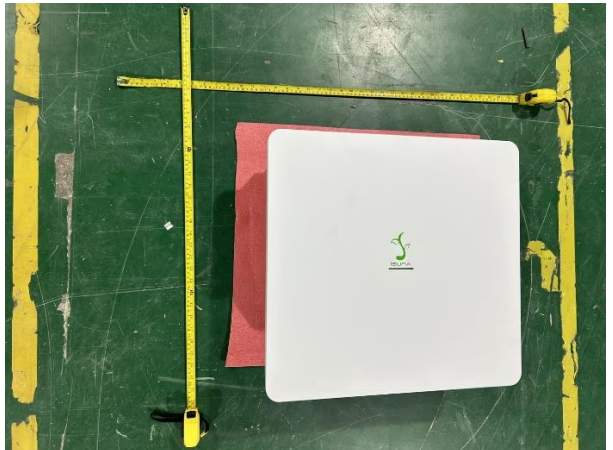
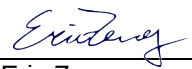


Prüfbericht-Nr.: Test report no.:	CN23HOMA 001	Auftrags-Nr.: Order no.:	244495829	Seite 1 von 12 Page 1 of 12
Kunden-Referenz-Nr.: Client reference no.:	2064060	Auftragsdatum: Order date:	2023-02-23	
Auftraggeber: Client:	Shenzhen Sinexcel Isuna Energy Technology Co., Ltd Room 301, Building 6, BaiWangXin High-tech Industrial Park, Nanshan District, Shenzhen, 518055 Guangdong P.R. China			
Prüfgegenstand: Test item:	Hybrid Inverter			
Bezeichnung / Typ-Nr.: Identification / Type no.:	Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S			
Auftrags-Inhalt: Order content:	AK Certification			
Prüfgrundlage: Test specification:	G99/1-9:2022			
Wareneingangsdatum: Date of sample receipt:	2023-02-23			
Prüfmuster-Nr.: Test sample no.:	A003543983-001			
Prüfzeitraum: Testing period:	2023-02-23 – 2023-08-30			
Ort der Prüfung: Place of testing:	Shenzhen Sinexcel Isuna Energy Technology Co.,Ltd.			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co.,Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	 Edward Z.L. Li		genehmigt von: authorized by:	 Eric Zeng
Datum: Date:	2023-08-30		Ausstellungsdatum: Issue date:	2023-08-30
Stellung / Position:	Project Engineer		Stellung / Position:	Reviewer
Sonstiges / Other:	This report does not evidence compliance of the provided sample with the relevant standards but only with the referred tests. This test report documents the findings of examination conducted on the delivered product mentioned above only. This report does not entitle the applicant to carry any safety mark on this or similar products. Further for sales or other application purposes of the tested product, any reference to TÜV Rheinland or a test through TÜV Rheinland is only permissible with prior written consent of TÜV Rheinland.			
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:	Prüfmuster vollständig und unbeschädigt Test item complete and undamaged			
* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
* Legend:	P(ass) = passed a.m. test specification(s)	F(ail) = failed a.m. test specification(s)	N/A = not applicable	N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. This test report only relates to the above mentioned test sample as. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.				

V05

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Test report no.:

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Absatz Clause	Anforderungen - Prüfungen / Requirements - Tests	Messergebnisse – Bemerkungen/ Measuring results - Remarks	Ergebnis Result
1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.</i> <i>Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>		
2	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. <i>As contractually agreed, this document has been signed digitally only. TÜV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TÜV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i>		
3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>		
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>		

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Test Report No.:

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Liste der verwendeten Prüfmittel
List of used test equipment

Equip.	Description	Model	Manufacturer
9017074	Current Sensor(For WT3000)	IT 200-S	LEM
9017078	Programmable AC Source(61860)	61860	Chroma ATE INC.
G1819267	T-Power Software	TP100-P-LVHA/STP	JAPAN, Yokogawa
G1819268	Anti-islanding test detection devices	ACLT-4830H	QUNLING Energy Resources
G1819274	Impedance Network Device	ACLT-6150	QUNLING Energy Resources
G1819275	Temperature and Humidity	175H1	testo
G1819277	PV array simulator	62150H-1000S	Chroma Co.
G1819278	PV array simulator	62150H-1000S	Chroma Co.
G1819279	PV array simulator	62150H-1000S	Chroma Co.
G1819280	PV array simulator	62150H-1000S	Chroma Co.
G1819282	Anti-islanding Protection test Load	ACLT-3830H	INNET INTERNAT IONAL
G1819283	AC Test Load	ACLT-6150R	INNET INTERNAT IONAL

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Produktbeschreibung Product description

