Prüfbericht-Nr.: *Test Report No.*:	**50216450 001**	**Auftrags-Nr.:** *Order No.*:	164143376	Seite 1 von 35 *Page 1 of 35*
Kunden-Referenz-Nr.: *Client Reference No.*:	632179	**Auftragsdatum:** *Order date*:	Sep. 19th, 2018	
Auftraggeber: *Client*:	**EAST Group Co., Ltd.** No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China			
Prüfgegenstand: *Test item*:	Grid-connected PV Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type No.*:	EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI			
Auftrags-Inhalt: *Order content*:	AK certificate			
Prüfgrundlage: *Test specification*:	IEC 61727: 2004, IEC 62116: 2014			

Wareneingangsdatum: *Date of receipt*:	Sep. 20th, 2018
Prüfmuster-Nr.: *Test sample No.*:	201808150001
Prüfzeitraum: *Testing period*:	Sep. 20th, 2018–Jan. 04th, 2019
Ort der Prüfung: *Place of testing*:	CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.
Prüflaboratorium: *Testing laboratory*:	TÜV Rheinland (Shanghai) Co., Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von / *tested by*:

15. 01. 2019 Corney Zhang/ PE

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

15. 01. 2019 Dean Cao / Reviewer

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:
1. For issuing grid connecting AK certificate.
2. Tests were carried out on models for standard IEC 61727: 2004 and standard IEC 62116: 2014.

Zustand des Prüfgegenstandes bei Anlieferung: Prüfmuster vollständig und unbeschädigt
Condition of the test item at delivery: *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

V04

TEST REPORT
IEC 61727: 2004
Photovoltaic (PV) systems– Characteristics of the utility interface
IEC 62116: 2014
Utility-interconnected photovoltaic inverters-Test procedure of islanding prevention measures

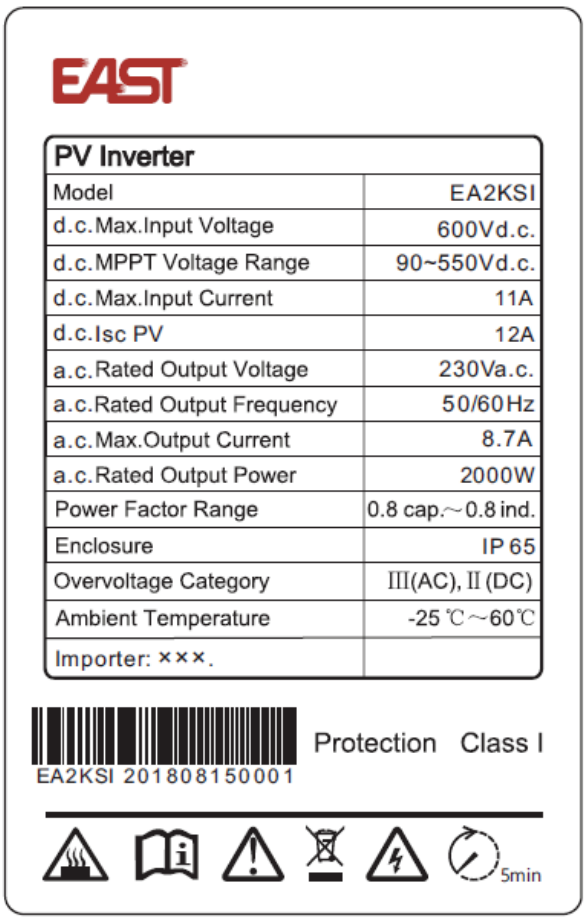
Report Reference No. .....:	50216450 001	
Tested by (name + signature) .....:	See cover page	.....
Witnessed by (name + signature) ..:	See cover page	.....
Supervised by (name + signature) .:	See cover page	.....
Approved by (name + signature)....:	See cover page	.....
Date of issue.....:	See cover page	

Testing Laboratory.....:	TÜV Rheinland (Shanghai) Co., Ltd.
Address .....:	No. 177, Lane 777 West Guangzhong Road, Jingan District, Shanghai, P.R.China
Testing location/ procedure .....:	CBTL☒ TMP☐ WMT☐ SMT☐ RMT☐ CCATL ☐
Testing location/ address .....:	CCIC Southern Electronic Product Testing(Shenzhen) Co., Ltd. Shahe Road, Xili, Nanshan District, Shenzhen 518055 P.R. China
Applicant's name .....:	EAST Group Co., Ltd.
Address .....:	No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China
Test specification:	
Standard .....:	IEC 61727: 2004, IEC 62116: 2014
Test procedure .....:	AK
Non-standard test method……..:	N/A
Test Report Form No.....:	IEC 61727A
Test Report Form(s) Originator .....:	TÜV Rheinland Group
Master TRF.....:	2014-02

Test item description	:	Grid-Connected PV Inverter
Trade Mark	:	
Manufacturer	:	Same as applicant
Model/Type reference	:	See model list.
Ratings	:	See model list.

Testing procedure and testing location:		
☒ **CB Testing Laboratory:**	**TÜV Rheinland (Shanghai) Co., Ltd.**	
Testing location/ address .....:	**CCIC Southern Electronic Product Testing(Shenzhen) Co., Ltd.** Shahe Road, Xili, Nanshan District, Shenzhen 518055 P.R. China	
☐ **Associated CB Test Laboratory:**		
Testing location/ address .....:		
Tested by (name + signature) .....:	See cover page	.....
Approved by (+ signature).....:	See cover page	.....
☐ Testing procedure: TMP		
Tested by (name + signature) .....:		
Approved by (+ signature).....:		
Testing location/ address .....:		
☐ Testing procedure: WMT		
Tested by (name + signature) .....:		
Witnessed by (+ signature) .....:		
Approved by (+ signature).....:		
Testing location/ address .....:		
☐ Testing procedure: SMT		
Tested by (name + signature) .....:		
Approved by (+ signature).....:		
Supervised by (+ signature) .....:		
Testing location/ address .....:		
☐ Testing procedure: RMT		
Tested by (name + signature) .....:		
Approved by (+ signature).....:		
Supervised by (+ signature) .....:		
Testing location/ address .....:		

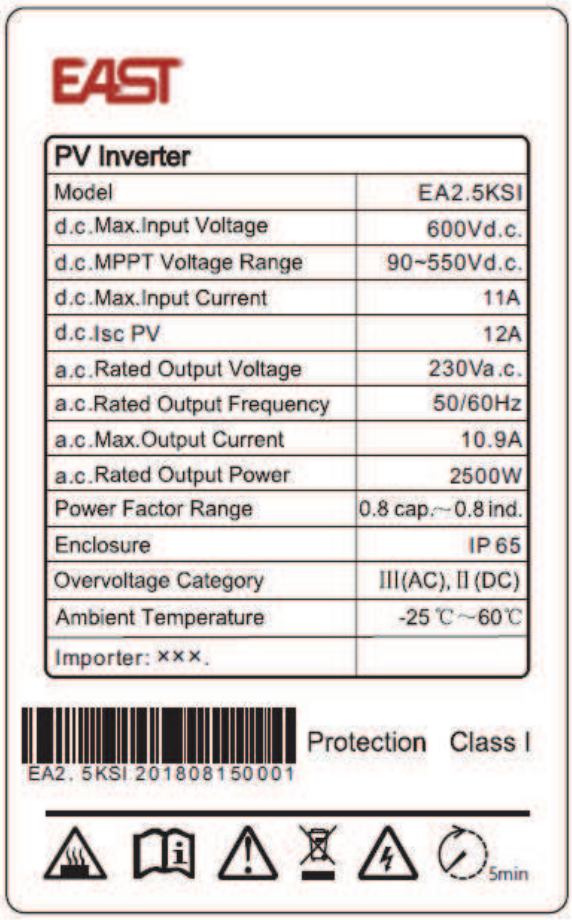
Copy of marking plate:



PV Inverter	
Model	EA2KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	8.7A
a.c.Rated Output Power	2000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA2KSI 201808150001 Protection Class I

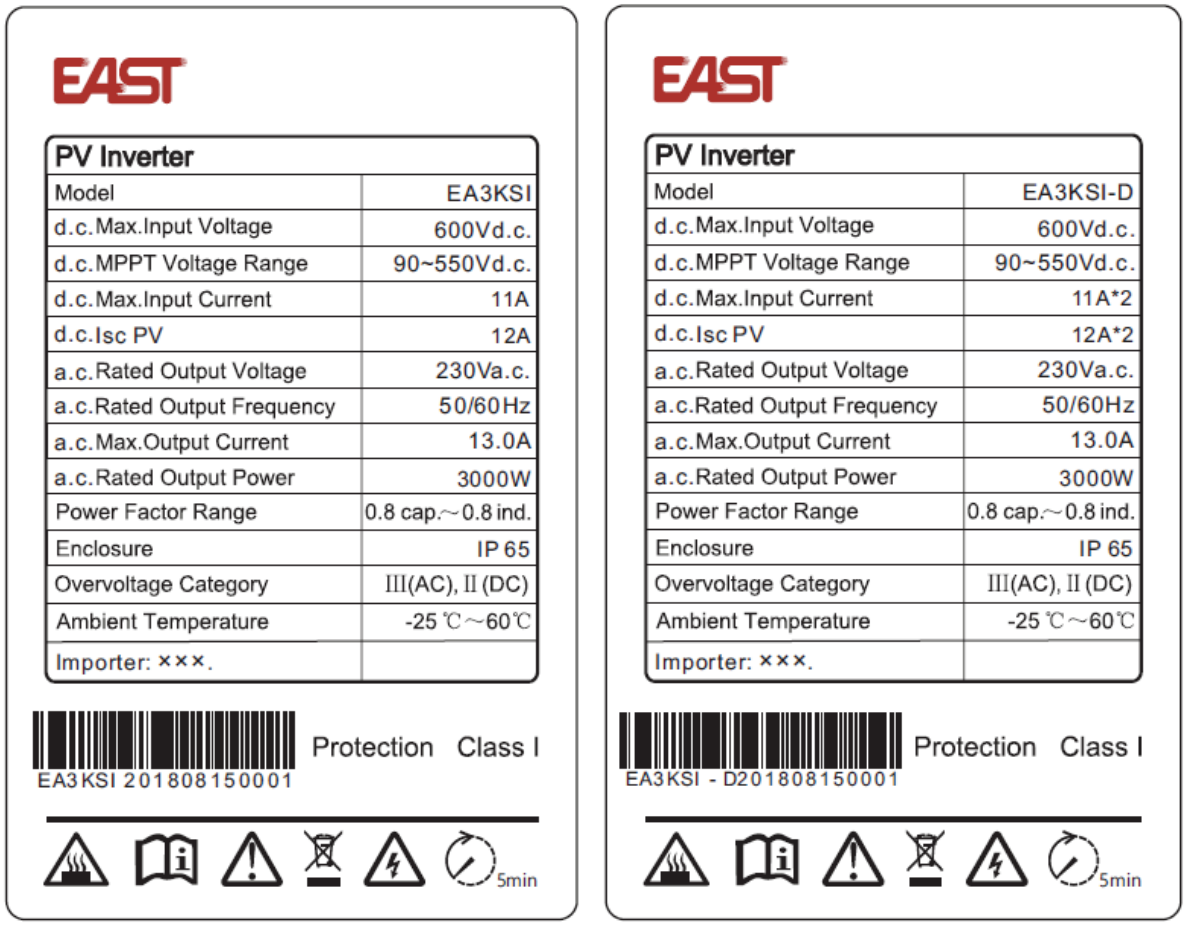
5min



PV Inverter	
Model	EA2.5KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	10.9A
a.c.Rated Output Power	2500W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA2. 5KSI 201808150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA3KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A
d.c.Isc PV	12A
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	13.0A
a.c.Rated Output Power	3000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA3KSI 201808150001 Protection Class I

