TEST REPORT

IEC 61727

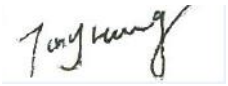
Photovoltaic (PV) systems
Characteristics of the utility interface

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

Report reference number .....:	**SXP-18OC1761FCSHP-1**
Date of issue .....……..:	2019-05-27
Total number of pages .....……..:	65
Testing laboratory name .....:	**Bureau Veritas** **LCIE China Company Limited**
Address .....:	Building 4, No. 518, Xinzhuan Road, Caohejing Songjiang High-Tech Park, Shanghai, P.R. China (201612)
Applicant's name.....:	**SolaX Power Network Technology (Zhe jiang) Co., Ltd.**
Address .....:	No. 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing District 311500, Tonglu City, Zhejiang Province, People's Republic of China
Test specification	
Standard.....:	IEC 61727:2004
Certificate.....:	**Certificate of compliance**
Test report form number .....:	IEC 61727
Master TRF .....:	Bureau Veritas Consumer Products Services Germany GmbH

Test item description .....:	**Grid-tied photovoltaic inverter**
Trademark.....:	
Model / Type .....:	X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E, X1-Fit-3.7E,X1-Fit-5.0E

Model / Type ..... :	X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E	X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E	X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E	X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E
MPP voltage range [V] ..... :	125-550V d.c.			
Max. DC voltage [V] ..... :	600V d.c.			
Max. DC current [A]..... :	10/10 A d.c.			
Nominal AC voltage [V] ..... :	230V a.c. 50/60Hz			
Max. Output AC current [A] ..... :	14,4A a.c.	16A a.c.	21A a.c.	21,7A a.c.
Nomina AC apparent power [VA] ..... :	3000VA	3680VA	4600VA	4999VA
Battery Voltage Operation Range .... :	85-400V d.c.			
Max Charge and Discharge Current...:	20A			
Model / Type ..... :	X1-Fit-3.7E	X1-Fit-5.0E		
Nominal AC voltage [V] ..... :	230V a.c.			
Nominal AC Frequency [Hz]..... :	50/60Hz			
Max. AC output/intput current [A] ..... :	16 A a.c.	21,7A a.c.		
Nomina AC apparent power [VA] ..... :	3680VA	4999VA		
Battery Voltage Operation Range .... :	85-400V			
Max Charge and Discharge Current :	20A			

Testing Location .....:	**Bureau Veritas LCIE China Company Limited**
Address .....:	Building 4, No, 518, Xinzhuan Road, Caohejing, Songjiang High-Tech Park, Shanghai, P,R, China (201612)
Tested by (name and signature) .....:	Tony Huang Test engineer 
Approved by (name and signature) .....:	Harvey Wang Project Manager
Manufacturer's name .....:	**SolaX Power Network Technology (Zhe jiang) Co., Ltd,**
Factory address .....:	No, 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing District 311500, Tonglu City, Zhejiang Province, People's Republic of China

Document History			
Date	**Internal reference**	**Modification / Change / Status**	**Revision**
2019-05-27	Tony Huang	Initial report was written	0
Supplementary information:			

Test items particulars

Equipment mobility ..... :	Permanent connection
Operating condition ..... :	Continuous
Class of equipment ..... :	Class I
Protection against ingress of water .. :	IP65 according to EN 60529
Mass of equipment [kg] ..... :	24kg for X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E 23kg for X1-Fit-3.7E,X1-Fit-5.0E

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 ..... :	2018-10-30
Date(s) of performance test ..... :	2018-11-14 to 2019-05-16

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,

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

The IEC61727 does not provide any limits of accuracy for the utility voltage and frequency measurement of the PV-system, If nothing different stated at the test table the values for tolerances given in EN 50438, Table 2 are used,

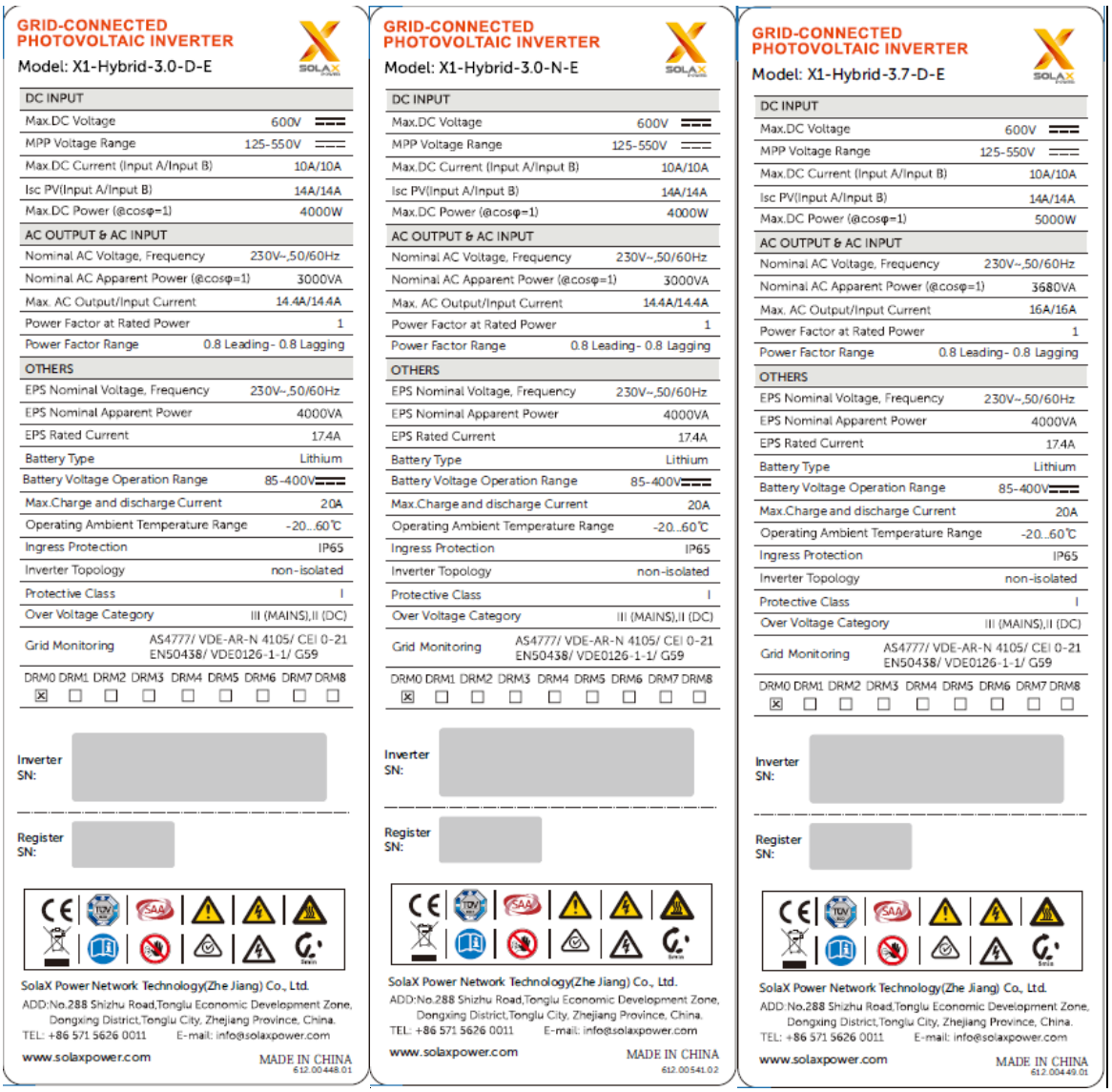
Tolerances on trip values tabel 2 EN50438:

- Voltage: +/- 1% of the nominal voltage
- Frequency: +/- 0,5% of the nominal frequency
- Clearance time: +/- 10%

This Test Report consists of the following documents:

1. Test Results
2. Annex No, 1 – EMC Test Report
3. Annex No, 2 – Pictures of the unit
4. Annex No, 3 – Test equipment list

Copy of marking plate:



GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-3.0-D-E

DC INPUT	
Max.DC Voltage	600V
MPP Voltage Range	125-550V
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	4000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	3000VA
Max. AC Output/Input Current	14.4A/14.4A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading - 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	4000VA
EPS Rated Current	17.4A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

DRM0 DRM1 DRM2 DRM3 DRM4 DRM5 DRM6 DRM7 DRM8

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Inverter SN:

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GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-3.0-N-E

DC INPUT	
Max.DC Voltage	600V
MPP Voltage Range	125-550V
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	4000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	3000VA
Max. AC Output/Input Current	14.4A/14.4A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading - 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	4000VA
EPS Rated Current	17.4A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

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GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-3.7-D-E

DC INPUT	
Max.DC Voltage	600V
MPP Voltage Range	125-550V
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	5000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	3680VA
Max. AC Output/Input Current	16A/16A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading - 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	4000VA
EPS Rated Current	17.4A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

