



**TEST REPORT
IEC 61727
Photovoltaic (PV) systems –
Characteristics of the utility interface**

Report Number..... : 2217 / 1094 – 3 – M2(*)

(*) This is a co- report of the report 2217 / 1094 – 3 – M1, for detailed information refer to page 8.

Date of issue..... : 18 / 06 / 2019

Total number of pages 22

Name of Testing Laboratory preparing the Report : SGS Tecnos, S.A. (Electrical Testing Laboratory)

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 61727:2004 (Second Edition)

Test procedure : Characteristic Examination

Non-standard test method : N/A

Test Report Form No. : IEC61727A

Test Report Form(s) Originator : TÜV SÜD Product Service GmbH

Master TRF : Dated 2014-11

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General disclaimer:

The test results presented in this report relate only to the object tested.


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Test item description	Solar Grid-tied Inverter
Trade Mark	
Manufacturer.....	EVOLVE ENERGY GROUP CO., LIMITED
Model/Type reference	EVVO 6000TLG2
Ratings	DC input: 90-580V, 11/11A. AC output: 230V, 50Hz, 27.3A, 6000VA Serial Number: ZG1ES060H61001 ZH1ES160H9S999 for spot-check test Firmware version: V0.22

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):				
Test date from 30/10/2017 to 20/11/2017 (location 1) and 24/04/2019 and 06/05 2019 (location 2)				
<input checked="" type="checkbox"/>	Testing procedure: TMP/CTF Stage 1:	Shenzhen SOFAR SOLAR Co., Ltd.		
Testing location/ address.....:		<p>Location 1: 5/F, Building 4, Antongda Industrial Park, No. 1 Liuxian Avenue, Xin'an Street, Bao'an District, Shenzhen City, Guangdong Province, P.R. China</p> <p>Location 2: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China</p>		
Tested by (name, function, signature).....:		<table border="1"> <tr> <td>Roger Hu (Project Engineer)</td> <td></td> </tr> </table>	Roger Hu (Project Engineer)	
Roger Hu (Project Engineer)				
Approved by (name, function, signature.....:		<table border="1"> <tr> <td>Jacobo Tevar (Technical Reviewer)</td> <td> <p>P.A</p>   </td> </tr> </table>	Jacobo Tevar (Technical Reviewer)	<p>P.A</p>  
Jacobo Tevar (Technical Reviewer)	<p>P.A</p>  			

List of Attachments (including a total number of pages in each attachment):		
50 Hz		
Attachment #	Description	Pages
Attachment I	Pictures of the EUT and Electrical Schemes	12 pages
Attachment II	Testing Information	5 pages
Attachment II	Graphs and Screenshots of Test Results	15 pages
Summary of testing:		
<p>Tests performed (name of test and test clause):</p> <p>The equipment has been tested according to the standard: IEC 61727:2004. Testing has been carried out at 50 Hz</p> <p>All applicable tests according to the above specified standard have been carried out.</p> <p>From the result of inspection and tests on the submitted sample, we conclude that it complies with the requirements of the standard.</p> <p>This report is a first issuance for a co-license based on report number 2217 / 1094 – 3–M1, See further information in page 8.</p>	<p>Testing location:</p> <p>Test data: from 30/10/2017 to 20/11/2017: Shenzhen SOFAR SOLAR Co., Ltd. 5/F, Building 4, Antongda Industrial Park, No. 1 Liuxian Avenue, Xin'an Street, Bao'an District, Shenzhen City, Guangdong Province, P.R. China (All clauses)</p> <p>Test date: from 24/04/2019 to 06/05/2019 Shenzhen SOFAR SOLAR Co., Ltd. 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China</p>	
Summary of compliance with National Differences:		
No National Differences are addressed to this test report		

Copy of marking plate(representative):

EVVO Solar Grid-tied Inverter	
Model No:	EVVO 6000TLG2
Max.DC Input Voltage	600V
Operating MPPT Voltage Range	90~580V
Max. Input Current	2x11A
Max. PV Isc	2x13.2A
Nominal Grid Voltage	230V
Max. Output Current	27.3A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	6000W
Max. Output Power	6000VA
Power Factor	1 (adjustable +/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25°C~ +60°C
Protection Class	Class I
Inverter Topology	Non-Isolated
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, G99, EN50438, AS4777, IEC62116, IEC61727	
	

Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation
3. Labels of other models are as the same with EVVO 6000TLG2's except the parameters of rating.