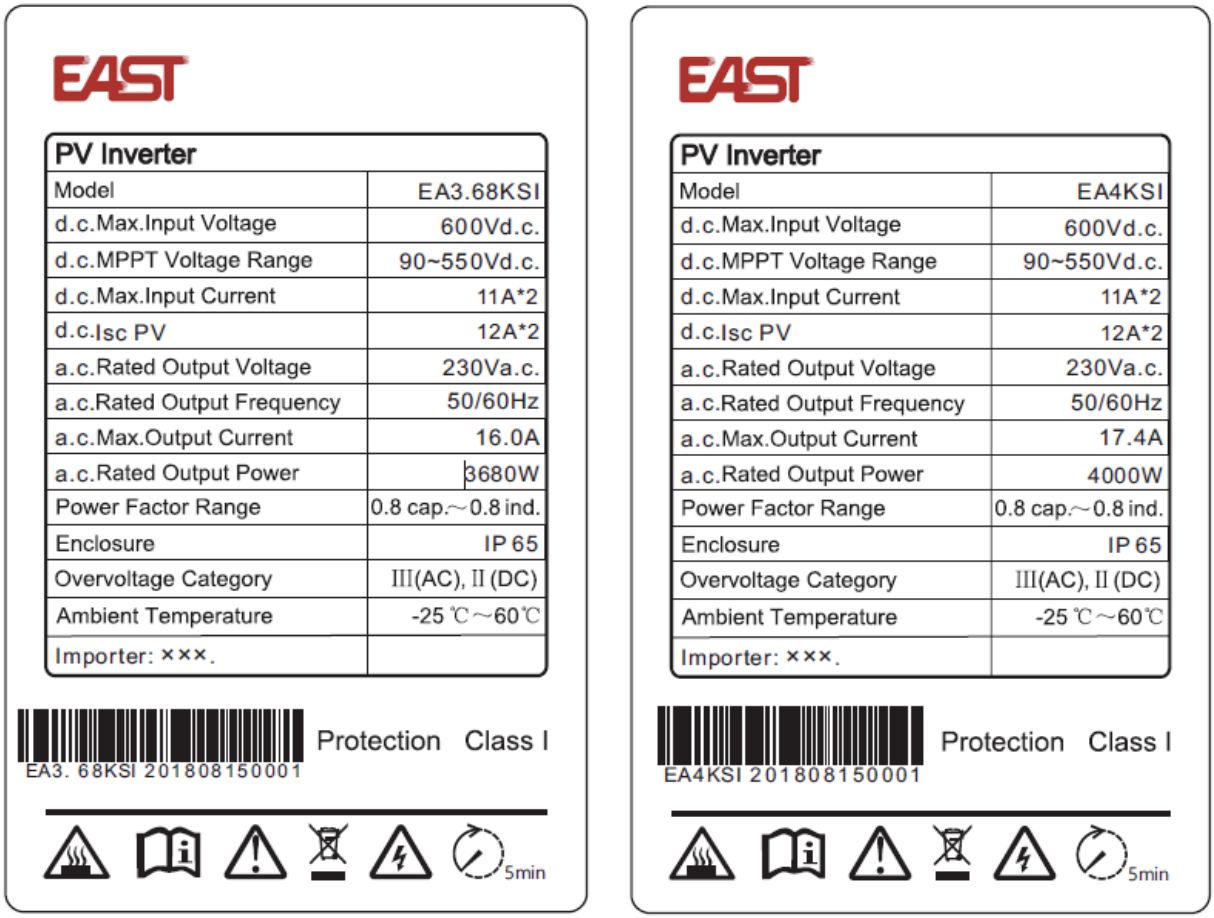
5min

EAST

PV Inverter	
Model	EA3KSI-D
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	13.0A
a.c.Rated Output Power	3000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA3KSI - D201808150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA3.68KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	16.0A
a.c.Rated Output Power	3680W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA3. 68KSI 201808150001 Protection Class I

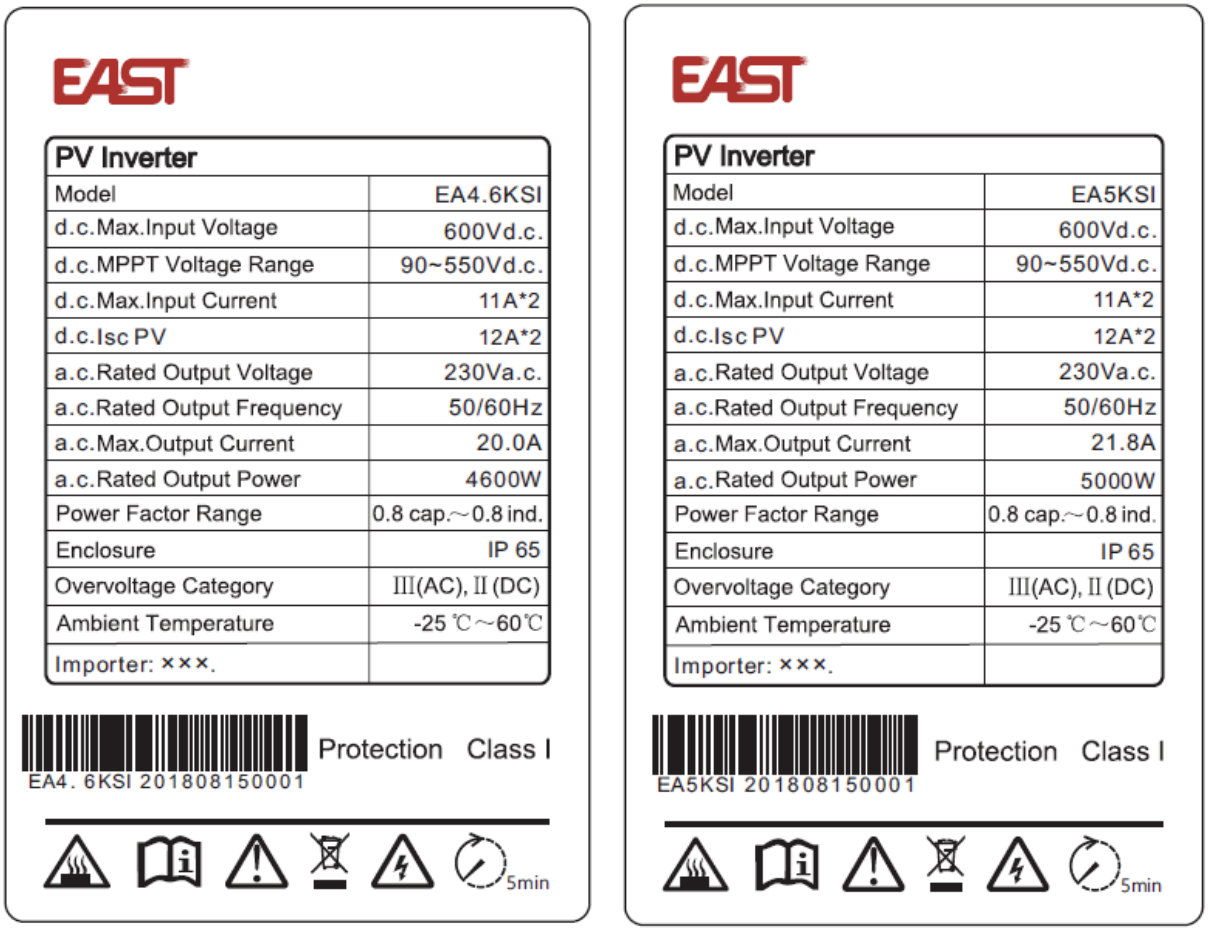
5min

EAST

PV Inverter	
Model	EA4KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	17.4A
a.c.Rated Output Power	4000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA4KSI 201808150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA4.6KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	20.0A
a.c.Rated Output Power	4600W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA4. 6KSI 201808150001 Protection Class I

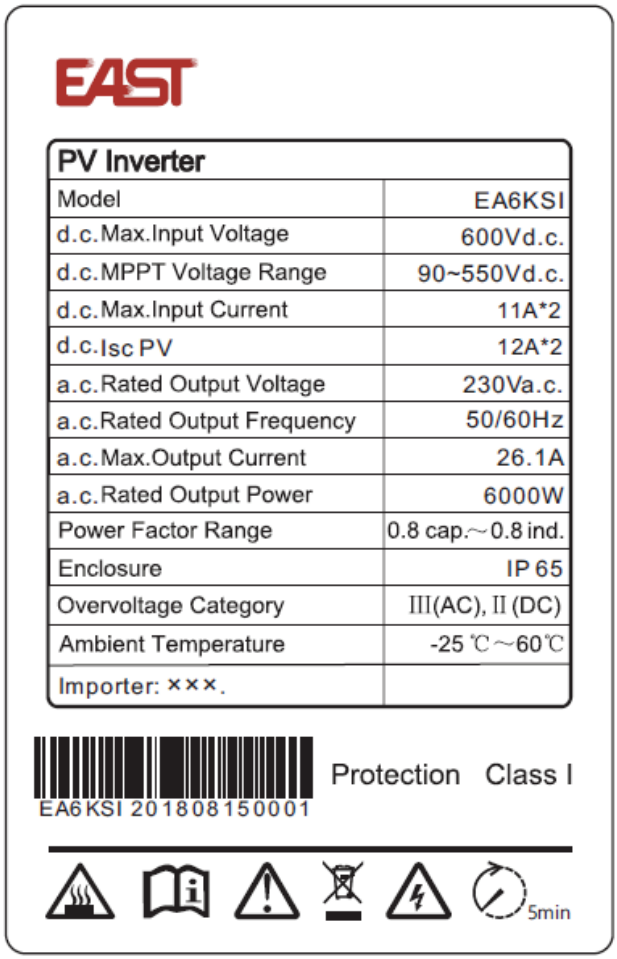
5min

EAST

PV Inverter	
Model	EA5KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	21.8A
a.c.Rated Output Power	5000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25 ℃~60℃
Importer: ×××.	

EA5KSI 201808150001 Protection Class I

5min



EAST

PV Inverter	
Model	EA6KSI
d.c.Max.Input Voltage	600Vd.c.
d.c.MPPT Voltage Range	90~550Vd.c.
d.c.Max.Input Current	11A*2
d.c.Isc PV	12A*2
a.c.Rated Output Voltage	230Va.c.
a.c.Rated Output Frequency	50/60Hz
a.c.Max.Output Current	26.1A
a.c.Rated Output Power	6000W
Power Factor Range	0.8 cap.~0.8 ind.
Enclosure	IP 65
Overvoltage Category	III(AC), II (DC)
Ambient Temperature	-25℃~60℃
Importer: ×××.	

EA6KSI 201808150001

Protection Class I

5min

Summary of testing

Tests performed (name of test and test clause):

☒ 4	Utility compatibility
☒ 4.1	Voltage, current and frequency
☒ 4.3	Flicker
☒ 4.4	DC injection
☒ 4.6	Harmonics and waveform distortion
☒ 4.7	Power factor
☒ 5	Personnel safety and equipment protection
☒ 5.2	Over/under voltage and frequency
☒ 5.2.1	Over/under voltage
☒ 5.2.2	Over/under frequency
☒ 5. 3	Islanding protection
☒ 5.4	Response to utility recovery

☒ The product fulfils the requirements of IEC 62116: 2014.