DRM0 DRM1 DRM2 DRM3 DRM4 DRM5 DRM6 DRM7 DRM8

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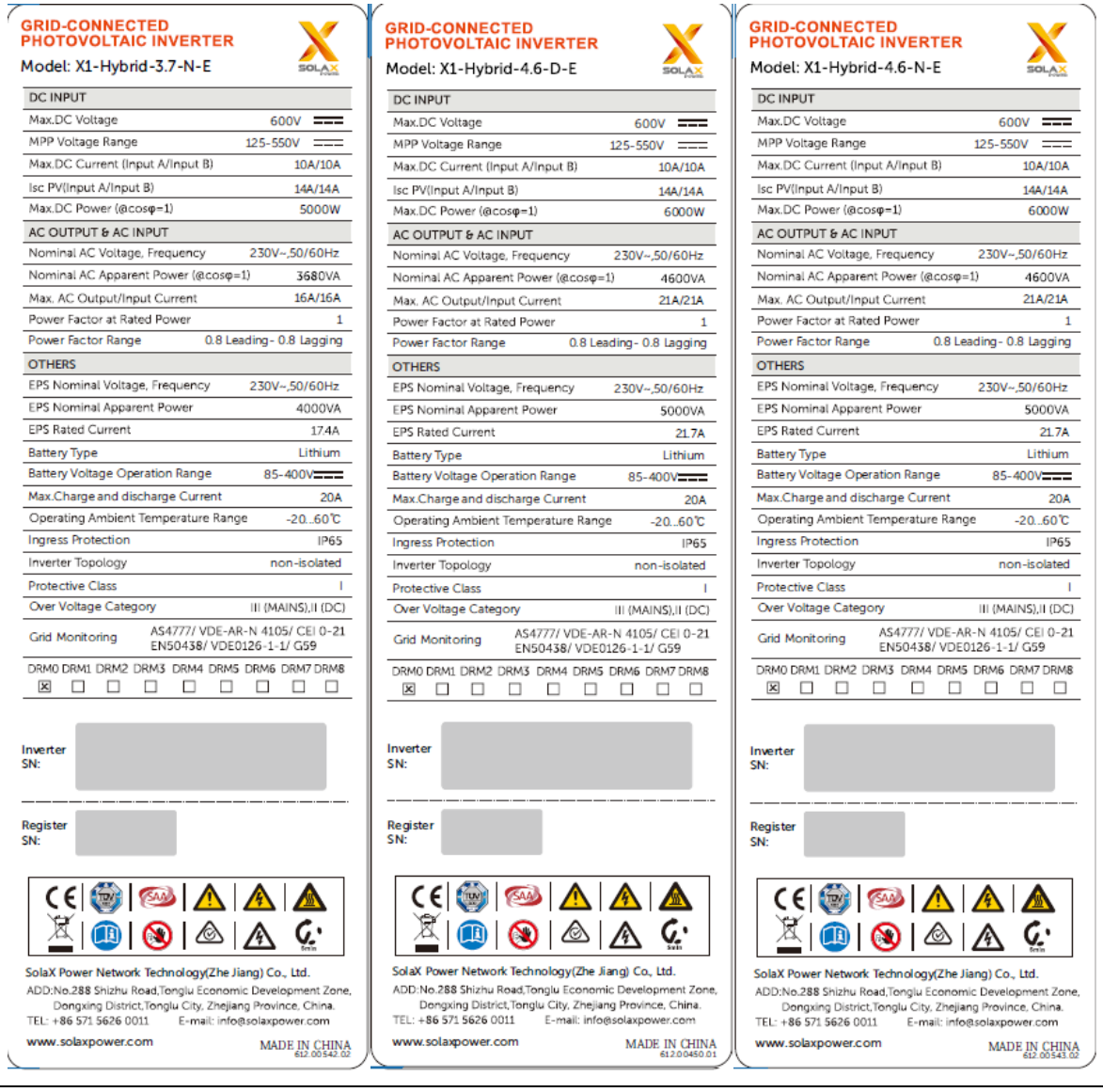

GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-3.7-N-E

DC INPUT	
Max.DC Voltage	600V
MPP Voltage Range	125-550V
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	5000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	3680VA
Max. AC Output/Input Current	16A/16A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading- 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	4000VA
EPS Rated Current	17.4A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

DRM0 DRM1 DRM2 DRM3 DRM4 DRM5 DRM6 DRM7 DRM8

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GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-4.6-D-E

DC INPUT	
Max.DC Voltage	600V
MPP Voltage Range	125-550V
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	6000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	4600VA
Max. AC Output/Input Current	21A/21A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading- 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	5000VA
EPS Rated Current	21.7A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

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GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-4.6-N-E

DC INPUT	
Max.DC Voltage	600V
MPP Voltage Range	125-550V
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	6000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	4600VA
Max. AC Output/Input Current	21A/21A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading- 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	5000VA
EPS Rated Current	21.7A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

DRM0 DRM1 DRM2 DRM3 DRM4 DRM5 DRM6 DRM7 DRM8

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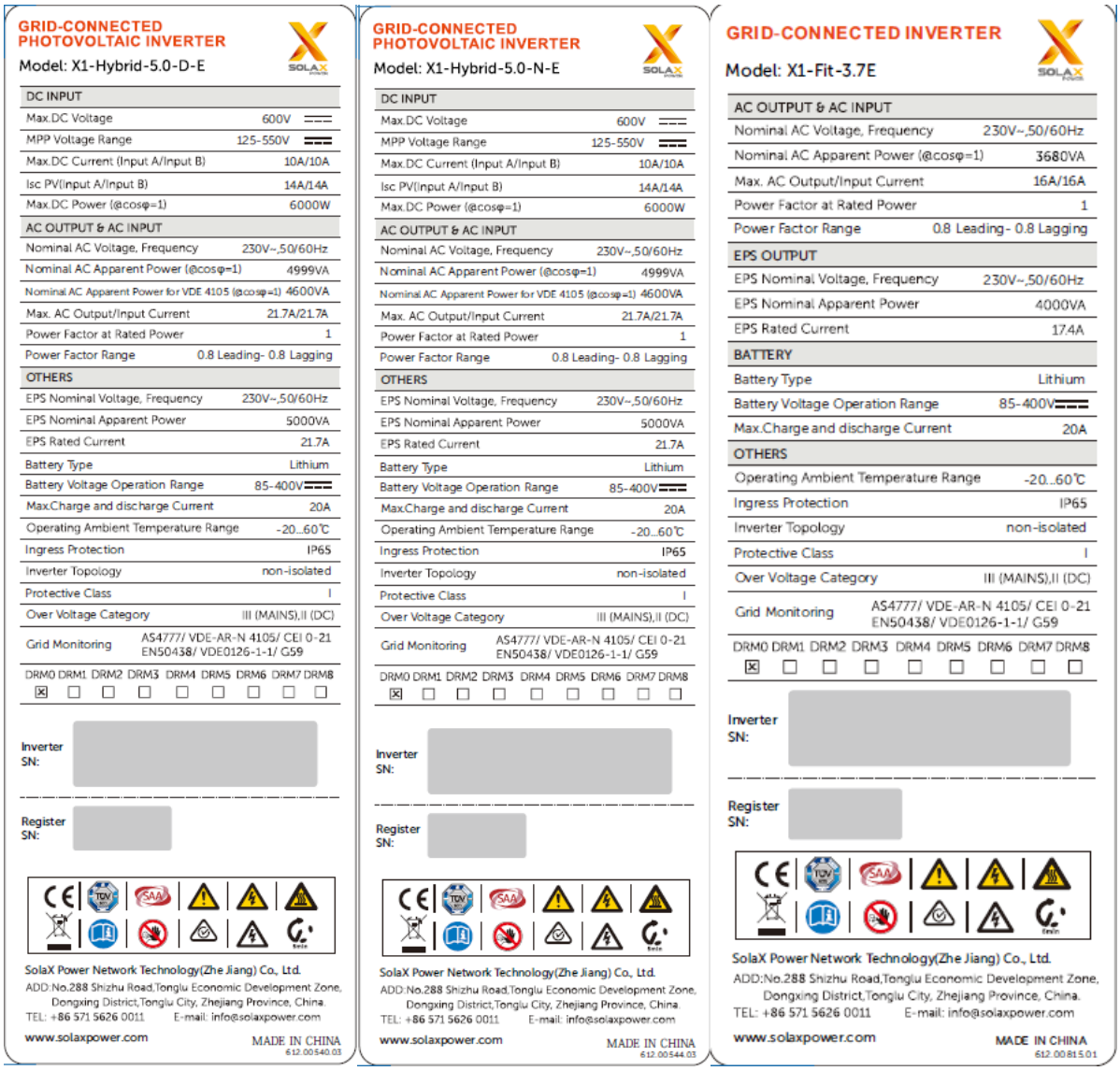

GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-5.0-D-E

DC INPUT	
Max.DC Voltage	600V ⎓
MPP Voltage Range	125-550V ⎓
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	6000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	4999VA
Nominal AC Apparent Power for VDE 4105 (@cosφ=1)	4600VA
Max. AC Output/Input Current	21.7A/21.7A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading- 0.8 Lagging
OTHERS	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	5000VA
EPS Rated Current	21.7A
Battery Type	Lithium
Battery Voltage Operation Range	85-400V⎓
Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

DRM0 DRM1 DRM2 DRM3 DRM4 DRM5 DRM6 DRM7 DRM8

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GRID-CONNECTED PHOTOVOLTAIC INVERTER

Model: X1-Hybrid-5.0-N-E

DC INPUT	
Max.DC Voltage	600V ⎓
MPP Voltage Range	125-550V ⎓
Max.DC Current (Input A/Input B)	10A/10A
Isc PV(Input A/Input B)	14A/14A
Max.DC Power (@cosφ=1)	6000W
AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	4999VA
Nominal AC Apparent Power for VDE 4105 (@cosφ=1)	4600VA
Max. AC Output/Input Current	21.7A/21.7A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading- 0.8 Lagging
OTHERS	
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EPS Nominal Apparent Power	5000VA
EPS Rated Current	21.7A
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Max.Charge and discharge Current	20A
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

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GRID-CONNECTED INVERTER

Model: X1-Fit-3.7E

AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	3680VA
Max. AC Output/Input Current	16A/16A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading- 0.8 Lagging
EPS OUTPUT	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	4000VA
EPS Rated Current	17.4A
BATTERY	
Battery Type	Lithium
Battery Voltage Operation Range	85-400V⎓
Max.Charge and discharge Current	20A
OTHERS	
Operating Ambient Temperature Range	-20...60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
Protective Class	I
Over Voltage Category	III (MAINS),II (DC)
Grid Monitoring	AS4777/ VDE-AR-N 4105/ CEI 0-21 EN50438/ VDE0126-1-1/ G59

