frequency: 50+/-0,1Hz U_N=400+/-4Vac Distortion factor of chokes < 2% Quality =1
Disconnection limit	2s

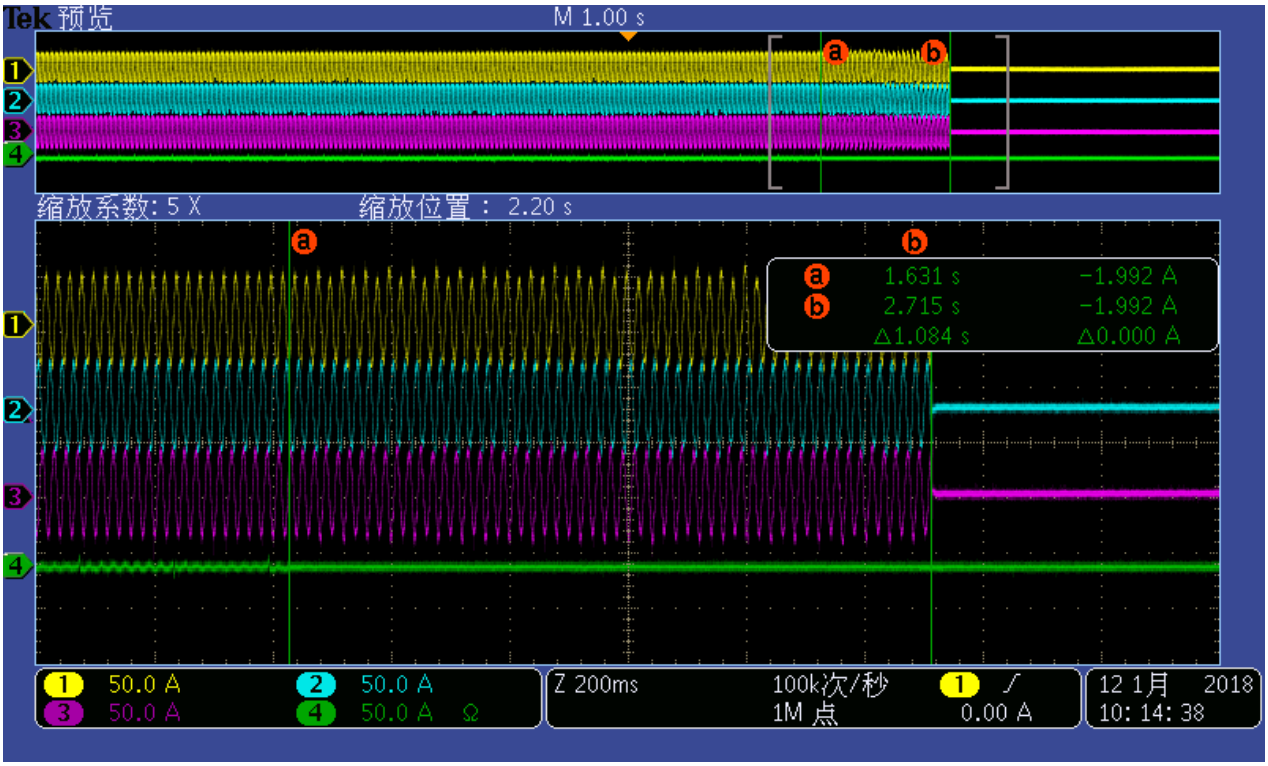
No	P_{EUT} [1] [% of EUT rating]	Reactive load [% of Q_L in 6.1.d) 1]	P_{AC} [2] [% of nominal]	Q_{AC} [3] [% of nominal]	I_{AC} [4] [A]	P_{EUT} [kW per phase]	V_{DC} [V]	Q_f [1]	Run on Time [ms]	Remarks [5]
22	33	33	0	-5	0,068	7,560	305	0,985	896	IB
23	33	33	0	-4	0,058	7,560	305	0,990	1046	IB
24	33	33	0	-3	0,051	7,560	305	0,995	1020	IB
25	33	33	0	-2	0,048	7,560	305	1,000	930	IB
26	33	33	0	-1	0,047	7,560	305	1,005	1026	IB
3	33	33	0	0	0,047	7,560	305	1,010	1084	BL
27	33	33	0	1	0,055	7,560	305	1,015	1052	IB
28	33	33	0	2	0,064	7,560	305	1,020	998	IB
29	33	33	0	3	0,075	7,560	305	1,025	954	IB
30	33	33	0	4	0,090	7,560	305	1,030	985	IB
31	33	33	0	5	0,108	7,560	305	1,035	982	IB

Parameter at 0%	L= 23,37 mH	R= 7,43 Ω	C= 439,26 µF

Note:
RLC is adjusted to min. +/-1% of the inverter rated output power
[1] P_{EUT}: EUT output power
[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.
[3] Q_{AC}: 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 I_{AC} 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 × (Y – X). Y shall not exceed 0,8 × 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.