Testing location:

The laboratory described on page 2.

Equipment mobility	:	☐ movable ☐ hand-held ☐ stationary ☒ fixed
Connection to the mains	:	☐ pluggable equipment ☐ direct plug-in ☒ permanent connection ☐ for building-in
Operating condition	:	☒ continuous ☐ short-time ☐ intermittent
Over voltage category	:	☐ OVC I ☒ OVC II ☒ OVC III ☐ OVC IV
Mains supply tolerance (%)	:	According to specified supply range
Tested for IT power systems	:	☐ Yes ☒ No
IT testing, phase-phase voltage (V)	:	N/A
Class of equipment	:	☒ Class I ☐ Class II ☐ Class III ☐ Not classified
Mass of equipment (kg)	:	See model list.
Pollution degree	:	☐ PD 1 ☐ PD 2 ☒ PD 3(internal reduced to PD 2)
IP protection class	:	IP65

Possible test case verdicts:		
- test case does not apply to the test object	:	N/A
- test object does meet the requirement	:	Pass (P)
- test object does not meet the requirement	:	Fail (F)

Testing:		
Date of receipt of test items	:	See cover page
Date(s) of performance of tests	:	See cover page

General remarks:

"(see Attachment #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

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

This report shall not be reproduced except in full without the written approval of the testing laboratory.

List of test equipment must be kept on file and available for review.

Additional test data and/or information provided in the attach2116ments to this report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Determination of the test results includes consideration of measurement uncertainty from the test equipment and methods.

Manufacturer's Declaration per sub-clause 6.2.5 of IECEE 02:

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	**:**	☐ Yes ☒ Not applicable

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) : **EAST Group Co., Ltd.**
No.6 Northern Industry Road, Songshan Lake Sci.& Tech. industrial zone, Dongguan City, Guangdong province, China

General product information:

The equipment with model names EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI and EA6KSI are single phase un-isolated type grid-connected PV inverters which will be installed and connected to the grid network after installation. In final installation the equipment shall be fixed to suitable manner as specified in the installation instruction.

The EUT contains filters for smoothing the output voltage and for EMC, switching and control circuits. Electronic circuits are mounted on a number of PCBs interconnected by appropriate connectors and wires. Power board including electronics components is mounted on the heat sink to earthing by metal screw and spring washer.
The PV input combine with 1 or 2 string MPPT tracer and PV input terminals. AC output direct connected to grid and Protective Earthing are provided by dedicated earthing terminals. Grid is protected combination with a two series of relays as redundant build for ensure the inverter can independent disconnected from gird while a relay was fault.

During fault condition defined in this standard, after the DSP receives the abnormal signal from the relevant protective detection circuit, the relays will operate to disconnect the PV inverter line and neutral from grid automatically.

The master DSP and slaver DSP has capacity independent disconnected from gird, when any grid fault had happened.

The maximum ambient temperature permitted by the manufacturer's specification is 60°C.

Test on the product:

Hardware version: V00

Firmware version: V009

Models EA2KSI, EA2.5KSI and EA3KSI are identical on hardware except the rated power changed by the software.

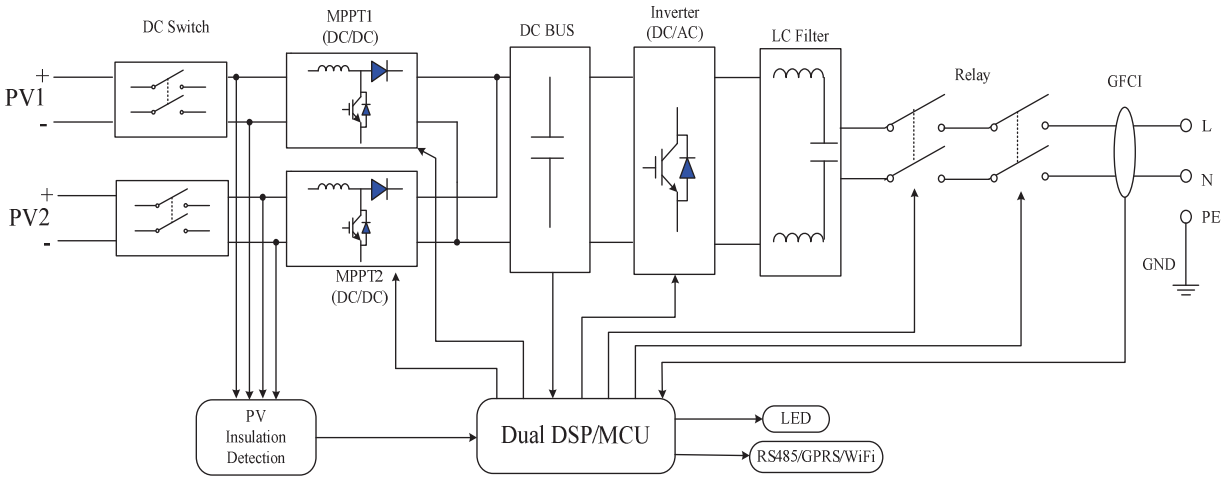
Models EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI and EA5KSI are identical on hardware except the rated power changed by the software.
Models EA5KSI identical to model EA6KSI on hardware except the rated power changed by the software and one internal fan assembled in model EA6KSI.

The model EA3KSI and model EA5KSI are the same on software and hardware, excepted below components are different:

Table 1

Model / Components	EA2KSI, EA2.5KSI, EA3KSI	EA3KSI-D, EA3.68KSI, EA4KSI EA4.6KSI, EA5KSI, EA6KSI
Max. input current	11A	11A×2
Output current sensor	HLSR 20-P/LEM	HLSR 32-P/LEM
MPPT string	1	2
Boost induct	580uH(11A)*1	580uH(11A)*2
BUS capacitor	1200uF(315V)*4	1200uF(315V)*6

IGBT/MOSFET	IKW40N65H5*5, IKW40N120H3*2	IKW40N65H5*6, IKW40N120H3*2
Power board size	262mm*216mm	322mm*231.5mm
Overall size (WxDxH) [mm]	308x116.5x353	370x126.5x420



Block diagram

Table 2

MODEL LIST 1		EA2KSI	EA2.5KSI	EA3KSI	EA3KSI-D
INPUT(PV)	V_{MAX} PV [Vdc]	600			
	I_{SC} PV [A]	12			2x12
	MPP Voltage Range V_{MPP}[Vdc]	90-550			
	Max. PV Input Current [A]	11			11x2
	MPP Full Power Voltage Range [Vdc]	200-480	250-480	300-480	150-480
	Input PV Operating Voltage Range [Vdc]	90-600			
	Start PV Voltage [Vdc]	120			
	Backfeed Current [A]	0			
	Overvoltage Category (OVC)	OVC II			
GRID CONNECTION	Rated Output Voltage Ur [Vac]	230			
	Normal Operating Voltage Range Un [Vac]	180-280			
	Rated Output Frequency F_{NETZ} [Hz]	50/60			
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65			
	Rated Output Power P_E [W]	2000	2500	3000	3000

	Max. Output Current Imax [A]	8.7	10.9	13	13
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)			
	Efficiency max. η_{max}[%]	97.8			
	Night Power Consumption [W]	< 0.5			
	THD [V / I] (100% full power)	< 3%			
	Acoustic Noise [dB]	< 40			
	Overvoltage Category (OVC)	OVC III			
SYSTEM	Type of inverter	Non-transformer			
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009			
	Separated by	Transformerless			
	MPPT strings	1			2
	MPPT tracking	1			2
	Protective Class	1			
	Enclosure Protection (IP)	IP65			
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)			
	Pollution degree (PD)	PD3 for outside, PD2 for inside			
	Altitude [m]	4000 (> 2000 derating power)			
	Weight [kg]	< 9			< 11.5
	Size (WxDxH) [mm]	308x116.5x353			370x126.5x420
Note:					

MODEL LIST 2		EA3.68KSI	EA4KSI	EA4.6KSI	EA5KSI	EA6KSI
INPUT(PV)	V_{MAX} PV [Vdc]	600				
	I_{SC} PV [A]	2x12				
	MPP Voltage Range V_{MPP}[Vdc]	90-550				
	Max. PV Input Current [A]	11x2				
	MPP Full Power Voltage Range [Vdc]	200-480		230-480	250-480	300-480
	Input PV Operating Voltage Range [Vdc]	90-600				
	Start PV Voltage [Vdc]	120				
	Backfeed Current [A]	0				
	Overvoltage Category (OVC)	OVC II				
GRID CONNE	Rated Output Voltage Ur [Vac]	230				
	Normal Operating Voltage Range Un [Vac]	180-280				

	Rated Output Frequency F_{NETZ} [Hz]	50/60				
	Normal Operating Frequency Range Fn [Hz]	45-55 / 55-65				
	Rated Output Power P_E [W]	3680	4000	4600	5000	6000
	Max. Output Current Imax [A]	16	17.4	20	21.8	26.1
	Power Factor cosφ [λ]	0.8 cap-0.8ind adjustable (defaut: 1)				
	Efficiency max. η_{max}[%]	97.8				
	Night Power Consumption [W]	< 0.5				
	THD [V / I] (100% full power)	< 3%				
	Acoustic Noise [dB]	< 40				
	Overvoltage Category (OVC)	OVC III				
SYSTEM	Type of inverter	Non-transformer				
	Firmware [DSP/MCU]	MDSP: V009, MCU: V009				
	Separated by	Transformerless				
	MPPT strings	2				
	MPPT tracking	2				
	Protective Class	1				
	Enclosure Protection (IP)	IP65				
	Operating Temperature Range [ºC]	-25-60 (derating after 45ºC)				
	Pollution degree (PD)	PD3 for outside, PD2 for inside				
	Altitude [m]	4000 (> 2000 derating power)				
	Weight [kg]	< 11.5				
	Size (WxDxH) [mm]	370x126.5x420				
Note:						

General Test Conditions are:

Some tests are conducted on model EA6KSI to represent all the models.