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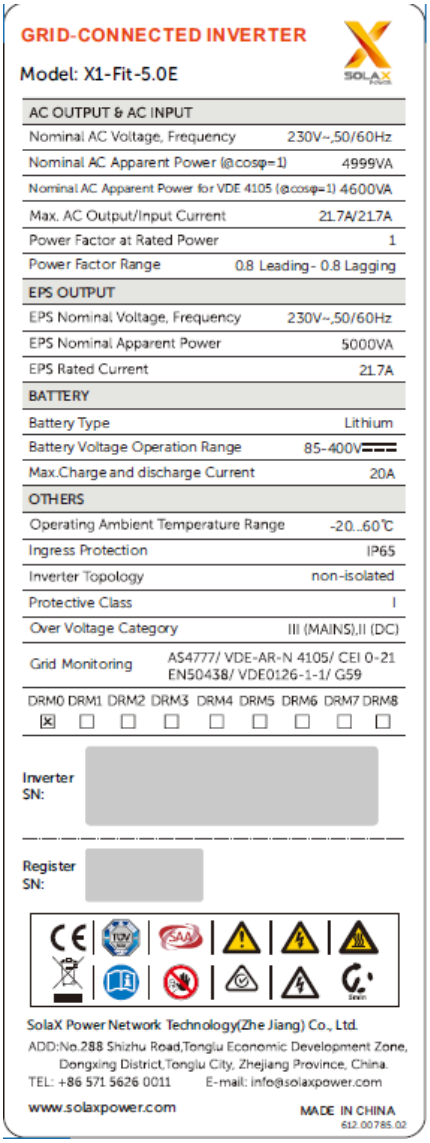

GRID-CONNECTED INVERTER

Model: X1-Fit-5.0E

AC OUTPUT & AC INPUT	
Nominal AC Voltage, Frequency	230V~,50/60Hz
Nominal AC Apparent Power (@cosφ=1)	4999VA
Nominal AC Apparent Power for VDE 4105 (@cosφ=1)	4600VA
Max. AC Output/Input Current	21.7A/21.7A
Power Factor at Rated Power	1
Power Factor Range	0.8 Leading - 0.8 Lagging
EPS OUTPUT	
EPS Nominal Voltage, Frequency	230V~,50/60Hz
EPS Nominal Apparent Power	5000VA
EPS Rated Current	21.7A
BATTERY	
Battery Type	Lithium
Battery Voltage Operation Range	85-400V⎓
Max.Charge and discharge Current	20A
OTHERS	
Operating Ambient Temperature Range	-20..60℃
Ingress Protection	IP65
Inverter Topology	non-isolated
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DRM0	DRM1	DRM2	DRM3	DRM4	DRM5	DRM6	DRM7	DRM8
☒	☐	☐	☐	☐	☐	☐	☐	☐

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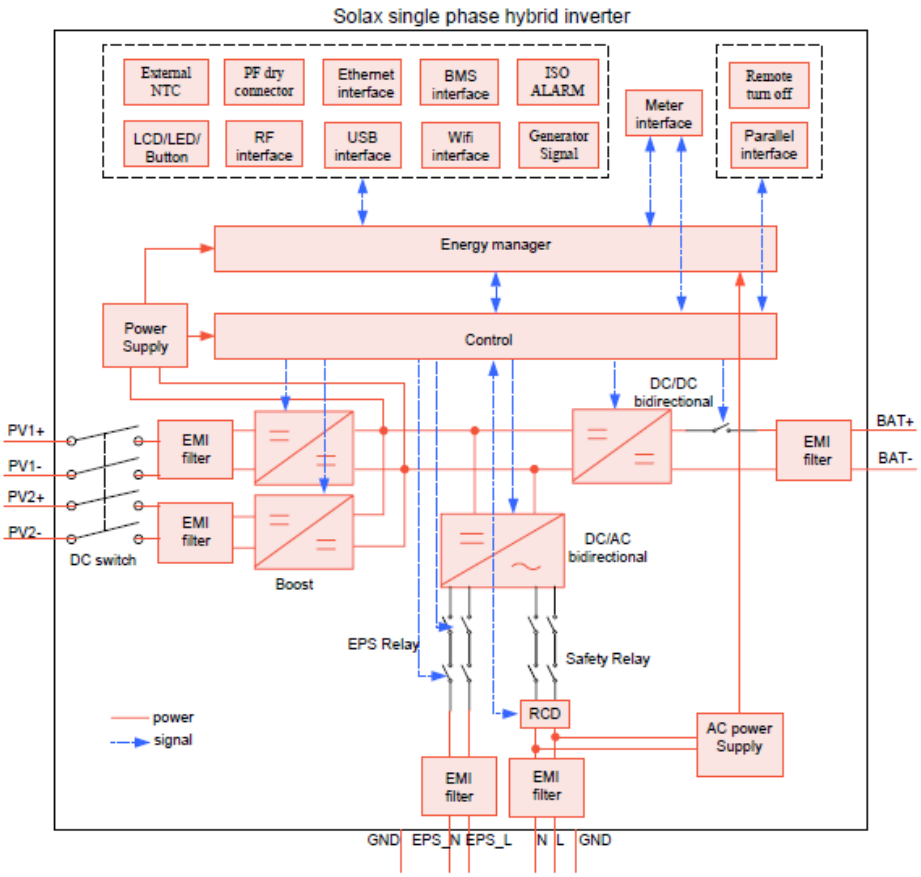
General product information:

The Solar 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 a two relays. This assures that the opening of the output circuit will also operate in case of one error.

The PV inverters can also be used with an energy storage system, utilize the advanced power conversion technology IGBT to convert DC to AC.

Block diagram



The internal control is redundant built, It consists of master controller(U2-A) and slave controller(U2-B), the master controller(U2-A) can control relays, measures voltage, frequency, AC current with injected DC, insulation resistance and residual current. The slave controller (U2-B) can control the relays, measures the voltage and frequency. Both controllers communicate with each other.

The voltage and frequency measurement is achieved with resistors in serial which are connected directly to line and neutral. Both controllers get these signals and calculate the data.

The protection device makes up of two in series in each line and netural between inverter and grid .Inverter and back-up load.Back-up load and grid.Communicative coupled AC relays so that the equipment could be effectively separated from utitlity even any one of relays short circuited or works unnormally.

The controlling section is also redundant built. one master DSP. and one slave DSP. The master DSP carries out the main calculation and driving instructions. Slave DSP is responsible for the redundant relay independently. In case any one of two chips breaks down or runs a wrong program. which result to the loss of protection funciton. the another chip could indicate the fault and disconnect the equipment immediately.

Hardware Version:

Model	X1-Hybrid-3.0-N-E	X1-Hybrid-3.0-D-E	X1-Hybrid-3.7-N-E	X1-Hybrid-3.7-D-E	X1-Hybrid-4.6-N-E
power board	710.00162.00				
control board	710.70548.00		710.60458.00		710.50458.00
LCD board	710.00177.00				
USB Board	710.00197.00				
EMI Board	710.10218.00				

Model	X1-Hybrid-4.6-D-E	X1-Hybrid-5.0-N-E	X1-Hybrid-5.0-D-E	X1-Fit-3.7E	X1-Fit-5.0E
power board	710.00162.00			710.10162.00	
control board	710.50548.00	710.40548.00		710.J0458.00	710.E0458.00
LCD board	710.00177.00				
USB Board	710.00197.00				
EMI Board	710.10218.00			710.10270.00	710.10270.00

Software Version:

Model	X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E, X1-Fit-3.7E,X1-Fit-5.0E
ARM	V2.03
DSP master	V2.07
DSP slave	V2.01

Description of the differences of the models within a series:

Model	R411	R412	R413	R328	R62	DC switch	DC connector
X1-Hybrid-3.0-N-E	Y	N	N	N	N	N	Y
X1-Hybrid-3.0-D-E	Y	N	N	N	N	Y	Y
X1-Hybrid-3.7-N-E	N	Y	N	N	N	N	Y
X1-Hybrid-3.7-D-E	N	Y	N	N	N	Y	Y
X1-Hybrid-4.6-N-E	Y	Y	N	N	N	N	Y
X1-Hybrid-4.6-D-E	Y	Y	N	N	N	Y	Y
X1-Hybrid-5.0-N-E	N	N	N	N	N	N	Y
X1-Hybrid-5.0-D-E	N	N	N	N	N	Y	Y
X1-Fit-3.7E	N	Y	N	Y	Y	N	N
X1-Fit-5.0E	N	N	Y	Y	Y	N	N

Note:
Y: have
N: haven't

Note:
The product was tested on:
The tests had been performed on model X1-Hybrid-5.0-D-E are valid for model X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-5.0-N-E, X1-Fit-3.7E,X1-Fit-5.0E since it is identical in hardware and just power derated by except for R411, R412, R413, R328, R62, DC Switch, DC Connector.

Default interface protection settings according IEC 61727:2004

TNB Technical Guidebook on Grid-interconnection of Photovoltaic Power Generations System to LV and MV Networks:2013

Parameter	Max. clearance time*	Trip setting
Over voltage (level 2)	0.05s	230V +20% (276V)
Over voltage (level 1)	2.0s	230V +10% (253V)
Under voltage (level 1)	2.0s	230V -15% (195.5V)
Under voltage (level 2)	0.1s	230V -50% (115V)
Over frequency	0.2s	50Hz +2% (51.0Hz)
Under frequency	0.2s	50Hz -2% (49.0Hz)
Reconnection time	20s to 300s	
Permanent DC-injection	1% of rated inverter output current	
Loss of main IEC 62116:2008	Inverter shall detect and disconnect within 2s	

* 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.