Test item particulars: Single Phase Inverter	
Classification of installation and use: Fixed(permanent connection)	
Supply Connection: DC; PV	
.....: AC; Grid connection	
Possible test case verdicts:	
- test case does not apply to the test object..... : N/A	
- test object does meet the requirement..... : P (Pass)	
- test object does not meet the requirement..... : F (Fail)	
Testing: CTF Stage 1 procedure	
Date of receipt of test item: N/A	
Date (s) of performance of tests: From 30/10/2017 to 20/11/2017, 24/04/2019 and 06/05/2019	
General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at www.sgs.com/terms_e-document.htm. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60068-2-21:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided :	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) : Dongguan SOFAR SOLAR Co., Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City, Guangdong Province, P.R. China.	

General product information:

Product covered by this report is grid-connected PV inverter for indoor or outdoor installation. The connection to the DC input and AC output are through connectors. The structure of the unit complied with the IP 65 requirement.

The inverters intended to operate at ambient temperature -25°C - +60°C, which will be specified in the user manual, however, the inverters will output full power when operated at 45°C, if operated at higher than 45°C temperature, the output power would be derate.

The Solar inverter converts DC voltage into AC voltage.

The input and output are protected by varistors to Earth. 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 a two relays. This assures that the opening of the output circuit can operate in case of one error.

Equipment Under Testing:

-EVVO 6000TLG2

Variant models:

- EVVO 5000TLG2
- EVVO 4600TLG2
- EVVO 4000TLG2
- EVVO 3600TLG2
- EVVO 3000TLG2

Product Model	EVVO 3000TL G2	EVVO 3600TL G2	EVVO 4000TL G2	EVVO 4600TL G2	EVVO 5000TL G2	EVVO 6000TL G2
Input (DC)						
Max.DC Input Power	3500W	4000W	4400W	5000W	5500W	6600W
Max.DC Voltage	600V					
Power Turn on	80V					
Start-up input voltage	120V					
Rated input voltage	360V					
MPPT Voltage Range	90-580V					
Full load DC voltage range	160-520V	180-520V	200-520V	230-520V	250-520V	300-520V
MAX input current per MPPT	11A/11A					
Number of DC inputs	2/2					
Output(AC)						
Max AC Output power	3000VA	3680VA	4000VA	4600VA	5000VA	6000VA
Max AC Output power (PF=1)	3000W	3680W	4000W	4600W	5000W	6000W
Max AC Output Current	13.7A	16.8A	18.2A	21A	22.8A	27.3A
Nominal Grid Voltage	230Vac(Single phase)					
Nominal Frequency	50Hz					
Power factor	1(adjustable+/-0.9)					
Topology	Transformerless					
Operating temperature range	-25-60°C					
Degree of protection	IP65					

The variants models have been included in this test report without tests because the following features don't change regarding to the tested model:

- Same connection system and hardware topology
- Same control algorithm.
- Output power within 2.5 and 2/3 of the EUT or Modular inverters
- Same Firmware Version

The report n° 2217 / 1094 – 3 – M1 was modified based on Report No. 2217 / 1094 – 3 with following points:

1. Modified the Applicant address from:

5/F, Building 4, Antongda Industrial Park, No. 1 Liuxian Avenue, Xin'an Street, Bao'an District, Shenzhen City, Guangdong Province, P.R. China

to

401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China

2. Modified the Factory name and address from:

Shenzhen SOFARSOLAR Co., Ltd.

5/F, Building 4, Antongda Industrial Park, No. 1 Liuxian Avenue, Xin'an Street, Bao'an District, Shenzhen City, Guangdong Province, P.R. China

to

Dongguan SOFAR SOLAR Co., Ltd.

1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City, Guangdong Province, P.R. China.