Copy of marking plate

Hybrid Inverter Model name: Isuna 3000S PV Port Operating Voltage 80 to 550d.c.V Max. Input Voltage 600d.c.V Max. Input Current 2×13d.c.A Short-Circuit Current 2×18d.c.A Battery Port Voltage Range 42 to 58d.c.V Max. Charge Current 75d.c.A Max. Discharge Current 75d.c.A AC Input / Output Port Nom. Voltage L/N/PE ~230a.c.V Nom. Frequency 50Hz Max. Input Current 16.4a.c.A Max. Input Apparent Power 3.6kVA Max. Output Current 13.6a.c.A Max. Output Apparent Power 3kVA Back-up Output Port Nom. Voltage L/N/PE~230a.c.V Nom. Frequency 50Hz Max. Output Current 13.6a.c.A Max. Output Apparent Power 3kVA General Data Power factor -0.8 to 0.8 Protective Class I Ingress Protection IP65 Operating Temperature -25 to 60 °C Derating Temperature >40 °C  Manufacturer: Shenzhen Shexsol Isuna Energy Technology Co., Ltd. Address: Room 301, Building 6, BaWangXin High-Tech Industrial Park, Nanshan District, Shenzhen City, China SN: Made In China	Hybrid Inverter Model name: Isuna 3600S PV Port Operating Voltage 80 to 550d.c.V Max. Input Voltage 600d.c.V Max. Input Current 2×13d.c.A Short-Circuit Current 2×18d.c.A Battery Port Voltage Range 42 to 58d.c.V Max. Charge Current 85d.c.A Max. Discharge Current 85d.c.A AC Input / Output Port Nom. Voltage L/N/PE ~230a.c.V Nom. Frequency 50Hz Max. Input Current 22.7a.c.A Max. Input Apparent Power 5kVA Max. Output Current 16.4a.c.A Max. Output Apparent Power 3.6kVA Back-up Output Port Nom. Voltage L/N/PE~230a.c.V Nom. Frequency 50Hz Max. Output Current 16.4a.c.A Max. Output Apparent Power 3.6kVA General Data Power factor -0.8 to 0.8 Protective Class I Ingress Protection IP65 Operating Temperature -25 to 60 °C Derating Temperature >40 °C  Manufacturer: Shenzhen Shexsol Isuna Energy Technology Co., Ltd. Address: Room 301, Building 6, BaWangXin High-Tech Industrial Park, Nanshan District, Shenzhen City, China SN: Made In China
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Produktbeschreibung
Product description

Hybrid Inverter
Model name: Isuna 4000S

PV Port
Operating Voltage 80 to 550d.c.V
Max. Input Voltage 600d.c.V
Max. Input Current 2×13d.c.A
Short-Circuit Current 2×18d.c.A

Battery Port
Voltage Range 42 to 58d.c.V
Max. Charge Current 85d.c.A
Max. Discharge Current 85d.c.A

AC Input / Output Port
Nom. Voltage L/N/PE ~230a.c.V
Nom. Frequency 50Hz
Max. Input Current 22.7a.c.A
Max. Input Apparent Power 5kVA
Max. Output Current 18.2a.c.A
Max. Output Apparent Power 4kVA

Back-up Output Port
Nom. Voltage L/N/PE~230a.c.V
Nom. Frequency 50Hz
Max. Output Current 18.2a.c.A
Max. Output Apparent Power 4kVA

General Data
Power factor -0.8 to 0.8
Protective Class I
Ingress Protection IP65
Operating Temperature -25 to 60 °C
Derating Temperature >40 °C



Address: Room 301, Building 6, BaWangXin High-Tech Industrial Park,
Nanshan District, Shenzhen City, China
Manufacturer: Shenzhen Sinexol Isuna Energy Technology Co., Ltd.

SN:

Made in China

Hybrid Inverter
Model name: Isuna 4600S

PV Port
Operating Voltage 80 to 550d.c.V
Max. Input Voltage 600d.c.V
Max. Input Current 2×13d.c.A
Short-Circuit Current 2×18d.c.A

Battery Port
Voltage Range 42 to 58d.c.V
Max. Charge Current 100d.c.A
Max. Discharge Current 100d.c.A

AC Input / Output Port
Nom. Voltage L/N/PE ~230a.c.V
Nom. Frequency 50Hz
Max. Input Current 27.2a.c.A
Max. Input Apparent Power 6kVA
Max. Output Current 20.8a.c.A
Max. Output Apparent Power 4.6kVA

Back-up Output Port
Nom. Voltage L/N/PE~230a.c.V
Nom. Frequency 50Hz
Max. Output Current 20.8a.c.A
Max. Output Apparent Power 4.6kVA

General Data
Power factor -0.8 to 0.8
Protective Class I
Ingress Protection IP65
Operating Temperature -25 to 60 °C
Derating Temperature >40 °C



Manufacturer: Shenzhen Sinexol Isuna Energy Technology Co., Ltd.
Address: Room 301, Building 6, BaWangXin High-Tech Industrial Park,
Nanshan District, Shenzhen City, China

SN:

Made in China

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Produktbeschreibung
Product description