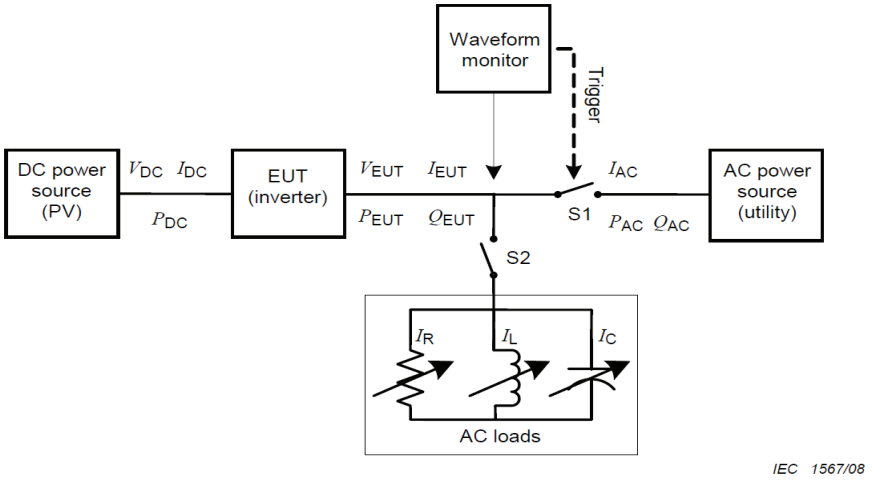
IEC 61727: 2004			
Clause	Requirement – Test	Result - Remark	Verdict
4	**Utility compatibility**	**See below.**	P
	The quality of power provided by the PV system for the on-site AC loads and for power delivered to the utility is governed by practices and standards on voltage, flicker, frequency, harmonics and power factor. 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.	Compliance.	P
	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. NOTE Balancing phase currents in multiphase systems is desirable.		P
4.1	**Voltage, current and frequency**	See below.	P
	The PV system AC voltage, current and frequency shall be compatible with the utility system.	See appended table 4.1.	P
4.2	**Normal voltage operating range**	See below.	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.	Compliance.	P
4.3	**Flicker**	See below.	P
	The operation of the PV system should not cause voltage flicker in excess of limits stated in the relevant sections of IEC 61000-3-3 for systems less than 16 A or IEC 61000-3-5 for systems with current of 16 A and above.	See appended table 4.3.	P
4.4	**DC injection**	See appended table 4.4.	N/A
	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.	External Industrial Frequency Transformer shall be used in final system, no additional test necessary.	N/A
4.5	**Normal frequency operating range**	See below.	P
	The PV system shall operate in synchronism with the utility system, and within the frequency trip limits defined in 5.2.2.	Compliance.	P
4.6	**Harmonics and waveform distortion**	See below.	P
	Low levels of current and voltage harmonics are desirable; the higher harmonic levels increase the potential for adverse effects on connected equipment.	Compliance.	P

<table>
<tr><td colspan="4">IEC 61727: 2004</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td></td><td>Acceptable levels of harmonic voltage and current depend upon distribution system characteristics, type of service, connected loads/apparatus, and established utility practice.</td><td>Compliance.</td><td>P</td></tr>
<tr><td></td><td>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.</td><td>Compliance.</td><td>P</td></tr>
<tr><td></td><td>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.</td><td>See appended table 4.6.</td><td>P</td></tr>
<tr><td></td><td>Even harmonics in these ranges shall be less than 25% of the lower odd harmonic limits listed.</td><td>See appended table 4.6.</td><td>P</td></tr>
<tr><td></td><td>Table 1-Current distortion limits
<table>
<tr><th>Odd harmonics</th><th>Distortion limit</th></tr>
<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>
</table>
NOTE Testing harmonics is very problematic, since voltage distortion may feed to enhanced current distortion. The harmonic current injection should be exclusive of any harmonic currents due to harmonic voltage distortion present in the utility grid without the PV system connected. Type tested inverters meeting the above requirements should be deemed to comply without further testing.</td><td></td><td>P</td></tr>
<tr><td>4.7</td><td>Power factor</td><td>See below.</td><td>P</td></tr>
<tr><td></td><td>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.
NOTE 1 Specially designed systems that provide reactive power compensation may operate outside of this limit with utility approval.
NOTE 2 Most PV inverters designed for utility-interconnected service operate close to unity power factor.</td><td>See appended table 4.7.</td><td>P</td></tr>
<tr><td>5</td><td>Personnel safety and equipment protection</td><td>See below.</td><td>P</td></tr>
<tr><td></td><td>This Clause provides information and considerations for the safe and proper operation of the utility-connected PV systems.
NOTE 1 The protection function may be provided as an internal or external device in the system.
NOTE 2 IEC 60364-5-55 or national or local codes may be applicable.</td><td>Installation, operation and maintain manual provided in English.</td><td>P</td></tr>
</table>

IEC 61727: 2004			
Clause	Requirement – Test	Result - Remark	Verdict
5.1	**Loss of utility voltage**	See below.	P
	To prevent islanding, a utility connected PV system shall cease to energize the utility system from a de-energized distribution line irrespective of connected loads or other generators within specified time limits.	See clause 5.3.	P
	A utility distribution line can become de-energized for several reasons. For example, a substation breaker opening due to fault conditions or the distribution line switched out during maintenance.		N/A
	If inverters (single or multiple) have DC SELV input and have accumulated power below 1 kw then no mechanical disconnect (relay) is required.		N/A
5.2	**Over/under voltage and frequency**	See below.	P
	Abnormal conditions can arise on the utility system that require 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.	Compliance.	P
5.2.1	**Over/under voltage**	See below.	P
	When the interface voltage deviates outside the conditions specified in Table 2, the photovoltaic system shall cease to energize the utility distribution system. This applies to any phase of a multiphase system.	See appended table 5.2.1.	P
	All discussions regarding system voltage refer to the local nominal voltage.	Compliance.	P
	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.	Compliance.	P

IEC 61727: 2004			
Clause	Requirement – Test	Result - Remark	Verdict
	Table 2 – Response to abnormal voltages Voltage (at point of utility connection) / Maximum trip time* V < 0,5 × Vnominal / 0,1 s 50 % ≤ V < 85 % / 2,0 s 85 % ≤ V ≤ 110 % / Continuous operation 110 % < V < 135 % / 2,0 s 135 % ≤ V / 0,05 s * 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.		
	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. NOTE The voltage drop between the inverter terminals and the point of connection with the utility should be taken into consideration.	Compliance.	P
5.2.2	**Over/under frequency**	See below.	P
	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.	See appended table 5.2.1.	P
	When the utility frequency is outside the range of ±1Hz, 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.	Compliance.	P
5.3	**Islanding protection**	See below.	P
	The PV system must cease to energize the utility line within 2s of loss of utility. NOTE The issues of non-islanding inverter are the subject of another standard under consideration.	The test procedure fulfill IEC 62116. See appended table 6.1.	P
5.4	**Response to utility recovery**	See below.	P
	Following an out-of-range utility condition that has caused the photovoltaic system to cease energizing, the photovoltaic system shall not energize the utility line for 20s to 5min after the utility service voltage and frequency have recovered to within the specified ranges. NOTE The energizing delay is dependent on local conditions.	The recovery time has measured after voltage or frequency out of the range.	P
5.5	**Earthing**		P

IEC 61727: 2004			
Clause	Requirement – Test	Result - Remark	Verdict
	The utility interface equipment shall be earthed/ grounded in accordance with IEC 60364-7-712.	Compliance.	P
5.6	**Short circuit protection**		P
	The photovoltaic system shall have short- circuit protection in accordance with IEC 60364-7-712.	Circuit breakers are installed on both DC and AC sides to protect short circuit.	P
5.7	**Isolation and switching**		P
	A method of isolation and switching shall be provided in accordance with IEC 60364-7-712.	All-pole circuit breaker provided.	P

IEC/EN 62116: 2014			
Clause	Requirement – Test	Result - Remark	Verdict
4	**Testing circuit**	Compliance.	P
			P

5	**Testing equipment**	See below.	P
5.1	Measuring instruments	Compliance.	P
	Waveform observation shall be measured by a device with memory function, for example, a storage or digital oscilloscope or a high speed data acquisition system. The waveform measurement/capture device shall be able to record the waveform from the beginning of the islanding test until the EUT ceases to energize the island. For multi-phase EUT, all phases shall be monitored. A waveform monitor designed to detect and calculate the run-on time may be used.		P

IEC/EN 62116: 2014			
Clause	Requirement – Test	Result - Remark	Verdict
	For multi-phase EUT, the test and measurement equipment shall record each phase current and each phase-to-neutral or phase-to-phase voltage, as appropriate, to determine fundamental frequency active and reactive power flow over the duration of the test. A sampling rate of 10 kHz or higher is recommended. The minimum measurement accuracy shall be 1 % or less of rated EUT nominal output voltage and 1 % or less of rated EUT output current. Current, active power, and reactive power measurements through switch S1 used to determine the circuit balance conditions shall report the fundamental (50 Hz or 60 Hz) component.	Compliance.	P
5.2	DC power source	See below.	P
5.2.1	General		P
	A DC power source, such as a PV array simulator, a PV array, or a current and voltage limited DC power supply with series resistance may be used. If the EUT can operate in utility-interconnected mode from a storage battery, a DC power source may be used in lieu of a battery as long as the DC power source shall not be the limiting device as far as the maximum EUT input current is concerned. The DC power source shall provide voltage and current necessary to meet the testing requirements described in Clause 6.	PV array simulator used.	P
5.2.2	PV array simulator	Compliance.	P
	A unit intended to be energized directly from a photovoltaic source shall be energized from a supply that simulates the current-voltage characteristics and time response of a photovoltaic array. The tests shall be conducted at the input voltage defined in Table 2 below, and the current shall be limited to 1,5 times the rated photovoltaic input current, except when specified otherwise by the test requirements.		P
5.2.3	Current and voltage limited DC power supply with series resistance		N/A
	A DC power source used as the EUT input source shall be capable of EUT maximum input power (so as to achieve EUT maximum output power) at minimum and maximum EUT input operating voltage.		N/A
	The power source should provide adjustable current and voltage limit, set to provide the desired short circuit current and open circuit voltage when combined with the series and shunt resistance described below.		N/A
	A series resistance (and, optionally, a shunt resistance) should be selected to provide a fill		N/A

<table>
<tr><td colspan="4">IEC/EN 62116: 2014</td></tr>
<tr><td>Clause</td><td>Requirement – Test</td><td>Result - Remark</td><td>Verdict</td></tr>
<tr><td></td><td>factor within the range shown in Table 2.</td><td></td><td></td></tr>
<tr><td>5.2.4</td><td>PV array</td><td></td><td>N/A</td></tr>
<tr><td></td><td>A PV array used as the EUT input source shall be capable of EUT maximum input power at minimum and maximum EUT input operating voltage (see Table 3). Testing is limited to times when the irradiance varies by no more than 2 % over the duration of the test as measured by a silicon-type pyranometer or reference device. It may be necessary to adjust the array configuration to achieve the input voltage and power levels prescribed in 6.1.</td><td></td><td>N/A</td></tr>
<tr><td>5.3</td><td>AC power source</td><td>Compliance.</td><td>P</td></tr>
<tr><td></td><td><table><tr><th>Items</th><th>Conditions</th></tr><tr><td>Voltage</td><td>Nominal ± 2,0 %</td></tr><tr><td>Voltage THD</td><td>< 2,5 %</td></tr><tr><td>Frequency</td><td>Nominal ± 0,1 Hz</td></tr><tr><td>Phase angle distance [a]</td><td>120° ± 1,5°</td></tr><tr><td colspan="2">[a] Three-phase case only.</td></tr></table></td><td></td><td>P</td></tr>
<tr><td>5.4</td><td>AC loads</td><td>See below.</td><td>P</td></tr>
<tr><td></td><td>On the AC side of the EUT, variable resistance, capacitance, and inductance shall be connected in parallel as loads between the EUT and the AC power source. Other sources of load, such as electronic loads, may be used if it can be shown that the source does not cause results that are different than would be obtained with passive resistors, inductors, and capacitors.</td><td>Compliance.</td><td>P</td></tr>
<tr><td></td><td>All AC loads shall be rated for and adjustable to all test conditions. The equations for Q_f are based upon an ideal parallel RLC circuit. For this reason, non-inductive resistors, low loss (high Q_f) inductors, and capacitors with low effective series resistance and effective series inductance shall be utilized in the test circuit. Iron core inductors, if used, shall not exceed a current THD of 2 % when operated at nominal voltage. Load components should be conservatively rated for the voltage and power levels expected. Resistor power ratings should be chosen so as to minimize thermally-induced drift in resistance values during the course of the test.</td><td>Compliance.</td><td>P</td></tr>
<tr><td></td><td>Active and reactive power should be calculated (using the measurements provided in Table 1)</td><td>Calculated. See appended</td><td>P</td></tr>
</table>

IEC/EN 62116: 2014			
Clause	Requirement – Test	Result - Remark	Verdict
	in each of the R, L and C legs of the load so that these parasitic parameters (and parasitics introduced by variacs or autotransformers) are properly accounted for when calculating Q_f.	table for detail.	