The test results refer to the original test report PV171221N009-1-R1 issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, dated on Jan. 31, 2018.

Disconnection at P_{AC} 0% and Q_{AC} -0% reactive load and 33% nominal power



Annex No. 1

Pictures of the unit

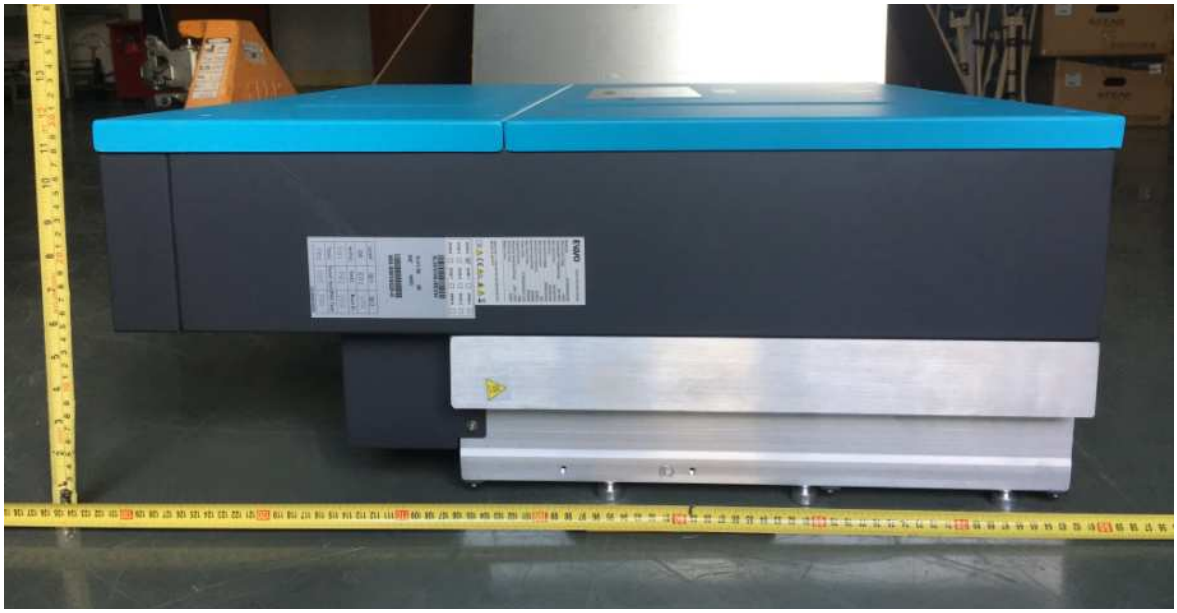
The full pictures refer to PHOTO DOCUMENT

Project No.: 190627N026

Date: 20190723

Front view


Rear view


Side view


Terminal view


Annex No. 2

Test Equipment list

Test location: Shenzhen Academy of Metrology & Quality Inspection
Performed dates of test: 2017-12-21 to 2018-01-11

Equipment	Internal No.	Manufacturer	Type	Serial No.	Last Calibration
Power Analyzer	SB8900	YOKOGAWA	WT3000	91LB39847	Apr. 12, 2017
AC Source	SB9540/03	ACPOWER	AFG-S-331507	C312020029	Monitored by Power Analyzer
DC Simulation Power Supply	SB9540/02	Chroma	62000H	--	
RLC Load	SB9605	Qunling	ACLT-3830H	--	
PV inverter test system	SB9540	Chroma	--	CH0240021207	
ScopeCorder	SB11177	YOKOGAWA	DL850-H-HC/HD1	91P215763	Mar. 13, 2017
	SB9146	TEKTRONIX	DP03034	--	Apr. 13, 2017
Current transducer	SB9618/07	YOKOGAWA	751552	1132540023	Mar. 10, 2017
	SB9618/08	YOKOGAWA	751552	1132320003	Mar. 10, 2017
	SB9618/09	YOKOGAWA	751552	1132320004	Mar. 10, 2017
	SB11205	YOKOGAWA	96001	--	Aug. 28, 2017
	SB11206	YOKOGAWA	96001	--	Aug. 28, 2017
	SB11207	YOKOGAWA	96001	--	Aug. 28, 2017