Hybrid Inverter
Model name: Isuna 5000S

PV Port

Operating Voltage 80 to 550d.c.V
Max. Input Voltage 600d.c.V
Max. Input Current 2×13d.c.A
Short-Circuit Current 2×18d.c.A

Battery Port

Voltage Range 42 to 58d.c.V
Max. Charge Current 100d.c.A
Max. Discharge Current 100d.c.A

AC Input / Output Port

Nom. Voltage L/N/PE ~230a.c.V
Nom. Frequency 50Hz
Max. Input Current 27.2a.c.A
Max. Input Apparent Power 6kVA
Max. Output Current 22.7a.c.A
Max. Output Apparent Power 5kVA

Back-up Output Port

Nom. Voltage L/N/PE~230a.c.V
Nom. Frequency 50Hz
Max. Output Current 22.7a.c.A
Max. Output Apparent Power 5kVA

General Data

Power factor -0.8 to 0.8
Protective Class I
Ingress Protection IP65
Operating Temperature -25 to 60℃
Derating Temperature >40℃



Manufacturer: Shenzhen Shixiao Isuna Energy Technology Co., Ltd.
Address: Room 301, Building 6, BaiWangXin High-Tech Industrial Park,
Nanshan District, Shenzhen City, China

SN:

Made In China

Hybrid Inverter
Model name: Isuna 6000S

PV Port

Operating Voltage 80 to 550d.c.V
Max. Input Voltage 600d.c.V
Max. Input Current 2×13d.c.A
Short-Circuit Current 2×18d.c.A

Battery Port

Voltage Range 42 to 58d.c.V
Max. Charge Current 100d.c.A
Max. Discharge Current 100d.c.A

AC Input / Output Port

Nom. Voltage L/N/PE ~230a.c.V
Nom. Frequency 50Hz
Max. Input Current 27.2a.c.A
Max. Input Apparent Power 6kVA
Max. Output Current 27.2a.c.A
Max. Output Apparent Power 6kVA

Back-up Output Port

Nom. Voltage L/N/PE~230a.c.V
Nom. Frequency 50Hz
Max. Output Current 27.2a.c.A
Max. Output Apparent Power 6kVA

General Data

Power factor -0.8 to 0.8
Protective Class I
Ingress Protection IP65
Operating Temperature -25 to 60℃
Derating Temperature >40℃



Manufacturer: Shenzhen Shixiao Isuna Energy Technology Co., Ltd.
Address: Room 301, Building 6, BaiWangXin High-Tech Industrial Park,
Nanshan District, Shenzhen City, China

SN:

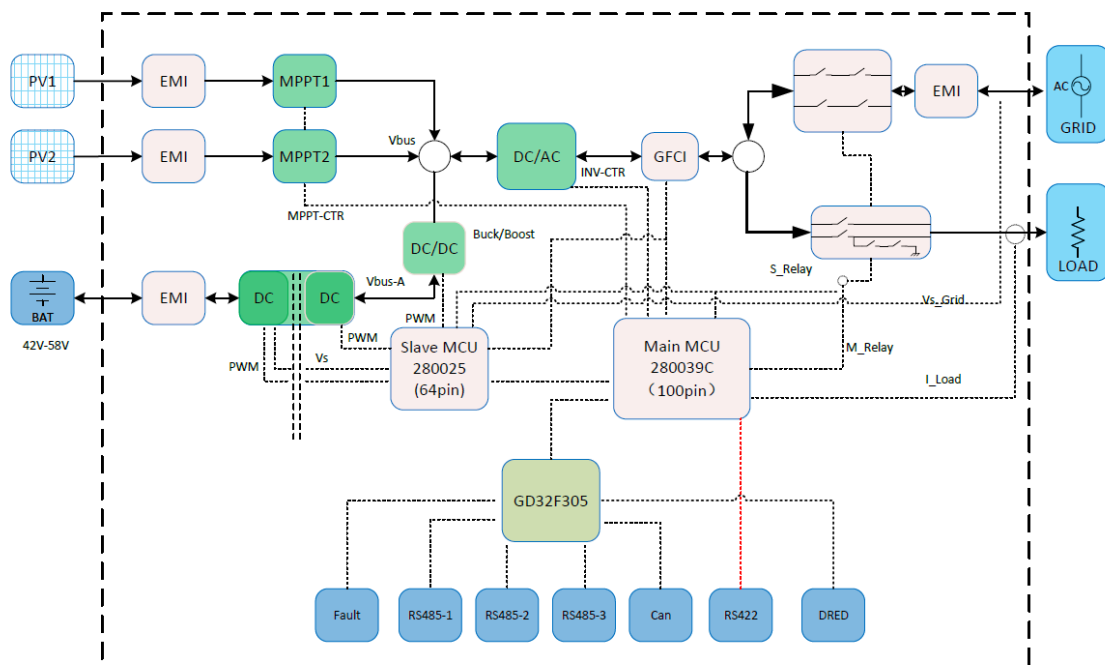
Made In China

Produktbeschreibung Product description

General product information:

Brief description:

The equipment Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S and Isuna 6000S are hybrid inverters designed to work with PV panels up to 600Vd.c and batteries up to 58Vd.c. It is responsible for converting the direct current generated by photovoltaic panels and batteries into single-phase 230 V, 50 Hz alternative current for feeding into the electrical power distribution grid or the backup load. The Hybrid inverter can operate when it is connected to the electrical power distribution line or as a stand-alone unit. The inverter can't work in bypass mode. If AC load needs to be connected to the grid, an external single-pole double-throw switch is required to ensure the AC grid and load are separated from the inverter as mentioned in user manual. The models Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S and Isuna 6000S same family products identical to each other, except for software settings for different output power and current.



Block diagram

Protective function in PCE:

1. PV array insulation resistance detecting
2. Residual current monitoring
3. Over and under grid voltage / frequency protection
4. Anti-islanding protection
5. DC injection current protection
6. Over current protection
7. Over temperature protection and auto derating function
8. Relay self-checking function
9. RCMU self-checking function
10. Relays used in series as grid auto-disconnection devices for redundant NS protection
11. Short-circuit protection relies on external circuit breaks which are specified in the installation manual

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Produktbeschreibung
Product description

Model list:

Model		Isuna 3000S	Isuna 3600S	Isuna 4000S	Isuna 4600S	Isuna 5000S	Isuna 6000S
DC input side	V _{MAX} Input [Vd.c.]	600					
	MPPT Voltage Range [Vd.c.]	80-550					
	MPPT Full Power Voltage Range[Vd.c.]	350-500					
	Isc PV[Ad.c.]	18					
	Maximum DC Input Current [Ad.c.]	13					
	Start PV Voltage [Vd.c.]	95					
	Overvoltage Category (OVC)	II					
Battery	Rated Input Voltage [Vd.c.]	51.2					
	Input Voltage Range [Vd.c.]	42-58					
	Max. battery charge current [Ad.c.]	75	85	85	100	100	100
	Max. battery discharge current [Ad.c.]	75	85	85	100	100	100
	Battery Type	Li-Ion					
AC output (grid side)	Rated Output Voltage Ur [Va.c.]	L/N/PE 230					
	Rated Output Frequency F _{NETZ} [Hz]	50					
	Rated Output Power P _E [kW]	3000	3600	4000	4600	5000	6000
	Max. Output Power P _E [kW]	3000	3600	4000	4600	5000	6000
	Rated. Output Current I _r [Aa.c.]	13.6	16.4	18.2	20.8	22.7	27.2
	Max. Output Current I _{max} [Aa.c.]	13.6	16.4	18.2	20.8	22.7	27.2
	Power Factor cosφ [λ]	-0.8 to 0.8					
	Overvoltage Category (OVC)	III					

Produktbeschreibung Product description

AC output (load side)	Rated Output Voltage Ur [Va.c.]	L/N/PE 230					
	Rated Output Frequency F _{NETZ} [Hz]	50					
	Rated Output Apparent Power[kVA]	3000	3600	4000	4600	5000	6000
	Max. Output Apparent Power[kVA]	3000	3600	4000	4600	5000	6000
	Rated. Output Current Ir [Aa.c.]	13.6	16.4	18.2	20.8	22.7	27.2
	Max. Output Current I _{max} [Aa.c.]	13.6	16.4	18.2	20.8	22.7	27.2
	Overvoltage Category (OVC)	III					

Grid input	Rated Input Voltage [Va.c.]	L/N/PE 230					
	Rated Input Frequency [Hz]	50					
	Max input apparent power [kVA]	3600	5000	5000	6000	6000	6000
	Max. input current [Aa.c.]	16.4	22.7	22.7	27.2	27.2	27.2
	Overvoltage Category (OVC)	III					
Enclosure Protection (IP)		IP65					
Operating Temperature Range [°C]		-25 to +60 (> 40 derating)					
Humidity (%)		0-100%					
Pollution degree (PD)		PD 3(PD 2 inside)					
Altitude [m]		4000					
Weight [kg]		21					
Dimension [W*H*D (mm)]		500*470*180					
Cooling Type		Natural heat dissipation					
Type of inverter		non isolated (between PV side and AC side)					
Firmware version		A00					
Notes:							

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Produktbeschreibung
Product description

Throughout the test report following abbreviations may be used:

- input	i/p	- Test repeated, similar result(3 times)	TRSR
- output	o/p	- No indication of dielectric breakdown	NB
- short-circuited	s-c	- Cheesecloth remained intact	NC
- overloaded	o-l	- Tissue paper remained intact	NT
- open-circuited	o-c	- No hazards	NH
- normal conditions	N.C.	- The PCE can recover to operate automatically after removing the abnormal condition	RO
- single fault conditions	SFC	- functional insulation	FI
- between parts of opposite polarity	BOP	- basic insulation	BI
- internal protection operated	IPO	- supplementary insulation	SI
- Component damage (list damaged component)	CD	- double insulation	DI
- No component damaged	NCD	- reinforced insulation	RI