6	**Test for single or multi-phase inverter**	See below.	P
6.1	Test procedure	Compliance.	P
	The following test is designed for an EUT consisting of a single or multi-phase inverter[1]. The test uses an RLC load, resonant at the EUT nominal frequency (50 Hz or 60 Hz) and matched to the EUT output power. For a multi-phase EUT, the load shall be balanced across all phases and the switch S1 as in Figure 1 shall open all phases[2]. This test shall be performed with the EUT conditions as in Table 5, where power and voltage values are given as a percent of EUT full output rating.	50Hz, three phases EUT.	P
	EUT settings for voltage and frequency trip parameters (magnitude and timing) can affect the measured run-on time. Passing this test verifies that the unit will provide adequate islanding protection for the settings tested as well as for tighter settings (e.g., an EUT that passes the test with frequency trip settings of ± 1,5 Hz of nominal should also trip within the maximum measured run-on time for settings of, say, ± 0,5 Hz.) Conversely, when adjusted to settings outside of those tested, the EUT may experience extended run-on times. Frequency settings of ±1,5 Hz around nominal frequency and voltage settings of ± 15 % around nominal voltage, for the purposes of this test procedure, should be wide enough to address the majority of utility requirements. Note that as trip settings are widened, more aggressive active antiislanding schemes may be required that could negatively impact power quality.	Voltage and frequency trip parameters are set according to the requirements of IEC 61727: 2004.	P

IEC/EN 62116: 2014			
Clause	Requirement – Test	Result - Remark	Verdict
			P

Condition	EUT output power, P_{EUT}	EUT input voltage [c]	EUT trip settings [d]
A	Maximum [a]	> 75 % of rated input voltage range	Voltage and frequency trip settings according to National standards and/or local code
B	50 % to 66 % of maximum	50 % of rated input voltage range, ±10 %	Voltage and frequency trip settings according to National standards and/or local code
C	25 % to 33 % [b] of maximum	< 20 % of rated input voltage range	Voltage and frequency trip settings according to National standards and/or local code

[a] Maximum EUT output power condition should be achieved using the maximum allowable input power. Actual output power may exceed nominal rated output.

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

[c] Based on EUT rated input operating range. For example, if range is between X volts and Y volts, 75 % 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.

[d] The manufacturer shall specify the applicable standard, code or utility based trip settings with which the unit shall be tested. The manufacturer may also choose more stringent trip settings to demonstrate compatibility with a greater number of utility requirements. The recommended settings shown below should address the majority of utility requirements.

Parameter	Magnitude	Timing s
Over voltage	115 % of nominal voltage	2
Under voltage	85 % of nominal voltage	2
Over frequency	1,5 Hz above nominal frequency	1
Under frequency	1,5 Hz below nominal frequency	1

If fast over and under voltage and frequency settings are provided, similarly extended values should also be specified by the manufacturer.

6.2	Pass/fail criteria	See below.	P
	An EUT is considered to comply with the requirements for islanding protection when each case of recorded run-on time is less than 2 s or meets the requirements of local codes.	Compliance.	P

7	**Documentation**		P

Annex A (informative)	**Islanding as it applies to PV systems**		P
A.1	General		P
A.2	Impact of distortion on islanding		P
Annex B (informative)	**Test for independent islanding detection device (relay)**	Test with inverter.	N/A
B.1	General		N/A
B.2	Testing circuit		N/A

IEC/EN 62116: 2014			
Clause	Requirement – Test	Result - Remark	Verdict
B.3	Testing equipment		N/A
B.3.1	General		N/A
B.3.2	AC input source		N/A
B.4	Testing procedure		N/A
B.5	Documentation		N/A
Annex C (informative)	Gate blocking signal		N/A
C.1	General		N/A
C.2	Gate blocking signal used in photovoltaic systems		N/A
C.3	Monitoring the gate blocking signal		N/A

4.1	TABLE: Voltage, current and frequency								P
Power conditions	I/P rated	PV / DC Input			O/P rated	Grid / AC Output			
	I [A]	U [V]	I [A]	P [W]	I [A]	U [V]	I [A]	P [W]	Fre. [Hz]
EA6KSI									
(10±5)%	--	373.5	1.65	618.74	2.61	230.0	2.72	602.3	50
(50±5)%	--	368.3	8.35	3075.7	13.05	231.0	13.09	3010	50
(100±5)%	--	376.2	16.25	6107.9	26.08	231.0	25.64	5921	50
EA5KSI									
(10±5)%	--	372.5	1.38	512.8	2.18	230.0	2.29	499.7	50
(50±5)%	--	368.3	6.96	2559.9	10.9	231.0	10.96	2519	50
(100±5)%	--	367.1	14.01	5141.7	21.8	231.0	21.74	5019	50
EA4.6KSI									
(10±5)%	--	344.5	1.353	466.02	2.0	230.0	2.079	447.7	50
(50±5)%	--	367.8	6.371	2343.3	10.0	231.0	10.03	2304	50
(100±5)%	--	366.8	12.858	4712.3	20.0	231.0	20.00	4610	50
EA4KSI									
(10±5)%	--	374.0	1.092	408.48	1.74	230.2	1.885	396.2	50
(50±5)%	--	368.7	5.552	2046.8	8.7	230.5	8.778	2016	50
(100±5)%	--	367.3	11.141	4090.7	17.4	230.9	17.40	4012	50
EA3.68KSI									
(10±5)%	--	375.6	0.993	373.1	1.60	230.0	1.749	361.2	50
(50±5)%	--	369.6	5.110	1889.9	8.0	230.3	8.101	1859	50
(100±5)%	--	367.6	10.202	3750.4	16.0	231.0	15.94	3677	50
EA3KSI-D									
(10±5)%	--	377.1	0.838	316.1	1.30	230.0	1.537	304.1	50

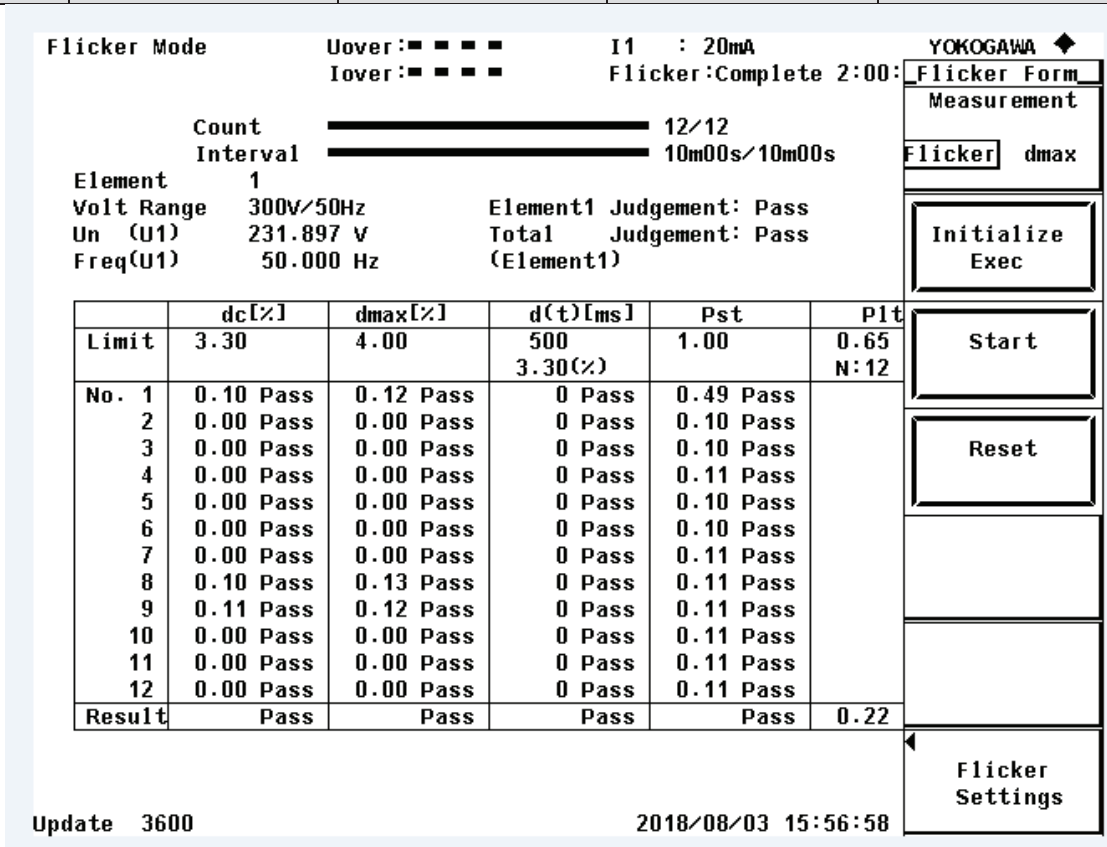
(50±5)%	--	369.4	4.152	1530.1	6.5	230.0	6.593	1510	50
(100±5)%	--	369.4	8.401	3100.1	13.0	231.0	13.24	3049	50
EA3KSI									
(10±5)%	--	377.3	0.871	327.7	1.30	230.0	1.601	315.8	50
(50±5)%	--	367.5	4.168	1530.0	6.5	230.0	6.592	1509	50
(100±5)%	--	367.9	8.402	3092.1	13.0	231.0	13.22	3036	50
EA2.5KSI									
(10±5)%	--	373.6	0.689	257.4	1.09	230.0	1.304	243.2	50
(50±5)%	--	368.0	3.490	1280	5.45	230.0	5.547	1266	50
(100±5)%	--	366.4	6.996	2560	10.9	231.0	10.92	2518	50
EA2KSI									
(10±5)%	--	367.7	0.581	213.64	0.87	230.0	1.190	202.5	50
(50±5)%	--	366.7	2.780	1020.0	4.35	230.0	4.423	999.9	50
(100±5)%	--	365.6	5.589	2040.1	8.7	231.0	8.766	2010	50
Note(s):									

4.3	TABLE: Flicker	P

EA6KSI

PHASE

	Pst	dc(%)	dmax(%)	d(t)
Limit	1.000	3.300	4.000	500



	dc[%]	dmax[%]	d(t)[ms]	Pst	Plt
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.10 Pass	0.12 Pass	0 Pass	0.49 Pass	
2	0.00 Pass	0.00 Pass	0 Pass	0.10 Pass	
3	0.00 Pass	0.00 Pass	0 Pass	0.10 Pass	
4	0.00 Pass	0.00 Pass	0 Pass	0.11 Pass	
5	0.00 Pass	0.00 Pass	0 Pass	0.10 Pass	
6	0.00 Pass	0.00 Pass	0 Pass	0.10 Pass	
7	0.00 Pass	0.00 Pass	0 Pass	0.11 Pass	
8	0.10 Pass	0.13 Pass	0 Pass	0.11 Pass	
9	0.11 Pass	0.12 Pass	0 Pass	0.11 Pass	
10	0.00 Pass	0.00 Pass	0 Pass	0.11 Pass	
11	0.00 Pass	0.00 Pass	0 Pass	0.11 Pass	
12	0.00 Pass	0.00 Pass	0 Pass	0.11 Pass	
Result	Pass	Pass	Pass	Pass	0.22

Plt=___0.22____, Limit=0.65

Note(s):
Maximum permissible voltage fluctuation (expressed as a percentage of nominal voltage at 100% power) and flicker. Less than 16A per phase according to IEC61000-3-3, more than 16 A per phase according to IEC61000-3-5
Tested on model **EA6KSI** to represent all the models.