3. Add spot-check test for clause 4.6 and 4.7

The report n° 2217 / 1094 – 3 – M2 is a co-report based on Report No. 2217 / 1094 – 3 – M1.

The report is issued including the co-license for EVOLVE ENERGY GROUP CO., LIMITED.

Models are the same as appearing in the base reports with different denomination and trademark.

Editorial changes have been included to change the applicant and trademark references.

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict
4	UTILITY COMPATIBILITY		P
	The quality of power provided by the PV system for the on-site AC loads and for power delivered to the utility is governed by practices and standards on voltage, flicker, frequency, harmonics and power factor.		P
	Deviation from these standards represents out-of-bounds conditions and may require the PV system to sense the deviation and properly disconnect from the utility system.		P
4.1	Voltage, current and frequency		P
	The PV system AC voltage, current and frequency are compatible with the utility system.		P
4.2	Normal voltage operating range		P
	Utility-interconnected PV systems do not normally regulate voltage, they inject current into the utility. Therefore, the voltage operating range for PV inverters is selected as a protection function that responds to abnormal utility conditions, not as a voltage regulation function.		P
4.3	Flicker		P
	The operation of the PV system is 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.	(see appended table)	P
4.4	DC injection		P
	The PV system is not inject DC current greater than 1 % of the rated inverter output current, into the utility AC interface under any operating condition.	(see appended table)	P
4.5	Normal frequency operating range		P
	The PV system operates in synchronism with the utility system, and within the frequency trip limits defined in 5.2.2.		P
4.6	Harmonics and waveform distortion		P
	Total harmonic current distortion is less than 5 % at rated inverter output. Each individual harmonic is limited to the percentages listed in Table 1.	(see appended table)	P
	Even harmonics in these ranges is less than 25 % of the lower odd harmonic limits listed.		P

IEC 61727: 2004																			
Clause	Requirement + Test	Result - Remark	Verdict																
	Table 1 – Current distortion limits <table border="1"> <thead> <tr> <th>Odd harmonics</th> <th>Distortion limit</th> </tr> </thead> <tbody> <tr> <td>3rd through 9th</td> <td>Less than 4,0 %</td> </tr> <tr> <td>11th through 15th</td> <td>Less than 2,0 %</td> </tr> <tr> <td>17th through 21st</td> <td>Less than 1,5 %</td> </tr> <tr> <td>23rd through 33rd</td> <td>Less than 0,6 %</td> </tr> <tr> <th>Even harmonics</th> <th>Distortion limit</th> </tr> <tr> <td>2rd through 8th</td> <td>Less than 1,0 %</td> </tr> <tr> <td>10th through 32nd</td> <td>Less than 0,5 %</td> </tr> </tbody> </table>		Odd harmonics	Distortion limit	3 rd through 9 th	Less than 4,0 %	11 th through 15 th	Less than 2,0 %	17 th through 21 st	Less than 1,5 %	23 rd through 33 rd	Less than 0,6 %	Even harmonics	Distortion limit	2 rd through 8 th	Less than 1,0 %	10 th through 32 nd	Less than 0,5 %	P
Odd harmonics	Distortion limit																		
3 rd through 9 th	Less than 4,0 %																		
11 th through 15 th	Less than 2,0 %																		
17 th through 21 st	Less than 1,5 %																		
23 rd through 33 rd	Less than 0,6 %																		
Even harmonics	Distortion limit																		
2 rd through 8 th	Less than 1,0 %																		
10 th through 32 nd	Less than 0,5 %																		
4.7	The PV system has a lagging power factor greater than 0,9 when the output is greater than 50 % of the rated inverter output power.	(see appended table)	P																
5	PERSONNEL SAFETY AND EQUIPMENT PROTECTION		P																
	This Clause provides information and considerations for the safe and proper operation of the utility-connected PV systems.		P																
5.1	Loss of utility voltage		P																
	To prevent islanding, a utility connected PV system ceases to energize the utility system from a de-energized distribution line irrespective of connected loads or other generators within specified time limits.		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.		P																
5.2	Over/under voltage and frequency		P																
	The abnormal utility conditions of concern are voltage and frequency excursions above or below the values stated in this Clause, and the complete disconnection of the utility, presenting the potential for a distributed resource island.	(see appended table)	P																
5.2.1	Over/under voltage		P																
	When the interface voltage deviates outside the conditions specified in Table 2, the photovoltaic system ceases to energize the utility distribution system. This applies to any phase of a multiphase system.	(see appended table)	P																
	Table 2 – Response to abnormal voltages <table border="1"> <thead> <tr> <th>Voltage (at point of utility connection)</th> <th>Maximum trip time*</th> </tr> </thead> <tbody> <tr> <td>$V < 0,5 \times V_{nominal}$</td> <td>0,1 s</td> </tr> <tr> <td>$50 \% \leq V < 85 \%$</td> <td>2,0 s</td> </tr> <tr> <td>$85 \% \leq V \leq 110 \%$</td> <td>Continuous operation</td> </tr> <tr> <td>$110 \% < V < 135 \%$</td> <td>2,0 s</td> </tr> <tr> <td>$135 \% \leq V$</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>		Voltage (at point of utility connection)	Maximum trip time*	$V < 0,5 \times V_{nominal}$	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				
Voltage (at point of utility connection)	Maximum trip time*																		
$V < 0,5 \times V_{nominal}$	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		P																