Indicate used abbreviations (if any)

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Absatz <i>Clause</i>	Anforderungen - Prüfungen <i>Requirements - Tests</i>	Messergebnisse - Bemerkungen <i>Measuring results - Remarks</i>	Bewertung <i>Evaluation</i>
10	Protection	Considered, see appended test table for detail.	P
11	Type A Power Generating Module Technical Requirements	Considered, see appended test table for detail.	P

ANLAGE zum Prüfbericht-Nr.: CN23HOMA 001
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ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

See attachment for test data.

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Test report no.:

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Project Engineer:	Edward Z.L. Li	Reviewer:	Eric Zeng
Signature:		Signature:	

Testing Location:	
Name:	Shenzhen Sinexcel Isuna Energy Technology Co., Ltd
Address:	Room 301, Building 6, BaiWangXin High-tech Industrial Park, Nanshan District, Shenzhen, 518055 Guangdong P.R. China

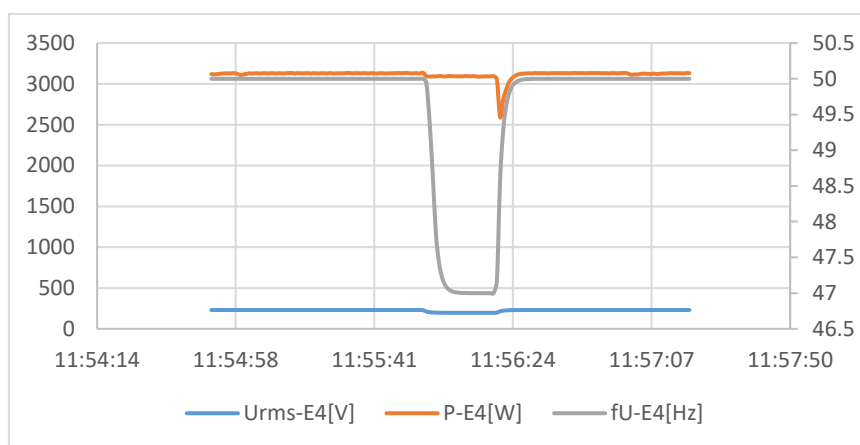
Prüfbericht-Nr.: CN23HOMA 001 attachment 1		Seite 2 von 19	
Test report no.:		Page 2 of 19	
Absatz	G99/1-9/10.22	Messergebnisse - Bemerkungen	Bewertung
Clause	Anforderungen - Prüfungen / Requirements - Tests	Measuring results - Remarks	Evaluation

Clause	Test items	Remark
1	Normal operating range (Operation range)	
2.1	Harmonics current (THDi)	For PGU ≤ 75A, per IEC 61000-3-12
2.2	Harmonics current (Iinter & Ihigher)	Extra test than A2-3 report form, particular for PGU > 75A
3.1	Voltage fluctuations (Flicker)	For PGU ≤ 75A, per IEC 61000-3-11
3.2	Voltage fluctuations (Flicker)	Extra test than A2-3 report form, particular for PGU > 75A
4	DC Injection (Idc)	
5	Power factor	
6	Protection-Frequency tests (OF/UF)	
7	Protection-Frequency tests (OV/UV)	
8.1	Protection-Loss of mains test (Anti-islanding)	
8.2	Vector shift stability test	
8.3	RoCoF stability test (RoCoF)	
9.1	Limited Frequency Sensitive Mode-Over frequency test (LFSM-O)	
9.2	Limited Frequency Sensitive Mode-Under frequency test (LFSM-U)	Extra test than A2-3 report form, particular for type C and type D plant
9.3	Frequency Sensitive Mode (FSM-O)	Extra test than A2-3 report form, particular for type C and type D plant
9.4	Frequency Sensitive Mode (FSM-U)	Extra test than A2-3 report form, particular for type C and type D plant
10	Protection-Reconnection timer (Reconnection)	
11	Fault level contribution	
12	Self-Monitoring solid state switching	N/A, only for solid state switching
13	Wiring functional tests	N/A, none on-site test.
14	Logic interface (input port)	
15	Cyber security	
16	P&Q range	Extra test than A2-3 report form, particular for type B, type C and type D plant
17	Fault Voltage-Ride Through (FVRT)	Extra test than A2-3 report form, particular for type B, type C and type D plant