4.4	TABLE: DC Injection						P
Power conditions		33%		66%		100%	
Limits		1%					
Measurement		[mA]	[%]	[mA]	[%]	[mA]	[%]
Test value	PHASE	58.7	0.23	25.8	0.1	18.5	0.07
Note(s): Tested on model EA6KSI to represent all the models.							

4.6	TABLE: Harmonics and waveform distortion (Current)		P
	EA6KSI		
Harmonics	Measurements (At Rated Current) [100%]	Limits [%]	Verdict
	PHASE		
THD (to the 40th)	0.027	5	P
2nd	0.200	1	P
3rd	1.169	4	P
4th	0.026	1	P
5th	0.494	4	P
6th	0.024	1	P
7th	0.298	4	P
8th	0.128	1	P
9th	0.120	4	P
10th	0.154	0.5	P
11th	0.125	2	P
12th	0.037	0.5	P
13th	0.119	2	P
14th	0.056	0.5	P
15th	0.139	2	P
16th	0.029	0.5	P
17th	0.121	1.5	P
18th	0.045	0.5	P
19th	0.095	1.5	P
20th	0.023	0.5	P

21th	0.114	1.5	P
22th	0.034	0.5	P
23th	0.108	0.6	P
24th	0.050	0.5	P
25th	0.143	0.6	P
26th	0.033	0.5	P
27th	0.163	0.6	P
28th	0.023	0.5	P
29th	0.140	0.6	P
30th	0.023	0.5	P
31th	0.126	0.6	P
32th	0.051	0.5	P
33th	0.033	0.6	P
Note(s): Tested on model EA6KSI to represent all the models.			

4.7	TABLE: Power Factor					P
EA6KSI						
Power conditions	(50±5) %	(60±5) %	(70±5) %	(80±5) %	(90±5) %	(100±5) %
Limits	0.9 (leading / lagging)					
U [V]	230.7	230.9	231.1	231.2	231.3	231.4
I [A]	13.16	15.77	18.33	21.00	23.42	25.79
Fre. [Hz]	50.00	50.00	50.00	50.00	50.00	50.00
P [W]	3025.84	3631.72	4225.01	4842.13	5401.50	5952.39
Q [VA]	228.45	260.76	289.34	339.79	376.97	391.42
S [VA]	3035.50	3641.79	4236.10	4855.03	5416.33	5967.81
PF [λ]	1.00	1.00	1.00	1.00	1.00	1.00
Note(s): Tested on model EA6KSI to represent all the models.						

5.2.1	TABLE: Over / Under Voltage				P
EA6KSI					
Rated voltage [Vrms]:	230V		Voltage accuracy [△V]:	1%Un	
Frequency [Hz]	50		Rated recover time [s]:	50	
Power condition:	☐ 100%		☐ (50-66)%	☒ (25-33)%	

Setting value U_N [Vrms]	Threshold / Trip value U [Vrms]			
	Measurements			Limits
	M1	M2	M3	
L-N: 113	112.7 V	112.1 V	112.0 V	$U < 50\%U_O$
L-N: 190	188.9 V	189.4 V	189.2 V	$50\%U_O \le U < 85\%U_O$
L-N: 256	256.8 V	256.8 V	256.8 V	$110\%U_O < U < 135\%U_O$
L-N: 280	280.5 V	280.7 V	280.4 V	$135\%U_O \le U$
Note(s): Increasing / Decreasing value ramp of 0.5V. (Voltage veracity < 0.1V)				

Trip $U_O \rightarrow U$	Trip time [ms]					Recover time [s]	
	Measurements				Limits	Measurement	Limits
	Phases	M1	M2	M3			
$U<50\%U_O$	L-N:	55.0	37.5	40.5	100	141.3	20≤t≤300
$50\%U_O \le U < 85\%U_O$	L-N:	183.0	178.5	180.5	200	141.7	20≤t≤300

110%U_O < U < 135%U_O	L-N:	186.5	189.0	173.5	200	142.2	20≤t≤300
135%U_O ≤ U	L-N:	7.5	7.0	14.5	50	141.7	20≤t≤300
Note(s): Tested on model EA6KSI to represent all the models.							

5.2.1	**TABLE: Over / Under Frequency**			**P**
EA6KSI				
Rated voltage [Vrms]:	230	Frequency accuracy [ΔF]:	0.1Hz	
Frequency [Hz]	50	Rated recover time [s]:	60	
Power condition:	☐ 100%	☐ (50-66)%	☒ (25-33)%	

Setting value F_N [Hz]	Threshold / Trip value F [Hz]			
	Measurements			Limits
	M1	M2	M3	
49.00	48.99	48.99	48.99	49.0
51.00	51.01	51.01	51.01	51.0
Note(s): Increasing / Decreasing value ramp of 0.01Hz, (Frequency veracity < 10 mHz).				

Trip $F_O \rightarrow F$	Trip time [ms]				Recover time [s]	
	Measurements			Limits	Measurement	Limits
	M1	M2	M3			
F_N +ΔF→F_N -ΔF (F<49.0)	68.25	80.00	76.75	200	141.4	20≤t≤300
F_N -ΔF→F_N +ΔF(F>51.0)	99.50	110.5	107.50	200	142.0	20≤t≤300
Note(s): Tested on model EA6KSI to represent all the models.						

IEC/EN62116: 2014							
6.1	TABLE: Islanding Protection						P
Condition C: 100% of rated power							
Conditions	P_W [kW]	Q_L [kVA]	Q_C [kVA]	Q_f	Trip time [ms]	Limitation [ms]	
P_R: 95% P_Q: 95%	A: 5.67 B: -- C: --	A: 5.85 B: -- C: --	A: 6.4 B: -- C: --	1.02	99.5	2000	
P_R: 95% P_Q: 100%	A: 5.70 B: -- C: --	A: 6.15 B: -- C: --	A: 6.36 B: -- C: --	1.04	175.5	2000	
P_R: 95% P_Q: 105%	A: 5.72 B: -- C: --	A: 6.45 B: -- C: --	A: 6.38 B: -- C: --	1.06	137.5	2000	
P_R: 105% P_Q: 95%	A: 6.30 B: -- C: --	A: 5.88 B: -- C: --	A: 6.38 B: -- C: --	0.93	103.5	2000	
P_R: 105% P_Q: 100%	A: 6.33 B: -- C: --	A: 6.17 B: -- C: --	A: 6.40 B: -- C: --	0.95	112.0	2000	
P_R: 105% P_Q: 105%	A: 6.28 B: -- C: --	A: 6.42 B: -- C: --	A: 6.35 B: -- C: --	0.97	151.5	2000	
P_R: 100% P_Q: 95%	A: 6.03 B: -- C: --	A: 5.85 B: -- C: --	A: 6.40 B: -- C: --	0.97	102.0	2000	
P_R: 100% P_Q: 100%	A: 5.90 B: -- C: --	A: 6.10 B: -- C: --	A: 6.30 B: -- C: --	1.00	186.5	2000	
P_R: 100% P_Q: 105%	A: 5.88 B: -- C: --	A: 6.33 B: -- C: --	A: 6.28 B: -- C: --	1.02	137.0	2000	

Condition B: 66% of rated power						
Conditions	P_W [kW]	Q_L [kVA]	Q_C [kVA]	Q_f	Trip time [ms]	Limitation [ms]
P_R: 100% P_Q: 95%	A: 3.77 B: -- C: --	A: 3.87 B: -- C: --	A: 3.64 B: -- C: --	0.97	129.8	2000
P_R: 100% P_Q: 96%	A: 3.77 B: -- C: --	A: 3.85 B: -- C: --	A: 4.03 B: -- C: --	0.98	122.8	2000
P_R: 100% P_Q: 97%	A: 3.8 B: -- C: --	A: 3.92 B: -- C: --	A: 4.05 B: -- C: --	0.98	214.8	2000
P_R: 100% P_Q: 98%	A: 3.75 B: -- C: --	A: 3.90 B: -- C: --	A: 4.03 B: -- C: --	0.98	137.3	2000
P_R: 100% P_Q: 99%	A: 3.77 B: -- C: --	A: 4.00 B: -- C: --	A: 4.03 B: -- C: --	1.00	155.8	2000
P_R: 100% P_Q: 100%	A: 3.80 B: -- C: --	A: 4.08 B: -- C: --	A: 4.05 B: -- C: --	1.00	158.8	2000
P_R: 100% P_Q: 101%	A: 3.80 B: -- C: --	A: 4.15 B: -- C: --	A: 4.05 B: -- C: --	1.01	194.8	2000
P_R: 100% P_Q: 102%	A: 3.80 B: -- C: --	A: 4.17 B: -- C: --	A: 4.05 B: -- C: --	1.02	136.8	2000
P_R: 100% P_Q: 103%	A: 3.80 B: -- C: --	A: 4.20 B: -- C: --	A: 4.05 B: -- C: --	1.02	133.8	2000
P_R: 100% P_Q: 104%	A: 3.80 B: -- C: --	A: 4.22 B: -- C: --	A: 4.08 B: -- C: --	1.02	135.8	2000
P_R: 100% P_Q: 105%	A: 3.90 B: -- C: --	A: 4.40 B: -- C: --	A: 4.15 B: -- C: --	1.03	132.3	2000
Condition A: 33% of rated power						
Conditions	P_W [kW]	Q_L [kVA]	Q_C [kVA]	Q_f	Trip time [ms]	Limitation [ms]
P_R: 100% P_Q: 95%	A: 1.80 B: --	A: 1.88 B: --	A: 1.95 B: --	0.98	119.2	2000

	C: ––	C: ––	C: ––			
PR: 100% PQ: 96%	A: 1.80 B: –– C: ––	A: 1.88 B: –– C: ––	A: 1.95 B: –– C: ––	0.97	117.2	2000
PR: 100% PQ: 97%	A: 106.9 B: –– C: ––	A: 106.1 B: –– C: ––	A: 119.5 B: –– C: ––	1.053/1.038/1.040	298	2000
PR: 100% PQ: 98%	A: 1.80 B: –– C: ––	A: 1.90 B: –– C: ––	A: 1.98 B: –– C: ––	1.01	149.7	2000
PR: 100% PQ: 99%	A: 1.80 B: –– C: ––	A: 1.93 B: –– C: ––	A: 1.98 B: –– C: ––	1.01	146.7	2000
PR: 100% PQ: 100%	A: 1.80 B: –– C: ––	A: 1.95 B: –– C: ––	A: 1.95 B: –– C: ––	1.01	153.2	2000
PR: 100% PQ: 101%	A: 1.80 B: –– C: ––	A: 1.98 B: –– C: ––	A: 1.95 B: –– C: ––	1.02	219.2	2000
PR: 100% PQ: 102%	A: 1.80 B: –– C: ––	A: 2.00 B: –– C: ––	A: 1.98 B: –– C: ––	1.02	144.2	2000
PR: 100% PQ: 103%	A: 1.80 B: –– C: ––	A: 2.00 B: –– C: ––	A: 1.95 B: –– C: ––	1.03	137.2	2000
PR: 100% PQ: 104%	A: 1.80 B: –– C: ––	A: 2.02 B: –– C: ––	A: 1.98 B: –– C: ––	1.03	141.7	2000
PR: 100% PQ: 105%	A: 1.80 B: –– C: ––	A: 2.05 B: –– C: ––	A: 1.95 B: –– C: ––	1.03	119.2	2000
PR: 100% PQ: 106%	A: 110.4 B: –– C: ––	A: 106.7 B: –– C: ––	A: 125.3 B: –– C: ––	1.047/1.041/1.010	325	2000
Remark: Test has be performance on EA6KSI to represent all the models.						