IEC61727:2004			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 4: Utility compatibility			
4	**General** 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. 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. All power quality parameters (voltage. flicker. frequency. harmonics. and power factor) must be measured at the utility interface/ point of common coupling unless otherwise specified.	Noticed	**P**
4.1	**Voltage. current and frequency** The PV system AC voltage. current and frequency shall be compatible with the utility system.	Derived from tests	**P**
4.2	**Normal voltage operating range** 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.	Derived from tests	**P**
4.3	**Flicker** 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.	See table 4.3 and Annex No. 1. The test report is stored in Bureau Veritas LCIE China Company Limited.	**P**
4.4	**DC injection** 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.	See table 4.4	**P**
4.5	**Normal frequency operating range** The PV system shall operate in synchronism with the utility system. and within the frequency trip limits defined in 5.2.2.	See table 4.5 and 5.2.2	**P**

IEC61727:2004			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 4: Utility compatibility			
4.6	**Harmonics and waveform distortion** Low levels of current and voltage harmonics are desirable; the higher harmonic levels increase the potential for adverse effects on connected equipment. Acceptable levels of harmonic voltage and current depend upon distribution system characteristics. type of service. connected loads/apparatus. and established utility practice. The PV system output should have low current-distortion levels to ensure that no adverse effects are caused to other equipment connected to the utility system. 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. Even harmonics in these ranges shall be less than 25 % of the lower odd harmonic limits listed. (see Clause 4.6 Table 1 – Current distortion limits)	See tables 4.6 and Annex No.1	**P**
4.7	**Power factor** The PV system shall have a lagging power factor greater than 0.9 when the output is greater than 50 % of the rated inverter output power.	See table 4.7	**P**

IEC61727:2004			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 5: Personnel safety and equipment protection			
5	**General** This Clause provides information and considerations for the safe and proper operation of the utility-connected PV systems.	Noticed	**P**
5.1	**Loss of utility voltage** 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. 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. If inverters (single or multiple) have DC SELV input and have accumulated power below 1 kW then no mechanical disconnect (relay) is required.	The loss of utility voltage test report for IEC61727 according to IEC62116 is stored in archive at Bureau Veritas LCIE China Company Limited.	**P**
5.2	**Over/under voltage and frequency** Abnormal conditions can arise on the utility system that requires a response from the connected photovoltaic system. This response is to ensure the safety of utility maintenance personnel and the general public. as well as to avoid damage to connected equipment. including the photovoltaic system. 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 table 5.2.1 and 5.2.2	**P**
5.2.1	**Over/under voltage** 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. All discussions regarding system voltage refer to the local nominal voltage. The system shall sense abnormal voltage and respond. The following conditions should be met. with voltages in RMS and measured at the point of utility connection. (see clause 5.2.1 Table 2 – Response to abnormal voltages) The purpose of the allowed time delay is to ride through short-term disturbances to avoid excessive nuisance tripping. The unit does not have to cease to energize if the voltage returns to the normal utility continuous operation condition within the specified trip time.	See table 5.2.1	**P**

IEC61727:2004			
Clause	Requirement – Test	Result – Remark	Verdict
SECTION 5: Personnel safety and equipment protection			
5.2.2	**Over/under frequency** 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. When the utility frequency is outside the range of ±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.	See table 5.2.2	**P**
5.3	**Islanding protection** The PV system must cease to energize the utility line within 2 s of loss of utility.	The loss of utility voltage test report for IEC61727 according to IEC62116 is stored in archive at Bureau Veritas LCIE China Company Limited.	**P**
5.4	**Response to utility recovery** 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**.**	See table 5.2 (1) and 5.2 (2)	**P**
5.5	**Earthing** The utility interface equipment shall be earthed/grounded in accordance with IEC 60364-7-712.	Stated in the manual.	**P**
5.6	**Short circuit protection** The photovoltaic system shall have short-circuit protection in accordance with IEC 60364-7-712.	Stated in the manual.	**P**
5.7	**Isolation and switching** A method of isolation and switching shall be provided in accordance with IEC 60364-7-712.	Stated in the manual.	**P**

Test overview:

IEC 61727:2004		
Clause		**Result**
1	Response to protection operation - fault condition tests (according VDE0126-1-1:2006)	**P**
4	Type test:	
4.3	Voltage Fluctuations and Flicker	**P**
4.4	Monitoring of DC-Injection	**P**
4.5	Normal frequency operating range (see 5.2.2 below)	**P**
4.6	Harmonics and waveform distortion	**P**
4.7	Power factor	**P**
5.2.1	Voltage monitoring	**P**
5.2.2	Frequency monitoring	**P**

Test Results

1. Response to protection operation - fault condition tests			P
	ambient temperature [°C] :	24.0°C	—
	model/type of power supply :	AC: type 61512 DC: type 62150H-1000S	—
	manufacturer of power supply :	AC: Chroma DC: Chroma	—
	rated markings of power supply :	AC: 18kW three phase DC: 15kW. 15A. 1000V	—

component No.	fault	test condition		test time	fuse No.	fault condition		result
		AC	DC			AC	DC	
Output L-N	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:" Grid Loss Fault ", no damage, no hazard, no fire.
Input PV+ to PV-	Short circuit before startup	230V <0,1A	500V 0,1A	1min	--	230V <0,1A	500V <0,1A	Unit can't start up, kept in waiting, no damage, no hazard, no fire.
Input PV+ to PV-	Reverse	230V <0,1A	500V 0,1A	1min	--	230V <0,1A	500V <0,1A	Unit can't start up, kept in waiting, no damage, no hazard, no fire.
Battery+ to battery-	Short circuit	230V 21,7A	500V 10A	1min	--	230V 21,7A	500V 10A	Unit operates normal, no damage, no hazard, no fire.
Battery+ to battery	Reverse	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"BAT ConDir Fault", no damage, no hazard, no fire.
RY3	Short circuit before startup	230V <0,1A	500V 0,1A	1min	--	230V <0,1A	500V <0,1A	Unit can't start up, message:"Grid Relay Fault", no damage, no hazard, no fire.

RY4	Short circuit before startup	230V <0,1A	500V 0,1A	1min	--	230V <0,1A	500V <0,1A	Unit can't start up, message:"Grid Relay Fault", no damage, no hazard, no fire.
RY5	Short circuit before startup	230V <0,1A	500V 0,1A	1min	--	230V <0,1A	500V <0,1A	Unit can't start up, message:"Grid Relay Fault", no damage, no hazard, no fire.
RY6	Short circuit before startup	230V <0,1A	500V 0,1A	1min	--	230V <0,1A	500V <0,1A	Unit can't start up, message:"Grid Relay Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Master DSP R256	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"Grid Volt Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Master DSP R260	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"DCI OCP Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Slaver DSP R252	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"Sample Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Slaver DSP R261	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"Sample Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Slaver DSP R244	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"Sample Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Slaver DSP R262	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"Sample Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Slaver DSP R248	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"Grid Volt Fault", no damage, no hazard, no fire.
Grid voltage resistance monitoring to Slaver DSP R281	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:"DCI OCP Fault", no damage, no hazard, no fire.
Q2 D-S	Short circuit	230V 21,7A	500V 10A	1min	--	230V 21,7A	500V 10A	Unit operates normal, no damage, no hazard, no fire.

Q2 G-S	Short circuit	230V 21,7A	500V 10A	1min	--	230V 21,7A	500V 10A	Unit operates normal, no damage, no hazard, no fire.
Q3 D-S	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, Q3 brokenno damage, no hazard, no fire.
Q3 G-S	Short circuit	230V 21,7A	500V 10A	1min	--	230V 21,7A	500V 10A	Unit operates normal, no damage, no hazard, no fire.
Q6 D-S	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, Q3 brokenno damage, no hazard, no fire.
Q6 G-S	Short circuit	230V 21,7A	500V 10A	1min	--	230V 21,7A	500V 10A	Unit operates normal, no damage, no hazard, no fire.
DC BUS Capacitor C5	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, C5 broken,no damage, no hazard, no fire.
R171	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:”ISO Fault”, no damage, no hazard, no fire.
R172	Short circuit	230V 21,7A	500V 10A	1min	--	230V <0,1A	500V <0,1A	Unit shut down, error message:”ISO Fault”, no damage, no hazard, no fire.
Note: The errors in the control circuit simulate that the safety is even ensured during single fault. Details for the error code please refer user manual.								

4.3 Voltage fluctuation and flicker				**P**
Test conditions:	Maximum permissible voltage fluctuation (expressed as a percentage of nominal voltage at 100 % power) and flicker as per EN 61000-3-11			
	Starting	**Stopping**	**Running**	
Limit	3.3%	3.3%	P_{st}=1.0	P_{lt}=0.65
Test value	*	*	*	*
inverter >16A				
Limit	dc% = 3.3		P_{st}=1.0	P_{lt}=0.65
X1-Hybrid-5.0-D-E	0,39		0,46	0,35

Note:

*The stationary deviance of dc% is bigger than the dynamic deviance of d_{max} at starting and stopping.
Mains Impedance according EN61000-3-11: **R_{max} =0.4 Ω; jX_{max}=0.25 Ω @50Hz (|Z_{max}| =0.472 Ω)**
Bei Einphasigen Invertern Zmax sowie Rn und jxn angeben **R_n =0.16 Ω; jX_n=0.1 Ω**
Calculation of the maximum permissible grid impedance at the point of common coupling based on d_c:
$Z_{max} = Z_{ref} * 3.3\% / d_c(P_n)$

The tests should be based on the limits of the EN 61000-3-11 for more than 16A.