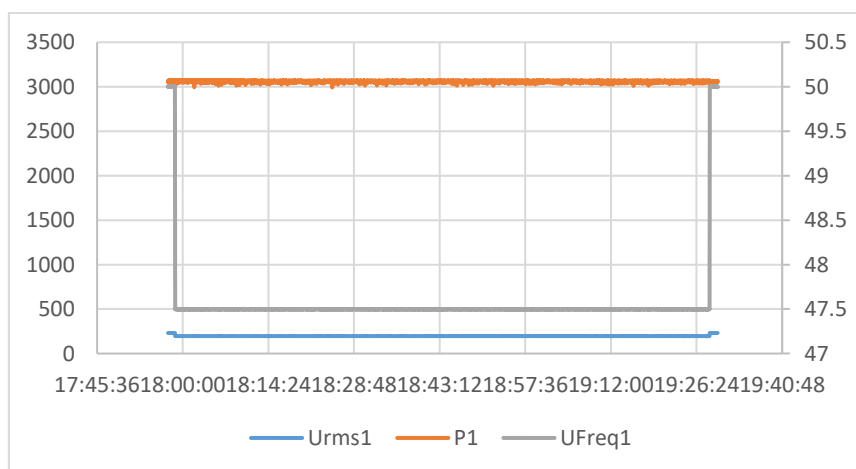
Prüfbericht-Nr.: CN23HOMA 001 attachment 1
Test report no.:

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1	TABLE: Normal operating range (Operation range)				P
Test Conditions				Measurements	Limitation
U/Un	f [Hz]	cosφ	t [s]		
85%(195.5 V)	47.0	1.00	20	No disconnect	No disconnect
85%(195.5 V)	47.5	1.00	5400	No disconnect	No disconnect
110%(253 V)	51.5	1.00	5400	No disconnect	No disconnect
110%(253 V)	52.0	1.00	900	No disconnect	No disconnect
100%(230 V)	50.0	1.00	5400	No disconnect	No disconnect
RoCoF-frequency change rate 1Hz/s				No disconnect	No disconnect
Note(s): * Function of interface protection and activating active power response to over/under frequency and voltage shall be disable.					