End of test report

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 1. Front view for model: EA2KSI, EA2.5KSI, EA3KSI

Figure 2. Rear view for model: EA2KSI, EA2.5KSI, EA3KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 3. Terminal panel view for model: EA2KSI, EA2.5KSI, EA3KSI

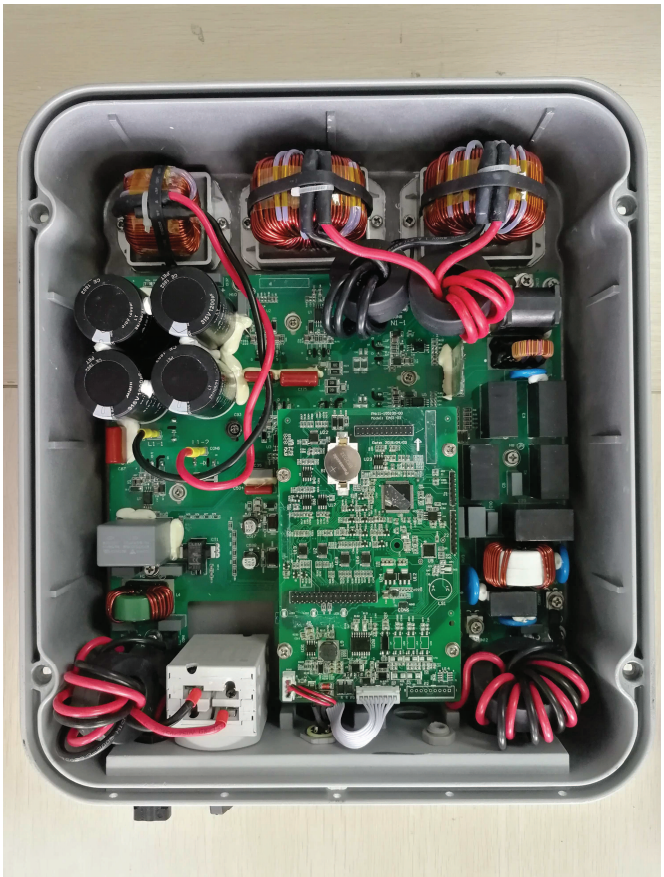


Figure 4. Internal view-1 for model: EA2KSI, EA2.5KSI, EA3KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

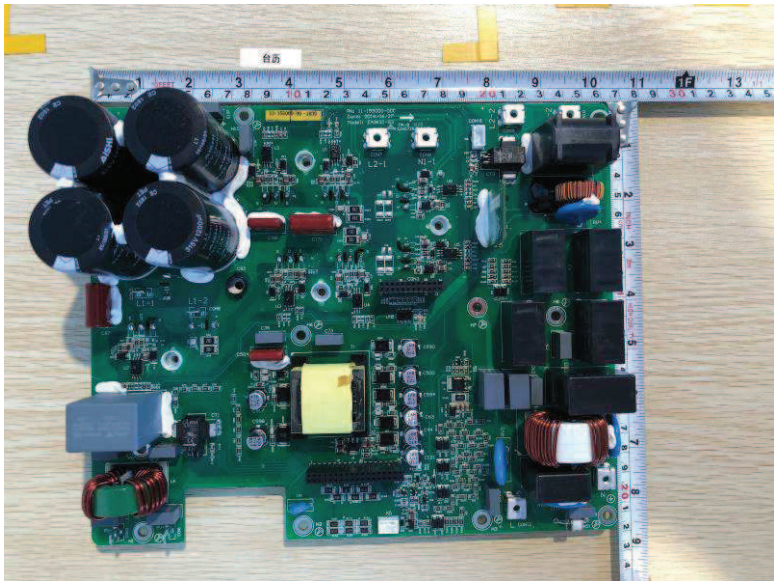


Figure 5. Component side view of Main board for model: EA2KSI, EA2.5KSI, EA3KSI

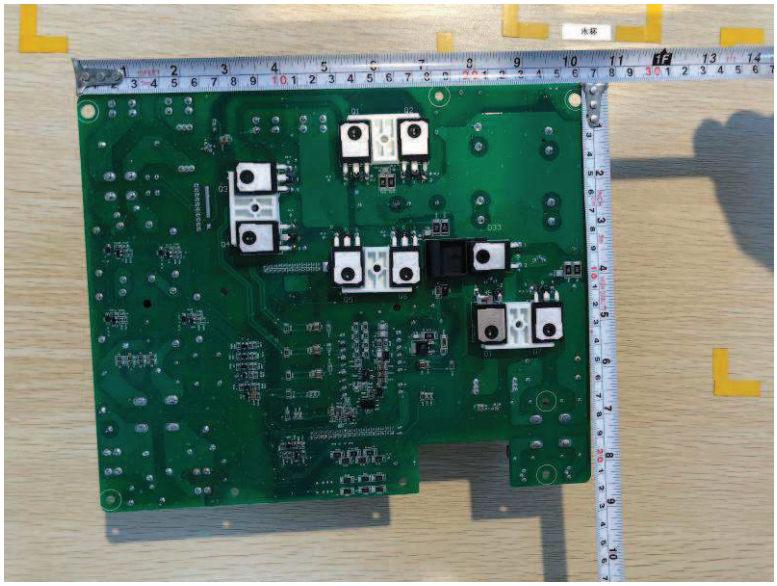


Figure 6. Solder side view of Main board for model: EA2KSI, EA2.5KSI, EA3KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 7. Front view for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

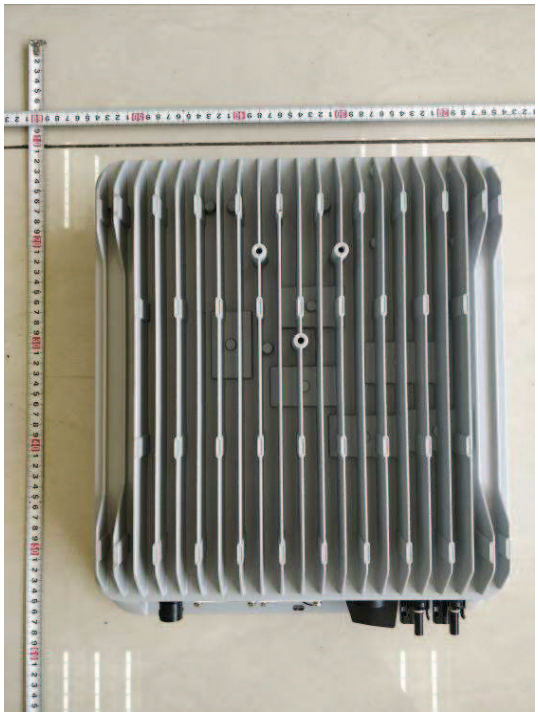


Figure 8. Rear view for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 9. Terminal panel view for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

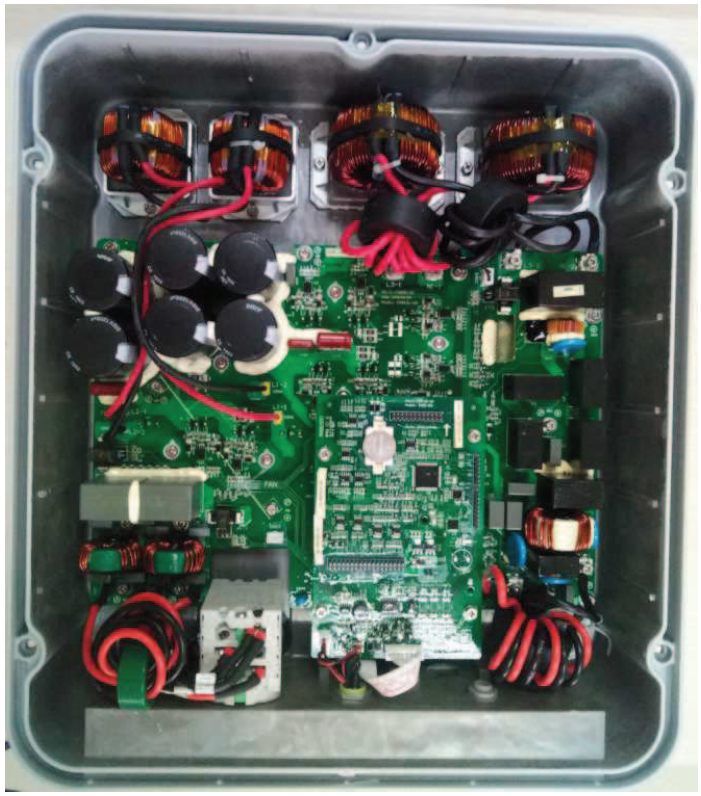


Figure 10. Internal view-1 for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

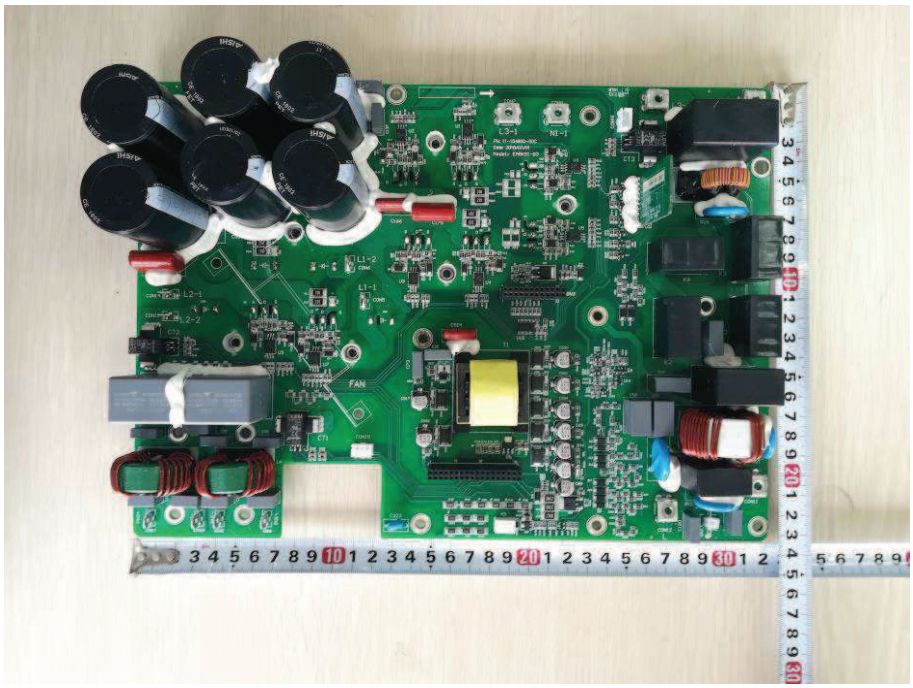


Figure 11. Component side view of Main board for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