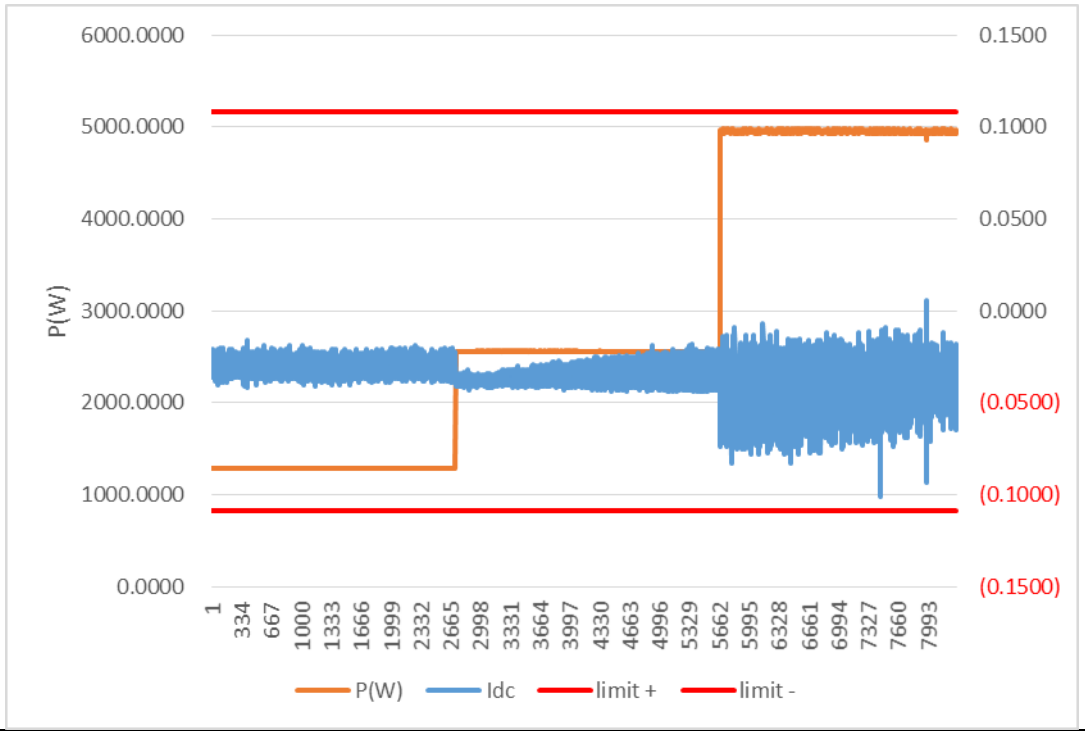
4.4 Monitoring of Permanent DC-Injection IEC 61727:2004				**P**
Model: X1-Hybrid-5.0-D-E				
Test conditions:	U_N = 230 V_{AC} Uinput =360 V_{DC} Rated Power:5000 W			
DC Injection (A)	**Limits**	**Trip Time (ms)**		
+1.0A	I_{DC}:>1A than disconnection within 0.2 sec	150	152	149
-1.0A	I_{DC}:>1A than disconnection within 0.2 sec	140	138	149
Note: A dc-current of 1A is injected. disconnection time of max. 0.2s				

Positive DC-Injection :

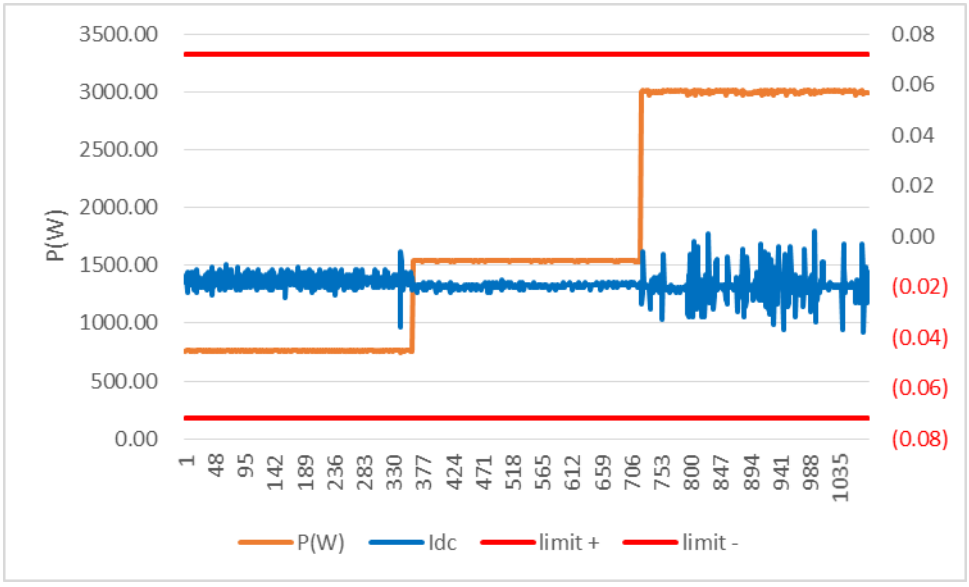
Negative DC-Injection :

4.4 Monitoring of Permanent DC-Injection IEC 61727:2004			**P**
Model: X1-Hybrid-5.0-D-E			
IEC61727 Limit:	**1% of Inom (108mA)**		
Output power:	25%	50%	100%
mean test value:	32,3	44,0	101,0
Model: X1-Hybrid-3.0-D-E			
IEC61727 Limit:	**1% of Inom (72mA)**		
Output power:	25%	50%	100%
mean test value:	36,0	22,0	38

X1-Hybrid-5.0-D-E: Diagram of permanent DC-Injection



X1-Hybrid-3.0-D-E: Diagram of permanent DC-Injection



4.6 Harmonic Current Limit Test IEC 61727:2004				P
Model: X1-Hybrid-5.0-D-E				
Watts(W)	4988,8			
VA(VA)	4991,3			
Vrms(V)	230,03			
Arms(A)	21,67			
PF	0,9995			
Frequency(Hz)	50			
THD(%)	1,35			
Harmonics	**Current Magnitude [A]**	**% of Fundamental**	**Phase**	**Harmonic Current Limits [%]**
1st	21,67	--	single phase	--
2nd	0,163	0,754	single phase	1%
3rd	0,210	0,968	single phase	4%
4th	0,008	0,039	single phase	1%
5th	0,052	0,238	single phase	4%
6th	0,006	0,028	single phase	1%
7th	0,029	0,136	single phase	4%
8th	0,005	0,021	single phase	1%
9th	0,021	0,098	single phase	4%
10th	0,004	0,020	single phase	0,5%
11th	0,027	0,127	single phase	2%
12th	0,006	0,025	single phase	0,5%
13th	0,033	0,150	single phase	2%
14th	0,007	0,033	single phase	0,5%
15th	0,043	0,197	single phase	2%
16th	0,009	0,041	single phase	0,5%
17th	0,042	0,195	single phase	1,5%
18th	0,009	0,044	single phase	0,5%
19th	0,039	0,179	single phase	1,5%
20th	0,009	0,043	single phase	0,5%
21th	0,038	0,177	single phase	1,5%
22th	0,010	0,046	single phase	0,5%
23th	0,037	0,172	single phase	0,6%
24th	0,009	0,042	single phase	0,5%
25th	0,030	0,139	single phase	0,6%
26th	0,008	0,038	single phase	0,5%
27th	0,027	0,124	single phase	0,6%
28th	0,008	0,035	single phase	0,5%
29th	0,023	0,107	single phase	0,6%
30th	0,007	0,032	single phase	0,5%
31th	0,018	0,081	single phase	0,6%
32th	0,007	0,030	single phase	0,5%
33th	0,019	0,087	single phase	0,6%
34th	0,007	0,032	single phase	N/A
35th	0,015	0,068	single phase	N/A
36th	0,006	0,026	single phase	N/A
37th	0,011	0,053	single phase	N/A
38th	0,006	0,029	single phase	N/A
39th	0,012	0,056	single phase	N/A
40th	0,006	0,027	single phase	N/A

4,7 Power factor					P
Model	X1-Hybrid-5.0-D-E				
Output power [kW] / **Test AC voltage [V]**	**~10%** **0,50**	**~20%** **1,0**	**~50%** **2,50**	**~75%** **3,75**	**~100%** **5,00**
230V	**0,9428i**	**0,9915i**	**0,9985i**	**0,9994i**	**0,9995i**
Model	X1-Hybrid-4.6-D-E				
Output power [kW] / **Test AC voltage [V]**	**~10%** **0,46**	**~20%** **0,92**	**~50%** **2,30**	**~75%** **3,45**	**~100%** **4,60**
230V	**0,9270i**	**0,9916i**	**0,9984i**	**0,9993i**	**0,9996i**
Model	X1-Hybrid-3.7-D-E				
Output power [kW] / **Test AC voltage [V]**	**~10%** **0,37**	**~20%** **0,74**	**~50%** **1,84**	**~75%** **2,76**	**~100%** **3,70**
230V	**0,8908i**	**0,9837i**	**0,9970i**	**0,9986i**	**0,9994i**
Model	X1-Hybrid-3.0-D-E				
Output power [kW] / **Test AC voltage [V]**	**~10%** **0,30**	**~20%** **0,60**	**~50%** **1,50**	**~75%** **2,25**	**~100%** **3,0**
230V	**0,8389i**	**0,9756i**	**0,9956i**	**0,9981i**	**0,9989i**

Note:
The PV system shall have a lagging power factor greater than 0,95 when the output is greater than 50% of the rated inverter output power,

The letter “i” is short for “inductive” and indicates inductive power factor, In case of capacitive power factor the letter “c” is used instead,

5,2,1 Voltage monitoring									**P**
IEC 61727: First Level									
Model: X1-Hybrid-5.0-D-E									
	Under Voltage				**Over Voltage**				
Parameter	Voltage	Time [s]			Voltage	Time [s]			
Limit	**195,5V**	**<= 2,0s**			**253V**	**<= 2,0s**			
Trip value	194,5V				254,0 V				
Trip time(s)	230V to 190,0 V	1,680	1,656	1,656	230V to 258V	1,048	1,064	1,072	
Reconnection time (s)	20s<t<300s	77,68			20s<t<300s	253,2			
IEC 61727: Second Level									
	Under Voltage				**Over Voltage**				
Parameter	Voltage	Time [ms]			Voltage	Time [ms]			
Limit	**115V**	**<= 100ms**			**276V***	**<= 50ms**			
Trip value	114,0V				277,4				
Trip time(ms)	230V to 110V	84,0	89,6	77,6	230V to 281 V	15,60	9,20	28,00	
Reconnection time (s)	20s<t<300s	137,8			20s<t<300s	137,1			

Note:

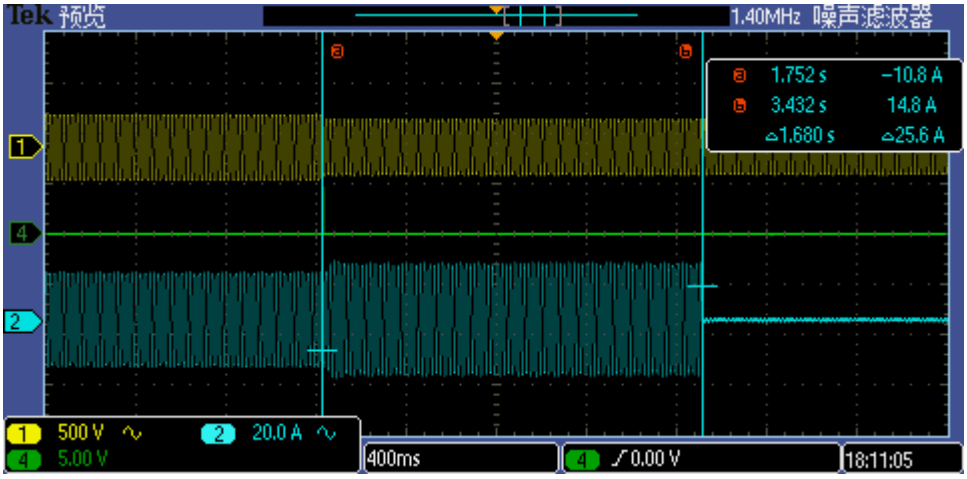
The IEC61727 does not provide any limits of accuracy for the utility voltage and frequency measurement of the PV-system, Therefore the values for tolerances given in EN 50438, Table 2 are used,

Tolerances on trip values tabel 2 EN50438:

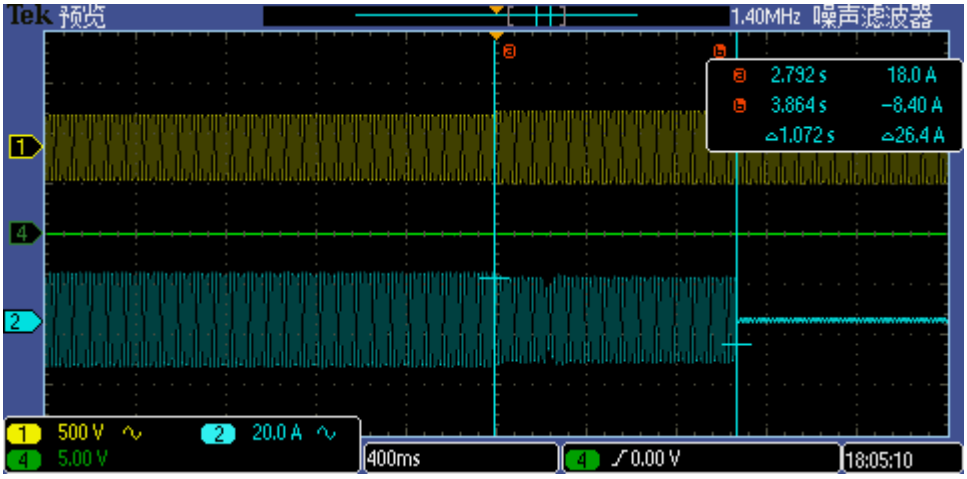
- Voltage: +/- 1% of the nominal voltage
- Frequency: +/- 0,5% of the nominal frequency
- Clearance time: +/- 10%

*The voltage is the biggest vaule that the manufacturer declared,

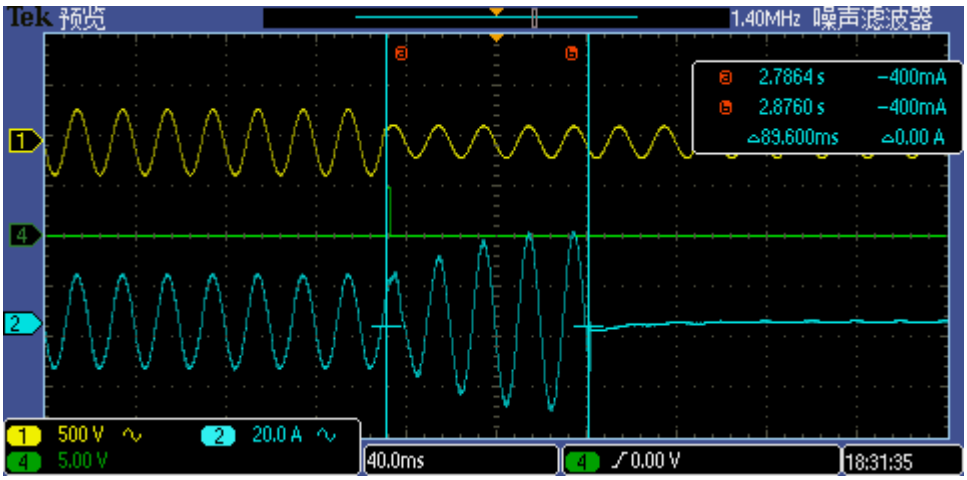
Under Voltage First Level



Over voltage First Level



Under Voltage Second Level



Over voltage Second Level

5,2,2 Frequency monitoring									**P**
IEC 61727									
Model: X1-Hybrid-5.0-D-E									
	Under frequency				**Over frequency**				
Parameter	Frequency	Time [ms]			Frequency	Time [ms]			
Output Voltage		85%U_N	U_N	110%U_N		85%U_N	U_N	110%U_N	
Limit	**49,00Hz**	**<= 200ms**			**51,00Hz**	**<= 200ms**			
Trip value		48,99	48,99	48,99		51,01	51,01	51,01	
Trip time(ms)	49,5Hz to 48,5Hz	150,4	157,6	166,0	50,5Hz to 51,5Hz	120,0	119,6	115,6	
Reconnection time(s)	20s<t<300s	137,6			20s<t<300s	138,4			

Note:

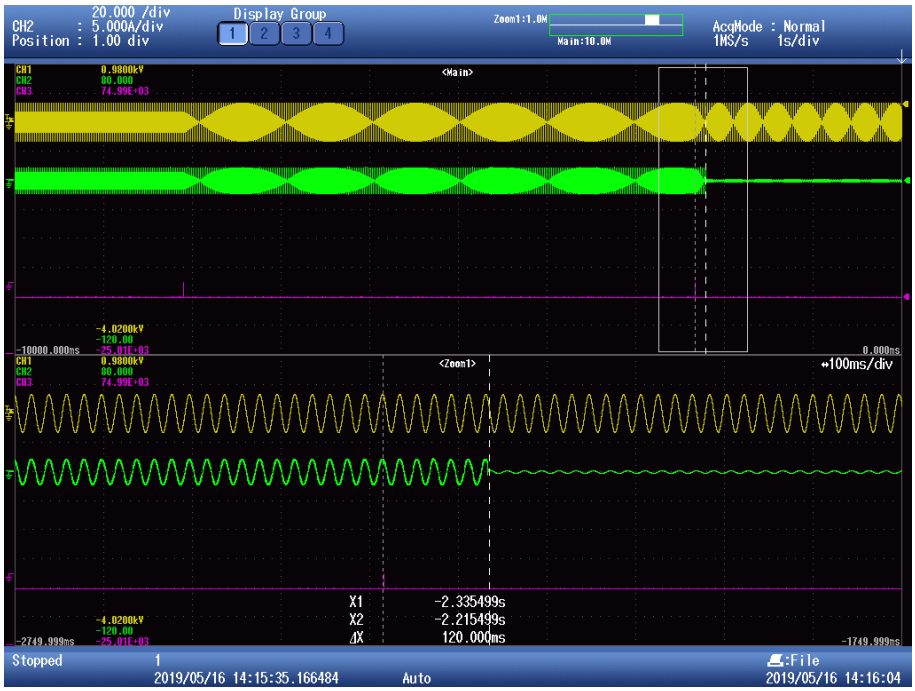
The IEC61727 does not provide any limits of accuracy for the utility voltage and frequency measurement of the PV-system, Therefore the values for tolerances given in EN 50438, Table 2 are used,

Tolerances on trip values tabel 2 EN50438:

- Voltage: +/- 1% of the nominal voltage
- Frequency: +/- 0,5% of the nominal frequency
- Clearance time: +/- 10%

Under Frequency:

Over Frequency:



Annex 1

EMC Test Report

(The whole EMC test report was stored in internal of BV LCIE CHINA)

EMTEK

EMC TEST REPORT

For

SOLAX POWER CO., LTD.

X1-Hybrid-single phase

Model No.: X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.0-N-I, X1-Hybrid-3.0-D-I, X1-Hybrid-3.0-N-C, X1-Hybrid-3.0-D-C, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-3.7-N-I, X1-Hybrid-3.7-D-I, X1-Hybrid-3.7-N-C, X1-Hybrid-3.7-D-C, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-4.6-N-I, X1-Hybrid-4.6-D-I, X1-Hybrid-4.6-N-C, X1-Hybrid-4.6-D-C, X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E, X1-Hybrid-5.0-N-I, X1-Hybrid-5.0-D-I, X1-Hybrid-5.0-N-C, X1-Hybrid-5.0-D-C

Prepared for	:	SOLAX POWER CO., LTD.
Address	:	No. 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing Disctrict, Tonglu City, Zhejiang Province, People's Republic of China
Prepared by	:	EMTEK (NINGBO) CO., LTD.
Address	:	1/F ., Building 4, No. 1177, Lingyun Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang, China
		Tel: +86-574-27907998
		Fax: +86-574-27721538

Report Number	:	EN160824004E
Date of Test	:	August 24, 2016 to September 14, 2016
Date of Report	:	September 19, 2016

EMTEK
Answers to the World

TABLE OF CONTENT

EMTEK
Antenna to the World

TEST REPORT DESCRIPTION

Applicant	:	SOLAX POWER CO., LTD.
Manufacturer	:	SOLAX POWER CO., LTD.
Trade Mark	:	SolaX
EUT	:	X1-Hybrid-single phase
Model No.	:	X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.0-N-I, X1-Hybrid-3.0-D-I, X1-Hybrid-3.0-N-C, X1-Hybrid-3.0-D-C, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-3.7-N-I, X1-Hybrid-3.7-D-I, X1-Hybrid-3.7-N-C, X1-Hybrid-3.7-D-C, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-4.6-N-I, X1-Hybrid-4.6-D-I, X1-Hybrid-4.6-N-C, X1-Hybrid-4.6-D-C, X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E, X1-Hybrid-5.0-N-I, X1-Hybrid-5.0-D-I, X1-Hybrid-5.0-N-C, X1-Hybrid-5.0-D-C

Measurement Procedure Used:

EN 61000-6-3:2007+A1:2011
EN 61000-3-12:2011
EN 61000-3-11:2000
EN 61000-6-1:2007, EN 61000-6-2:2005
(IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC 61000-4-4:2012, IEC 61000-4-5:2005, IEC 61000-4-6:2013, IEC 61000-4-8:2009)

The device described above is tested by EMTEK (NINGBO) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (NINGBO) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment under Test) is technically compliant with the EN 61000-6-3, EN 61000-6-1, EN 61000-6-2, EN 61000-3-12 and EN 61000-3-11 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (NINGBO) CO., LTD.