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict
	When the utility frequency deviates outside the specified conditions the photovoltaic system ceases 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.	(see appended table)	P
	When the utility frequency is outside the range of ± 1 Hz, the system ceases 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		P
	The PV system must cease to energize the utility line within 2 s of loss of utility.	Test according IEC 62116: 2014	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 is 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.	(see appended table)	P
5.5	Earthing		P
	The utility interface equipment is earthed/grounded in accordance with IEC 60364-7-712.		P
5.6	Short circuit protection		P
	The photovoltaic system has short-circuit protection in accordance with IEC 60364-7-712.		P
5.7	Isolation and switching		P
	A method of isolation and switching is provided in accordance with IEC 60364-7-712.		P

IEC 61727: 2004				
Clause	Requirement + Test	Result - Remark		Verdict
4.3	TABLE: Flicker			P
	Starting	Stopping	Running	
Limit	4%	4%	Pst = 1.0	Plt = 0.65
Sample model	EVVO 6000TLG2			
33%Pn				
Test value	0.25	0.10	0.08	0.08
66%Pn				
Test value	0.54	0.15	0.11	0.10
100%Pn				
Test value	0.81	0.14	0.07	0.07
Supplementary information: N/A				

4.4	TABLE: Direct current injection							P	
Rated output current (A)	Ratio of rated output power (VA)	Measured DC output current between terminals (mA)						Isolated transformer ? (Yes/No)	Limit (mA)
		L1-L2	L1-L3	L2-L3	L1-N	L2-N	L3-N		
27.3	25%	--	--	--	29.00	--	--	No	273
27.3	50%	--	--	--	32.00	--	--	No	273
27.3	100%	--	--	--	63.00	--	--	No	273
Supplementary information: N/A									

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

4.6(a)	Table: harmonics and waveform distortion (at 33%Pn)					P
Harmonic	% of fundamental	Limits (% of fundamental)	Harmonic	% of fundamental	Limits (% of fundamental)	
02	0.086	1	03	2.114	4	
04	0.070	1	05	0.94	4	
06	0.027	1	07	0.897	4	
08	0.035	1	09	0.82	4	
10	0.067	0.5	11	0.812	2	
12	0.019	0.5	13	0.778	2	
14	0.051	0.5	15	0.673	2	
16	0.028	0.5	17	0.584	1.5	
18	0.029	0.5	19	0.478	1.5	
20	0.067	0.5	21	0.333	1.5	
22	0.018	0.5	23	0.238	0.6	
24	0.038	0.5	25	0.166	0.6	
26	0.035	0.5	27	0.073	0.6	
28	0.007	0.5	29	0.071	0.6	
30	0.020	0.5	31	0.089	0.6	
32	0.021	0.5	33	0.047	0.6	
THD	3.063	5	--			
Supplementary information:						