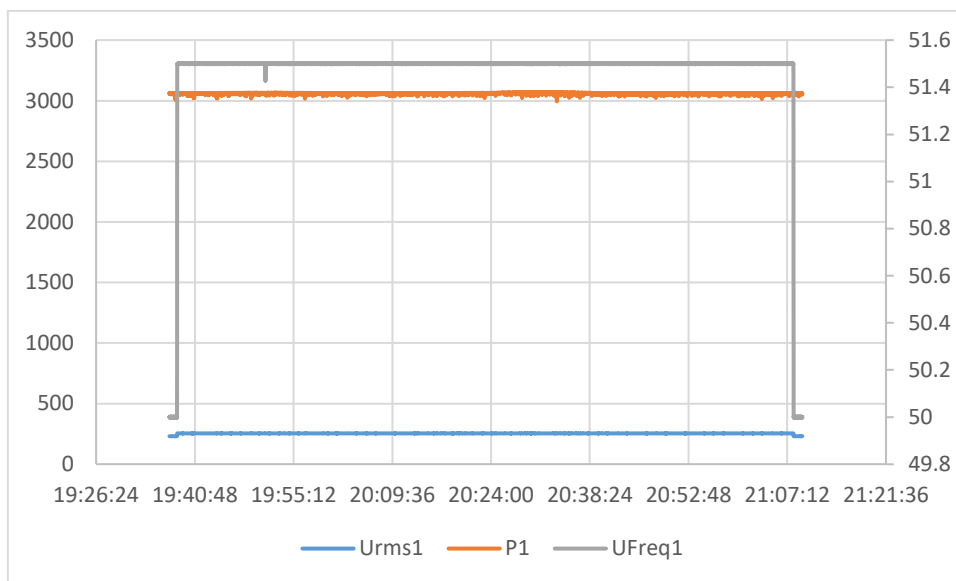
85%Un47Hz



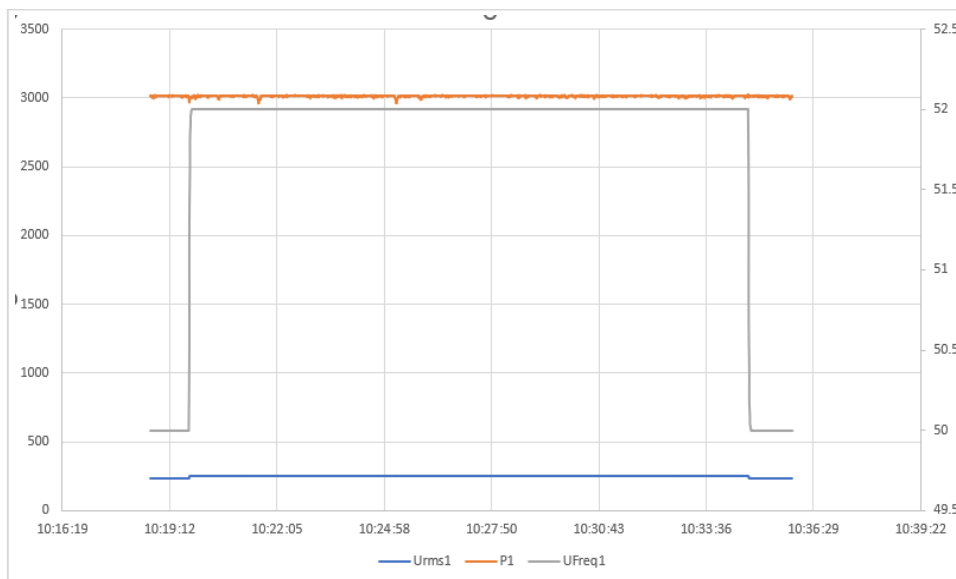
85%Un47.5Hz

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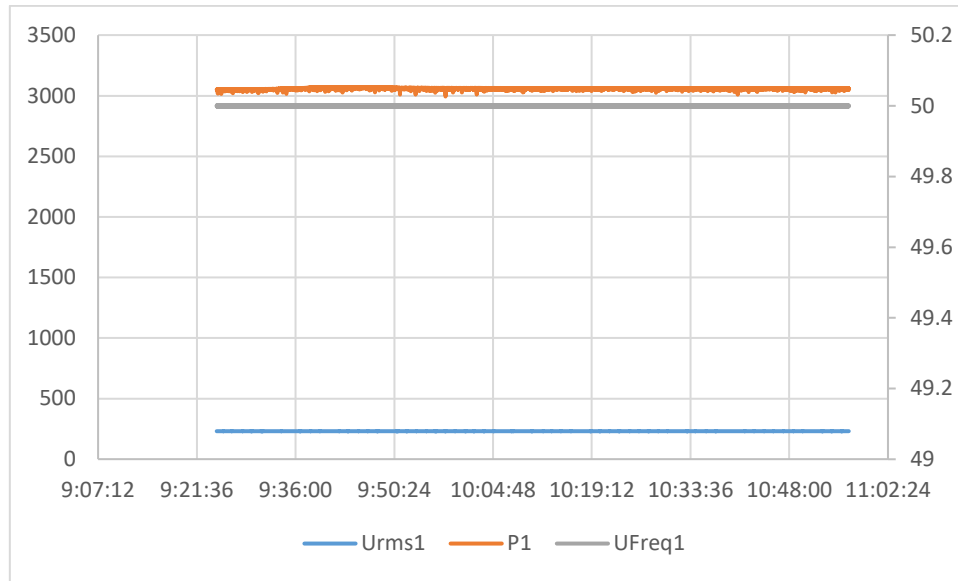
110%Un51.5Hz



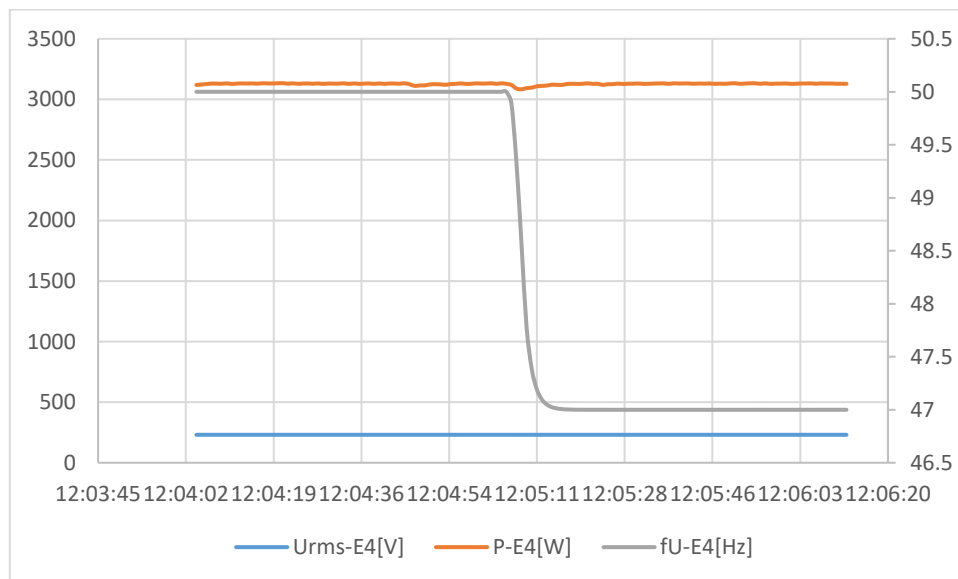
110%Un52Hz

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100%Un50Hz



RoCoF

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2.1	TABLE: Harmonics current (THDi)				P
P/Pn[%]	50		100		Limit
Order No.	Measurement				
	[A]	Ih/In [%]	[A]	Ih/In [%]	
1	13.561	51.98	25.957	99.50	--
2	0.049	0.19	0.082	0.31	8.0
3	0.096	0.37	0.336	1.29	21.6
4	0.032	0.12	0.032	0.12	4.0
5	0.081	0.31	0.072	0.28	10.7
6	0.023	0.09	0.027	0.10	2.67
7	0.053	0.20	0.032	0.12	7.2
8	0.027	0.11	0.029	0.11	2.0
9	0.055	0.21	0.033	0.12	3.8
10	0.029	0.11	0.025	0.09	1.6
11	0.055	0.21	0.034	0.13	3.1
12	0.026	0.10	0.026	0.10	1.33
13	0.033	0.13	0.037	0.14	2.0
THD ²⁷	0.762		THD ²⁹	1.483	23
PWHD ²⁸	1.623		PWHD ³⁰	2.430	23

Note(s): The worst value of the three phases has been choosed.