Date of Test	:	August 24, 2016 to September 14, 2016
Prepared by	:	Sophia (Engineer)
Reviewer	:	Kyki (Quality Manager)
Approved & Authorized Signer	:	(Manager)

EMTEK

Modified History

Version	Report No.	Revision date	Summary
Ver.1.0	EN160824004E	\	Original Report

EMTEK
Accuracy in the World

1. SUMMARY OF TEST RESULT

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted Disturbance at Mains Terminals	EN 61000-6-3:2007+A1:2011	Table 2	Pass
Radiated Disturbance	EN 61000-6-3:2007+A1:2011	Table 1	Pass
Harmonics*	EN 61000-3-12:2011	Table 3	Pass
Voltage fluctuation and flicker*	EN 61000-3-11:2000	Section 5	Pass
IMMUNITY (EN 61000-6-1:2007, EN 61000-6-2:2005)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio-Frequency, Continuous Radiated Disturbance*	IEC 61000-4-3:2006+ A1:2007+A2:2010	A	Pass
EFT/B Immunity	IEC 61000-4-4:2012	B	Pass
Surge Immunity	IEC 61000-4-5:2005	B	Pass
Conducted RF Immunity*	IEC 61000-4-6:2013	A	Pass
Power Frequency Magnetic Field*	IEC 61000-4-8:2009	A	Pass
Voltage dips*	IEC 61000-4-11:2004	B&C	N/A
Voltage Interruptions*		C	N/A

Note: 1. N/A is an abbreviation for Not Applicable.
2. " Tests were not within the accreditation scope of CNAS L6666, and were conducted at EMTEK (SHENZHEN) CO., LTD.

EMTEK
Answers in the World

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	X1-Hybrid-single phase
Model Number	:	X1-Hybrid-3.0-N-E, X1-Hybrid-3.0-D-E, X1-Hybrid-3.0-N-I, X1-Hybrid-3.0-D-I, X1-Hybrid-3.0-N-C, X1-Hybrid-3.0-D-C, X1-Hybrid-3.7-N-E, X1-Hybrid-3.7-D-E, X1-Hybrid-3.7-N-I, X1-Hybrid-3.7-D-I, X1-Hybrid-3.7-N-C, X1-Hybrid-3.7-D-C, X1-Hybrid-4.6-N-E, X1-Hybrid-4.6-D-E, X1-Hybrid-4.6-N-I, X1-Hybrid-4.6-D-I, X1-Hybrid-4.6-N-C, X1-Hybrid-4.6-D-C, X1-Hybrid-5.0-N-E, X1-Hybrid-5.0-D-E, X1-Hybrid-5.0-N-I, X1-Hybrid-5.0-D-I, X1-Hybrid-5.0-N-C, X1-Hybrid-5.0-D-C (Note: All models are identical except powers. "3.0" means 3.0kW; "D" means with "DC switch"; "N" means without "DC switch"; "E" means "EPS function" needs to install an external changeover device; "I" means "EPS function" has install an external changeover device already. "C" means without "EPS". We prepared X1-Hybrid-5.0-D-E for EMC tests.)
Power Supply	:	Please see APPENDIX II for detail information
Test voltage	:	AC 230V/50Hz or DC 360V (from DC source)
Applicant	:	SOLAX POWER CO., LTD.
Address	:	No. 288 Shizhu Road, Tonglu Economic Development Zone, Dongxing Disctrict, Tonglu City, Zhejiang Province, People's Republic of China
Manufacturer	:	SOLAX POWER CO., LTD.
Address	:	No.288 Shizhu Road, Tonglu Economic Development Zone, Dongxing Disctrict, Tonglu City, Zhejiang Province, People's Republic of China
Date of Received	:	August 24, 2016
Date of Test	:	August 24, 2016 to September 14, 2016

2.2. Description of Test Facility

Site Description

EMC Lab.	:	Accredited by CNAS, 2014.1.21 The certificate is valid until 2017.1.20 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005) The Certificate Registration Number is L6666. Accredited by FCC, June 18, 2014 The Certificate Registration Number is 463622.
Name of Firm	:	EMTEK (NINGBO) CO., LTD.
Site Location	:	1F Building 4, 1177#, Lingyun Road, National Hi-Tech Zone, Ningbo, Zhejiang, China

EMTEK

2.3. Description of Support Device

DC Source : M/N: 62150H-600S
Manufacturer: CHROMA
S/N: 62150EC00185

2.4. Measurement Uncertainty

Conducted Emission Uncertainty	: 2.8dB
Radiated Emission Uncertainty	: 3.3dB (3m Chamber)
Uncertainty for Flicker test	: 0.07%
Uncertainty for Harmonic test	: 1.8%
Uncertainty for C/S Test	: 1.45(Using CDN Test) 2.37(Using EM Clamp Test)
Uncertainty for R/S Test	: 2.10dB(80MHz-200MHz) 1.76dB(200MHz-1000MHz)

EMTEK

EMC TEST REPORT

For

SOLAX POWER NETWORK TECHNOLOGY(ZHEJIANG)CO., LTD.

X1-Retro Fit Series

Model No.: X1-Fit-3.7E, X1-Fit-3.7I, X1-Fit-3.7C, X1-Fit-4.6E, X1-Fit-4.6I, X1-Fit-4.6C, X1-Fit-5.0E, X1-Fit-5.0I, X1-Fit-5.0C

Prepared for	:	SOLAX POWER NETWORK TECHNOLOGY(ZHEJIANG)CO., LTD.
Address	:	No.288 Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province, China.
Prepared by	:	EMTEK (NINGBO) CO., LTD.
Address	:	1/F ., Building 4, No. 1177, Lingyun Road, Ningbo National Hi-Tech Zone, Ningbo, Zhejiang, China
		Tel: +86-574-27907998
		Fax: +86-574-27721538

Report Number	:	EN170826001E
Date of Test	:	August 28, 2017 to October 10, 2017
Date of Report	:	October 23, 2017

EMTEK
Access to the World

TABLE OF CONTENT

EMTEK
Access to the World

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TEST REPORT DESCRIPTION

Applicant	:	SOLAX POWER NETWORK TECHNOLOGY(ZHEJIANG)CO., LTD.
Manufacturer	:	SOLAX POWER NETWORK TECHNOLOGY(ZHEJIANG)CO., LTD.
Trade Mark	:	SolaX
EUT	:	X1-Retro Fit Series
Model No.	:	X1-Fit-3.7E, X1-Fit-3.7I, X1-Fit-3.7C, X1-Fit-4.6E, X1-Fit-4.6I, X1-Fit-4.6C, X1-Fit-5.0E, X1-Fit-5.0I, X1-Fit-5.0C

Measurement Procedure Used:

EN 61000-6-3:2007+A1:2011
EN 61000-3-12:2011
EN 61000-3-11:2000
EN 61000-6-1:2007, EN 61000-6-2:2005
(IEC 61000-4-2:2008, IEC 61000-4-3:2006+A1:2007+A2:2010, IEC 61000-4-4:2012, IEC 61000-4-5:2005, IEC 61000-4-6:2013, IEC 61000-4-8:2009, IEC 61000-4-11:2004)

The device described above is tested by EMTEK (NINGBO) CO., LTD. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and EMTEK (NINGBO) CO., LTD. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment under Test) is technically compliant with the EN 61000-6-3, EN 61000-6-1, EN 61000-6-2, EN 61000-3-12 and EN 61000-3-11 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of EMTEK (NINGBO) CO., LTD.

Date of Test	:	August 28, 2017 to October 10, 2017
Prepared by	:	Sophia (Engineer)
Reviewer	:	(Quality Manager)
Approved & Authorized Signer	:	Tony Wei (Manager)

EMTEK (NINGBO) CO., LTD. TESTING

EMTEK

Access to the World

Modified History

Version	Report No.	Revision date	Summary
Ver.1.0	EN170828001E	\	Original Report

EMTEK

1. SUMMARY OF TEST RESULT

EMISSION			
Description of Test Item	Standard	Limits	Results
Conducted Disturbance at Mains Terminals	EN 61000-6-3:2007+A1:2011	Table 2	Pass
Radiated Disturbance	EN 61000-6-3:2007+A1:2011	Table 1	Pass
Harmonics*	EN 61000-3-12:2011	Table 3	Pass
Voltage fluctuation and flicker*	EN 61000-3-11:2000	Section 5	Pass
IMMUNITY (EN 61000-6-1:2007, EN 61000-6-2:2005)			
Description of Test Item	Basic Standard	Performance Criteria	Results
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008	B	Pass
Radio-Frequency, Continuous Radiated Disturbance*	IEC 61000-4-3:2006+ A1:2007+A2:2010	A	Pass
EFT/B Immunity*	IEC 61000-4-4:2012	B	Pass
Surge Immunity*	IEC 61000-4-5:2005	B	Pass
Conducted RF Immunity*	IEC 61000-4-6:2013	A	Pass
Power Frequency Magnetic Field*	IEC 61000-4-8:2009	A	Pass
Voltage dips*	IEC 61000-4-11:2004	B&C	Pass
Voltage interruptions*		C	Pass
Note: 1. N/A is an abbreviation for Not Applicable. 2. * Tests were not within the accreditation scope of CNAS L6666, and were conducted at EMTEK (SHENZHEN) CO., LTD.			