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

4.6(b)	Table: harmonics and waveform distortion (at 66%Pn)					P
Harmonic	% of fundamental	Limits (% of fundamental)	Harmonic	% of fundamental	Limits (% of fundamental)	
02	0.116	1	03	1.787	4	
04	0.023	1	05	0.726	4	
06	0.007	1	07	0.704	4	
08	0.017	1	09	0.712	4	
10	0.027	0.5	11	0.645	2	
12	0.009	0.5	13	0.604	2	
14	0.045	0.5	15	0.523	2	
16	0.010	0.5	17	0.441	1.5	
18	0.017	0.5	19	0.358	1.5	
20	0.029	0.5	21	0.244	1.5	
22	0.014	0.5	23	0.193	0.6	
24	0.013	0.5	25	0.131	0.6	
26	0.012	0.5	27	0.074	0.6	
28	0.009	0.5	29	0.090	0.6	
30	0.013	0.5	31	0.061	0.6	
32	0.004	0.5	33	0.060	0.6	
THD	2.507	5	--			
Supplementary information:						

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

4.6(c)	Table: harmonics and waveform distortion (at 100%Pn)					P
Harmonic	% of fundamental	Limits (% of fundamental)	Harmonic	% of fundamental	Limits (% of fundamental)	
02	0.024	1	03	1.725	4	
04	0.041	1	05	0.691	4	
06	0.071	1	07	0.547	4	
08	0.045	1	09	0.540	4	
10	0.053	0.5	11	0.607	2	
12	0.078	0.5	13	0.473	2	
14	0.020	0.5	15	0.398	2	
16	0.038	0.5	17	0.383	1.5	
18	0.048	0.5	19	0.293	1.5	
20	0.016	0.5	21	0.203	1.5	
22	0.046	0.5	23	0.143	0.6	
24	0.026	0.5	25	0.111	0.6	
26	0.011	0.5	27	0.070	0.6	
28	0.016	0.5	29	0.029	0.6	
30	0.033	0.5	31	0.043	0.6	
32	0.021	0.5	33	0.042	0.6	
THD	2.268	5	--			
Supplementary information:						

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

4.6(d)	Table: Spot-check test for harmonics and waveform distortion (at 100%Pn)					P
Harmonic	% of fundamental	Limits (% of fundamental)	Harmonic	% of fundamental	Limits (% of fundamental)	
02	0.065	1	03	1.757	4	
04	0.050	1	05	0.894	4	
06	0.070	1	07	0.277	4	
08	0.067	1	09	0.348	4	
10	0.026	0.5	11	0.374	2	
12	0.089	0.5	13	0.208	2	
14	0.026	0.5	15	0.258	2	
16	0.037	0.5	17	0.261	1.5	
18	0.050	0.5	19	0.161	1.5	
20	0.041	0.5	21	0.127	1.5	
22	0.035	0.5	23	0.108	0.6	
24	0.049	0.5	25	0.114	0.6	
26	0.023	0.5	27	0.021	0.6	
28	0.033	0.5	29	0.007	0.6	
30	0.036	0.5	31	0.018	0.6	
32	0.015	0.5	33	0.057	0.6	
THD	2.125	5	--			
Supplementary information:						

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

4.7	TABLE: Power factor							P
No	Input			Output				Rated output (V.A)
	Voltage (V d.c.)	Current (A d.c.)	Power (W)	Voltage (V a.c.)	Current (A a.c.)	Power (W)	Power factor (+)	
1	362.17	3.45	1248	230.72	5.23	1204	0.998	(20±5)%
2	356.57	5.29	1881	230.96	7.95	1835	0.999	(30±5)%
3	360.74	7.01	2523	231.07	10.67	2464	0.999	(40±5)%
4	354.27	8.87	3134	231.16	13.23	3056	0.999	(50±5)%
5	358.99	10.50	3761	231.32	15.77	3645	0.999	(60±5)%
6	362.77	12.10	4378	231.48	18.32	4239	1.000	(70±5)%
7	362.65	13.81	4994	231.52	20.88	4832	1.000	(80±5)%
8	359.74	15.65	5612	232.29	23.44	5442	1.000	(90±5)%
9	370.73	16.63	6129	232.53	25.74	5983	1.000	(100±5)%
Supplementary information:								
Power factor with “+” indicating leading and “-“ indicating lagging.								