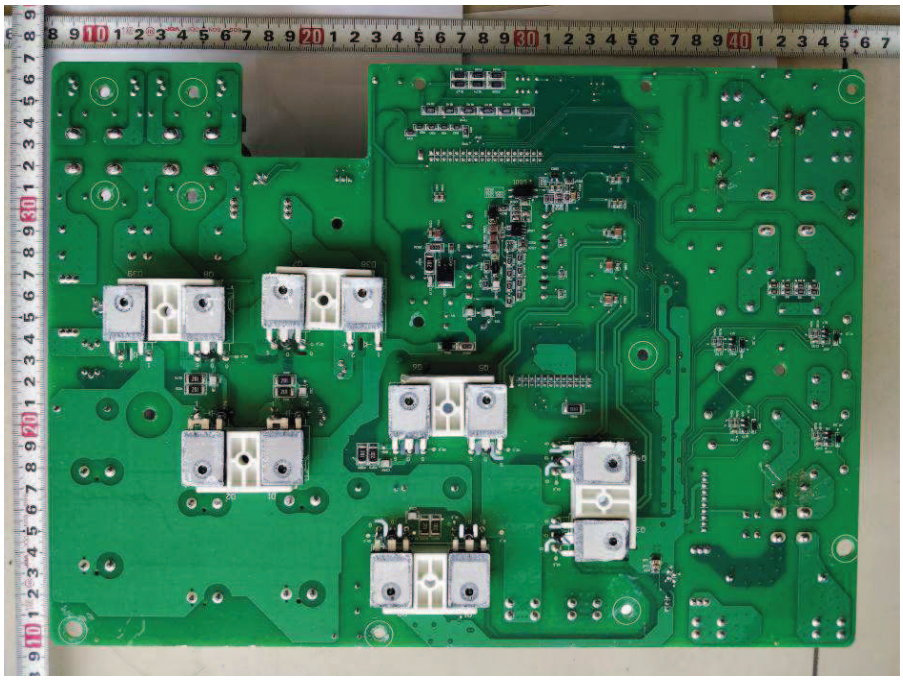


Figure 12. Solder side view of Main board for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

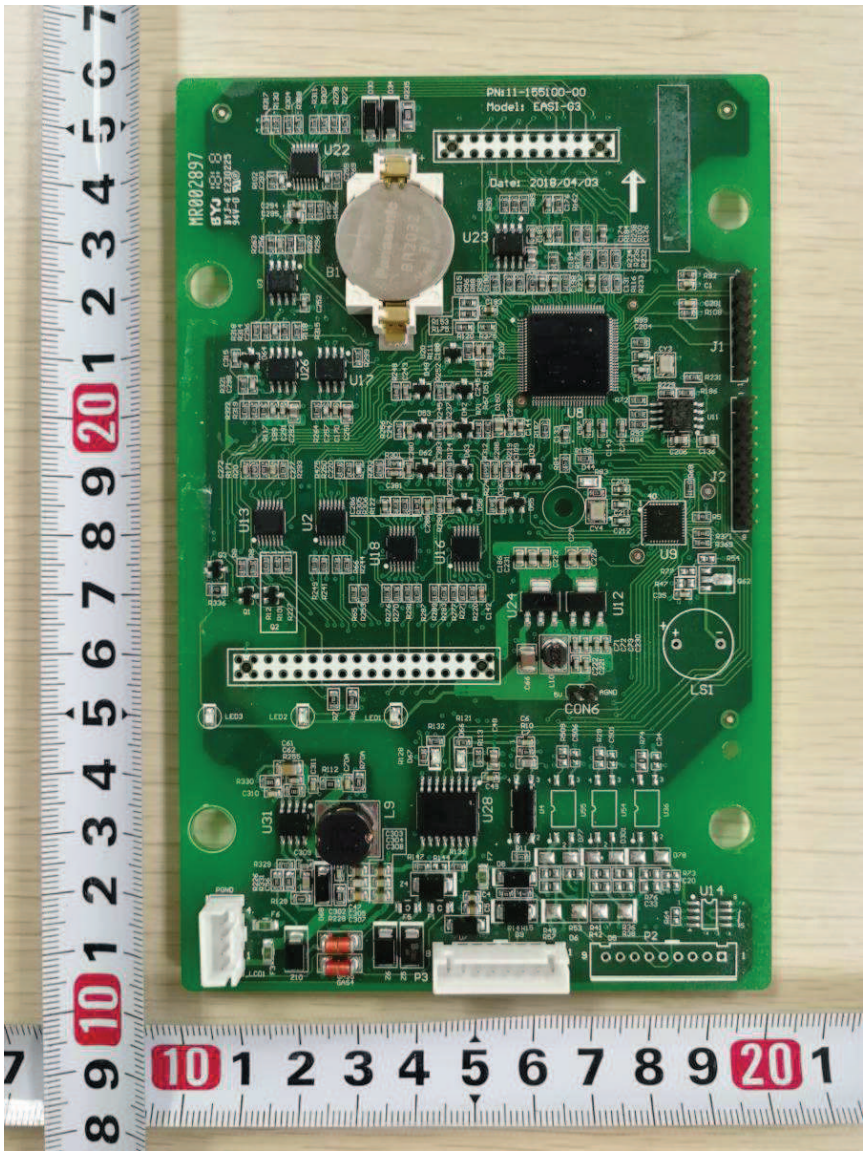


Figura 13. Component side view of Control board

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

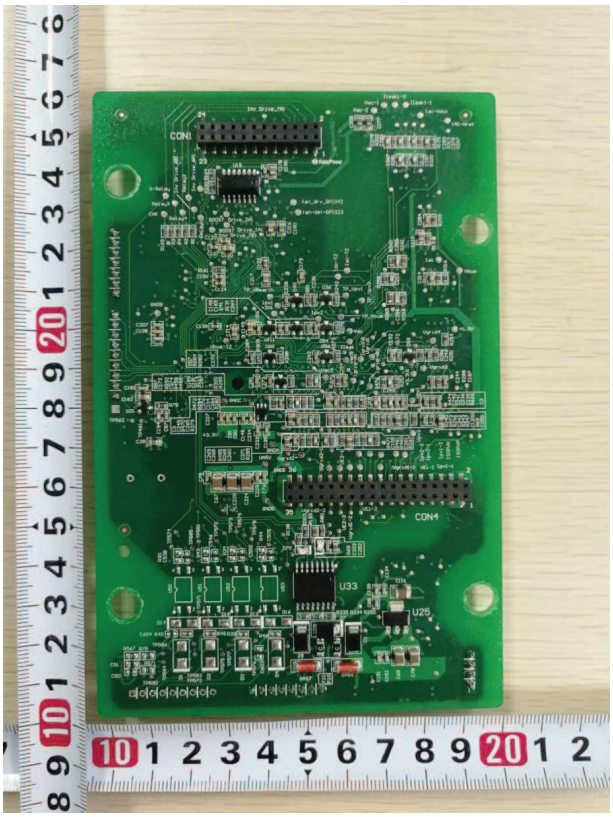


Figure 14. Solder side view of Control board

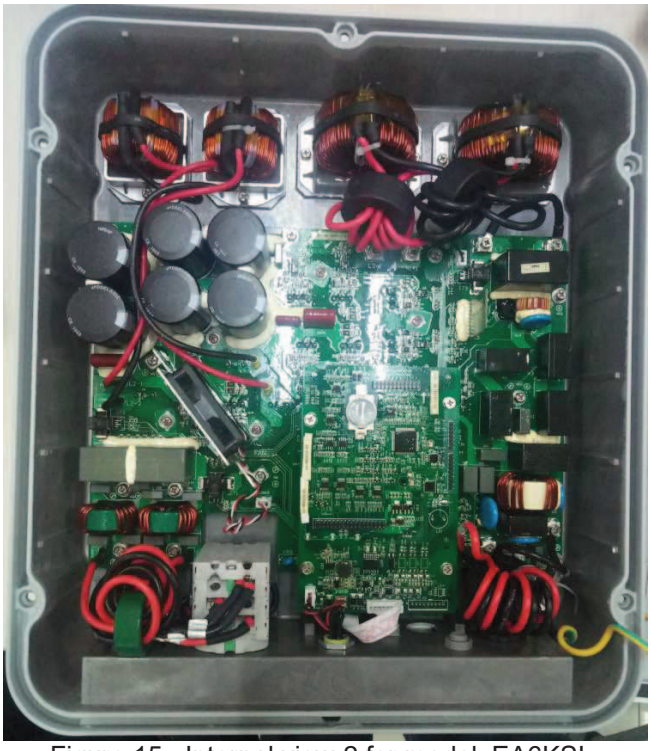


Figure 15. Internal view-2 for model: EA6KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

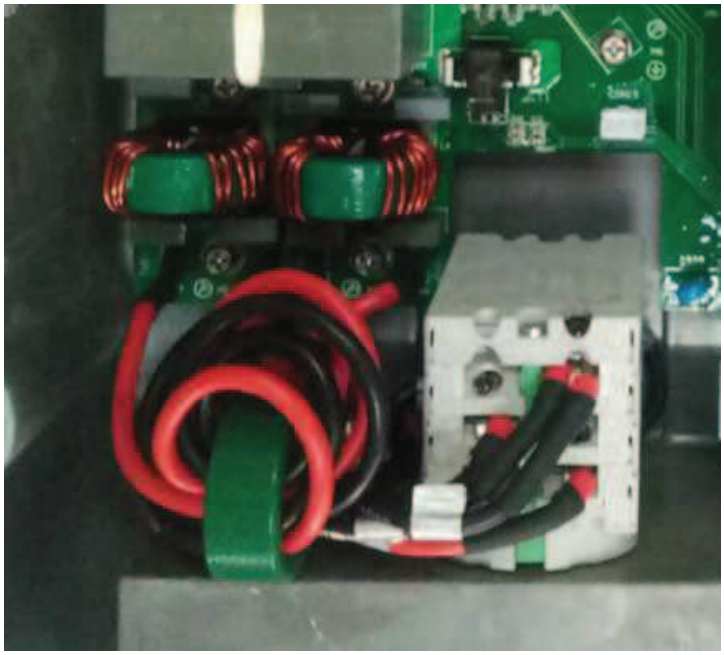


Figure 16. Input parts for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

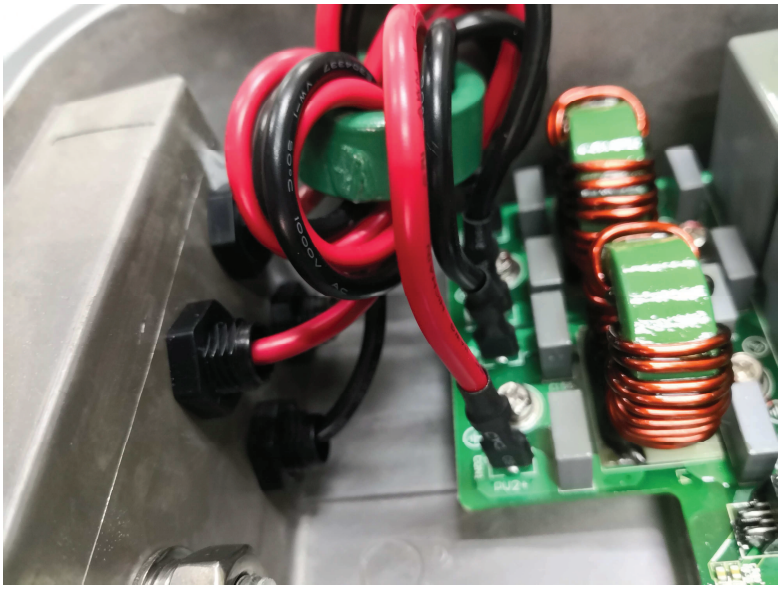


Figure 16. Input parts for model: EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Product: Grid-Connected PV Inverter

Type: EA2KSI, EA2.5KSI, EA3KSI, EA3KSI-D, EA3.68KSI, EA4KSI, EA4.6KSI, EA5KSI, EA6KSI

Figure 16. Earthing terminal for all modes