EMTEK
Access to the World

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT	:	X1-Retro Fit Series
Model Number	:	X1-Fit-3.7E, X1-Fit-3.7I, X1-Fit-3.7C, X1-Fit-4.6E, X1-Fit-4.6I, X1-Fit-4.6C, X1-Fit-5.0E, X1-Fit-5.0I, X1-Fit-5.0C (Note: The tests were performed under the Grid-ON mode and AC charging mode.The tests were performed with the battery module (manufacturer: Pylon Technologies Co., Ltd., model H48050A-15S) and battery manager system (manufacturer: Pylon Technologies Co., Ltd., model SC0500A-100S). We prepared X1-Fit-5.0I for EMC tests.)
Power Supply	:	Please see APPENDIX II(Model List) for detail information
Test voltage	:	AC 230V/50Hz or DC 360V (from DC source)
Applicant	:	SOLAX POWER NETWORK TECHNOLOGY(ZHEJIANG)CO., LTD.
Address	:	No.288 Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province, China.
Manufacturer	:	SOLAX POWER NETWORK TECHNOLOGY(ZHEJIANG)CO., LTD.
Address	:	No.288 Shizhu Road, Tonglu Economic Development Zone, Tonglu City, Zhejiang Province, China.
Date of Received	:	August 28, 2017
Date of Test	:	August 28, 2017 to October 10, 2017

2.2. Description of Test Facility

Site Description

EMC Lab.	:	Accredited by CNAS, 2016.12.20 The certificate is valid until 2023.1.20 The Laboratory has been assessed and proved to be in compliance with CNAS-CL01:2006 (identical to ISO/IEC 17025:2005) The Certificate Registration Number is L6666. Accredited by Industry Canada, November 14, 2016 The Certificate Registration Number is 46405-9469.
Name of Firm	:	EMTEK (NINGBO) CO., LTD.
Site Location	:	1F Building 4, 1177#, Lingyun Road, National Hi-Tech Zone, Ningbo, Zhejiang, China

2.3. Description of Support Device

DC Source	:	M/N: 62150H-600S Manufacturer: CHROMA S/N: 62150EC00185

2.4. Measurement Uncertainty

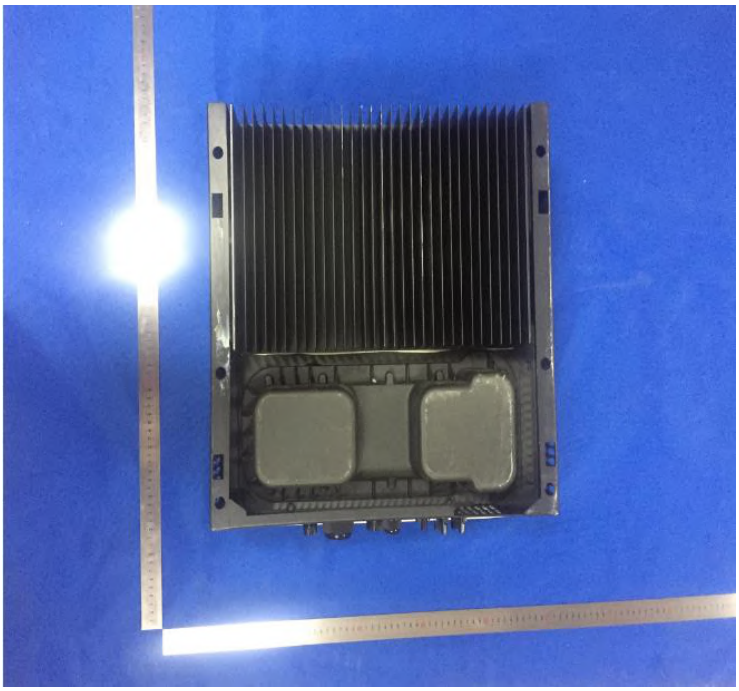
Conducted Emission Uncertainty	: 3.06dB (9K-150KHz) 2.44dB (150K-30MHz)
Radiated Emission Uncertainty (3m Chamber)	: 3.44dB (Polarize: H) (30MHz-1000MHz) 3.78dB (Polarize: V) (30MHz-1000MHz)
Uncertainty for Flicker test	: 0.07%
Uncertainty for Harmonic test	: 1.8%
Uncertainty for C/S Test	: 1.45(Using CDN Test) 2.37(Using EM Clamp Test)
Uncertainty for R/S Test	: 2.10dB(80MHz-200MHz) 1.76dB(200MHz-1000MHz)

Annex 2

Pictures of the unit

Enclosure front view for all model

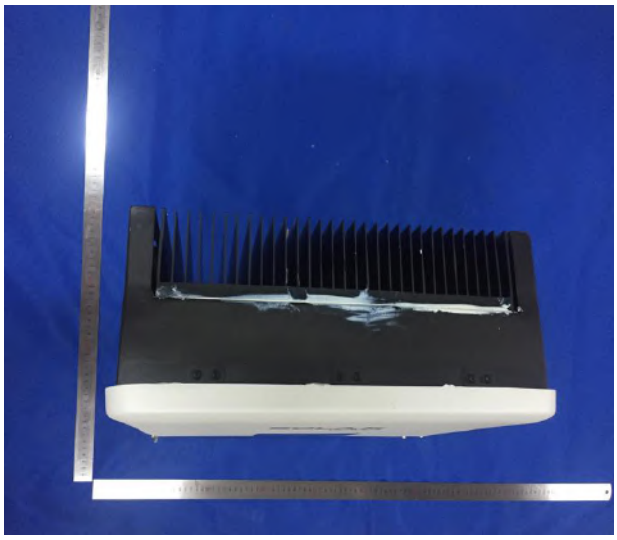
Enclosure rear view for all model



Enclosure left view for all model

Enclosure right view for all model

Enclosure top view for all model



Enclosure bottom view for X1-Hybrid-3.0-N-E, X1-Hybrid-3.7-N-E, X1-Hybrid-4.6-N-E, X1-Hybrid-5.0-N-E

Enclosure bottom view for X1-Hybrid-3.0-D-E, X1-Hybrid-3.7-D-E, X1-Hybrid-4.6-D-E, X1-Hybrid-5.0-D-E

Enclosure bottom view for X1-Fit-3.7E,X1-Fit-5.0E

Annex 3

Test Equipment list

No,	Equipment	Internal No,	Type/characteristics	Manufacturer	Last Calibration	Due Data
1	Oscilloscope	A4089024SH	P4034B	Tektronix	26/Jul/18	25/Jul/19
2	Oscilloscope	A4089008SH	DPO3014	Tektronix	23/Jan/19	22/Jan/20
3	Oscilloscope	A4089036SH	DL850	YOKOGAWA	29/Aug/18	28/Aug/19
4	High Voltage probe	A4089026SH	P5200A	Tektronix	23/Jan/19	22/Jan/20
5	Voltage probe	A4089004SH	P2220	Tektronix	10/Oct/18	09/Oct/19
6	Current probe	A4089009SH	P6139B	Tektronix	23/Jan/19	22/Jan/20
7	Current probe	A4089013SH	A622	Tektronix	23/Jan/19	22/Jan/20
8	Current probe	A4089037SH	960 30	YOKOGAWA	10/Oct/18	09/Oct/19
9	Current probe	A4089038SH	960 30	YOKOGAWA	10/Oct/18	09/Oct/19
10	Current probe	A4089039SH	960 30	YOKOGAWA	10/Oct/18	09/Oct/19
11	Current probe	A4089017SH	TCP0150	Tektronix	26/Jul/18	25/Jul/19
12	AC power supply	A7040066SH	AFC-31010T	APC	08/Aug/18	31/Jul/20
13	AC power supply	A7040071SH	29/May/68	Chroma	22/Feb/18	21/Feb/20
14	AC power supply	A7040057SH	29/May/68	Chroma	19/Jul/17	18/Jul/19
15	AC power supply	A7040077SH	MX-30	AMETEK	-	-
16	Programmable DC source	A7040058SH	62150H-1000S	Chroma	-	-
17	Programmable DC source	A7040059SH	62150H-1000S	Chroma	-	-
18	Programmable DC source	A7040069SH	62150H-1000S	Chroma	-	-
19	Programmable DC source	A7040074SH	62150H-1000S	Chroma	-	-
20	Programmable DC source	A7040075SH	62150H-1000S	Chroma	-	-

21	Programmable DC source	A7040076SH	62150H-1000S	Chroma	-	-
22	Programmable DC source	A7040070SH	62150H-1000S	Chroma	-	-
23	Power Analyzer	A1240096SH	WT3000	YOKOGAWA	31/Oct/18	30/Oct/19
24	Power Analyzer	A1240097SH	WT3000	YOKOGAWA	06/May/19	05/May/20
25	Power Analyzer	A1240103SH	LMG500	ZES ZIMMER	26/Jul/18	25/Jul/19
26	Power Analyzer	A1240101SH	WT3000	YOKOGAWA	26/Jul/18	25/Jul/19
27	Anti-isolating test stystem	A7150074SH	ACTL-380SH	qunling	-	-
28	Load cabinet	A7150083SH	WSTF-LDJ60K/300	shanghai wen shun	-	-
29	Load cabinet	A7150084SH	WSTF-LDJ45K/0385	shanghai wen shun	-	-
30	Load cabinet	A7150085SH	WSTF-LDJ45K/0385	shanghai wen shun	-	-
31	Load cabinet	A7150075SH	WSTF-RC25k/0,3D 0,001kVA-25kVA	shanghai wen shun	-	-
32	Temperature recorder	A740037SH	G820	GRAPHIEC	10/Oct/18	09/Oct/19
33	Load cabinet(for flick)	A7150090SH	200Ω ,250V;1200W	shanghai wen shun	-	-
34	Variable resistor	A7150076SH	BX8-67	LingOu	-	-