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

4.7(a)	TABLE: Spot-check test for Power factor							P
No	Input			Output				Rated output (V.A)
	Voltage (V d.c.)	Current (A d.c.)	Power (W)	Voltage (V a.c.)	Current (A a.c.)	Power (W)	Power factor (+)	
1	357.61	3.50	1251	230.28	5.25	1200	0.994	(20±5)%
2	358.30	5.23	1875	230.38	7.88	1809	0.997	(30±5)%
3	360.62	6.93	2499	230.48	10.50	2416	0.998	(40±5)%
4	358.91	8.70	3121	230.59	13.12	3020	0.999	(50±5)%
5	355.90	10.51	3742	230.69	15.71	3620	0.999	(60±5)%
6	355.90	12.26	4364	230.79	18.30	4220	0.999	(70±5)%
7	356.50	13.99	4988	230.89	20.89	4820	0.999	(80±5)%
8	365.47	15.27	5579	230.99	23.34	5386	0.999	(90±5)%
9	360.12	17.31	6235	231.09	26.05	6013	0.999	(100±5)%

Supplementary information:

Power factor with “+” indicating leading and “-“ indicating lagging.

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

5.2.1 & 5.4		TABLE: Under-and over-voltage trip settings and reconnection test						P
(1) Under voltage disconnection procedure								
Rated output voltage (V)	Output power (VA)	Required min. voltage (V)	Value of PCE trip settings (V)	Ratio of decreased (V / s)	Interval time (s)	Measured tripped voltage (V)	Measured disconnection time (s)	
50 % $V_n \leq V < 85 \% V_n$								
230	6000	195.5	195	2.3	2	194.80	1.63	
230	6000	155	155	2.3	2	154.78	1.62	
230	6000	117	117	2.3	2	116.83	1.63	
$V < 0,5 \times V_{\text{nominal}}$								
230	6000	114	114	2.3	0.1	113.83	0.036	
(2) Under voltage reconnection procedure								
Ratio of voltage rapidly decreased (V / s)			Reconnection voltage (V)		Reconnection time (s)			
0.01			230		72.6			
(3) Over voltage disconnection procedure								
Rated output voltage (V)	Output power (VA)	Required max. voltage (V)	Value of PCE trip settings (V)	Ratio of increased (V / s)	Interval time (s)	Measured tripped voltage (V)	Measured disconnection time (s)	
110 % $V_n < V < 135 \% V_n$								
230	6000	253	255	2.3	0.1	254.83	1.645	
230	6000	282	282	2.3	0.1	281.70	0.036	
230	6000	309	309	2.3	0.1	307.39	0.033	
135 % $V_n \leq V$								
230	6000	312	312	2.3	0.05	311.88	0.0232	
(4) Over voltage reconnection procedure								
Ratio of voltage rapidly decreased (V / s)			Reconnection voltage (V)		Reconnection time (s)			
0.01			230		72.8			
Supplementary information: N/A								

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

5.2.2 & 5.4		TABLE: Over/under frequency trip settings and reconnection test						Pass
(1) Under frequency disconnection procedure								
Rated output frequency (Hz)	Output power (VA)	Required min. frequency (Hz)	Value of PCE trip settings (Hz)	Ratio of decreased (Hz / s)	Interval time (s)	Measured tripped frequency (Hz)	Measured disconnection time (s)	
50	6000	49	49	0.1	0.2	48.89	0.157	
(2) Under frequency reconnection procedure								
Ratio of voltage rapidly decreased (V / s)			Reconnection frequency (Hz)		Reconnection time (s)			
0.01			50		72.9			
(3) Over frequency disconnection procedure								
Rated output frequency (Hz)	Output power (VA)	Required max. frequency (Hz)	Value of PCE trip settings (Hz)	Ratio of increased (Hz / s)	Interval time (s)	Measured tripped frequency (Hz)	Measured disconnection time (s)	
50	6000	51	51	0.1	0.2	51.19	0.154	
(4) Over frequency reconnection procedure								
Ratio of voltage rapidly decreased (V / s)			Reconnection frequency (Hz)		Reconnection time (s)			
0.01			50		73.2			
Supplementary information:								
N/A								

IEC 61727: 2004			
Clause	Requirement + Test	Result - Remark	Verdict

5.3	Table: tested condition and run-on time								P
No.	P _{EUT} (% of EUT rating)	Reactive load (% of normal)	P _{AC}	Q _{AC}	Run-on time(ms)	P _{EUT} (kW)	Actual Q _r	V _{DC} (d.c.V)	Which load is selected to be adjusted (R or L)
Test condnion A									
1	100	100	0	0	238.00	5.98	1.02	520.23	--
2	100	100	-5	-5	152.00	5.96	0.98	529.78	R/L
3	100	100	-5	0	166.00	5.97	0.99	523.17	R
4	100	100	-5	+5	77.00	5.99	0.98	521.17	R/L
5	100	100	0	-5	180.00	5.94	0.99	521.17	L
6	100	100	0	+5	88.00	5.91	1.01	521.17	L
7	100	100	+5	-5	156.00	5.97	1.02	520.17	R/L
8	100	100	+5	0	177.00	5.93	1.05	522.11	R
9	100	100	+5	+5	76.00	5.97	0.99	522.72	R/L
10	100	100	-10	+10	--	--	--	--	/
11	100	100	-5	+10	--	--	--	--	/
12	100	100	0	+10	--	--	--	--	/
13	100	100	+10	+10	--	--	--	--	/
14	100	100	+10	+5	--	--	--	--	/
15	100	100	+10	0	--	--	--	--	/
16	100	100	+10	-5	--	--	--	--	/
17	100	100	+10	-10	--	--	--	--	/
18	100	100	+5	-10	--	--	--	--	/
19	100	100	0	-10	--	--	--	--	/
20	100	100	-5	-10	--	--	--	--	/
21	100	100	-10	-10	--	--	--	--	/
22	100	100	-10	-5	--	--	--	--	/
23	100	100	-10	0	--	--	--	--	/
24	100	100	-10	+5	--	--	--	--	/
Test condnion B									
10	66	66	0	0	209.00	3.93	1.04	335.17	--
11	66	66	0	-5	131.25	3.95	0.99	335.12	L
12	66	66	0	-4	138.00	3.93	1.01	335.78	L
13	66	66	0	-3	198.00	3.93	1.04	335.12	L
14	66	66	0	-2	228.00	3.94	1.05	335.17	L
15	66	66	0	-1	271.00	3.92	1.03	335.18	L
16	66	66	0	1	192.00	3.94	0.98	335.17	L
17	66	66	0	2	100.50	3.92	0.99	335.17	L

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Clause	Requirement + Test				Result - Remark				Verdict
18	66	66	0	3	108.50	3.93	0.98	335.04	L
19	66	66	0	4	89.50	3.96	1.02	335.99	L
20	66	66	0	5	85.00	3.94	1.01	335.72	L
Test condition C									
21	33	33	0	0	242.00	1.94	0.95	180.54	--
22	33	33	0	-5	156.00	1.95	1.02	180.72	L
23	33	33	0	-4	182.00	1.92	1.03	180.11	L
24	33	33	0	-3	213.00	1.90	1.04	182.98	L
25	33	33	0	-2	195.00	1.95	0.99	183.27	L
26	33	33	0	-1	143.00	1.92	0.98	181.78	L
27	33	33	0	1	199.00	1.92	1.03	181.73	L
28	33	33	0	2	107.50	1.93	1.00	183.98	L
29	33	33	0	3	118.00	1.93	0.95	185.27	L
30	33	33	0	4	121.00	1.94	0.96	182.27	L
31	33	33	0	5	108.25	1.93	0.98	181.78	L
<p>Remark:</p> <p>For test condition A: If any of the recorded run-on times are longer than the one recorded for the rated balance condition, then the non-shaded parameter combinations also require testing.</p> <p>For test condition B and C: If run-on times are still increasing at the 95 % or 105 % points, additional 1 % increments is taken until run-on times begin decreasing.</p>									

--- End of test report---