Since the nominal current of product $I_n > 75A$, the following extra flicker table 2.2 has been also impelmented per BS EN 61000-4-7, as the requirement of EREC G5.

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3.1	TABLE: Power Quality – Voltage fluctuations and Flicker:							P	
Test start date					Test end date				
Test location									
	Starting			Stooping			Running		
	dmax[%]	dc[%]	d(t)[ms]	dmax[%]	dc[%]	d(t)[ms]	P _{st}	P _{lt} 2 hours	
Measured value at test impedance	3.327	0.058	490	3.027	2.895	0.0	0.483	0.481	
Z _{ref} Normalised to standard impedance	3.327	0.058	490	3.027	2.895	0.0	0.483	0.481	
Z _{max} Normalised to required maximum impedance	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Limitation	4.0%	3.3%	500ms	4.0%	3.3%	500ms	1.0	0.65	
Test impedance Z _{test}	R	0.4		Ω	XI	0.25		Ω	
Z _{ref} Normalised value	R	0.24* 0.4^		Ω	XI	0.15* 0.25^		Ω	
Z _{max} Normalised value	R	N/A		Ω	XI	N/A		Ω	

Note(s): The worst value of the three phases has been chosen.

Since the nominal current of product I_n>75A, the following extra flicker table 3.2 has been also implemented per BS EN 61400-21, as the requirement of EREC P28, clause 8.8.

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4	TABLE: Power quality – DC injection:			P
Test power level	10%	55%		100%
Recorded DC value in Amps	0.038	0.066		0.054
as % of rated AC current	0.15%	0.25%		0.21%
Limit	0.25%	0.25%		0.25%
Note(s):				

5	TABLE: Power Factor							P
Test Conditions			Measurements					Limit
P/Pn	cosφ	U/Un	P [W]	Q [kVar]	cosφ	U [V]	I [A]	cosφ
100%	1.00	0.94	5967.25	219.00	0.9993	216.24	27.61	>0.95
100%	1.00	1.0	5891.652	6.441	0.9996	231.86	25.42	>0.95
100%	1.00	1.1	5858.573	7.220	0.9994	253.15	23.15	>0.95
Note(s):								

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6	TABLE: Protection-Frequency tests (OF/UF)		P
Condition	Setting [Hz]	Measurement	Limitation
		Trip value [Hz]	
F>>	52.0	51.960	± 0.1% of f_n
F<	47.5	47.499	
F<<	47	46.951	
Condition	Setting [ms]	Measurement	Limitation [ms]
		Time delay	
F>>	500	558	500-600
F<	20000	20050	20000-20100
F<<	500	550	500-600
Condition		Measurement	limitation
F [Hz]	t [s]		
47.7	30	No trip	No trip
47.2	19.5	No trip	No trip
46.8	0.45	No trip	No trip
51.8	120	No trip	No trip
52.2	0.45	No trip	No trip
Note(s):			

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7	TABLE: Protection – Voltage tests (OV/UV)					P
Condition	Setting [U/Un]	Measurement				Limitation
		Trip value [V]				
		L1	L2	L3	L123	
U>>	1.19 (273.7 V)	275.912	--	--	--	± 1% of U _n
U>	1.14 (262.2 V)	263.409	--	--	--	
U<<	0.80(184 V)	184.064	--	--	--	
Condition	Setting [ms]	Measurement				Limitation
		Time delay				
		L1	L2	L3	L123	
U>>	500	508	--	--	--	500-600
U>	1000	1026	--	--	--	1000-1100
U<<	2500	2560	--	--	--	2500-2600
Condition		Measurement				limitation
U/Un	time [s]					
0.82(188 V)	5	No trip				No trip
0.78(180 V)	2.45	No trip				No trip
1.12(258.2 V)	5	No trip				No trip
1.17(269.2 V)	0.95	No trip				No trip
1.20(277.7 V)	0.45	No trip				No trip
Note(s):						

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8.1		TABLE: Protection-Loss of mains test					P		
Power 100%									
Input : Vdc									
Conditions	P _R [kW]		Q _L [kVar]		Q _C [kVar]	Q _f	Trip time [ms]	Limitation [ms]	
P _R : -10% Q _C : +10%	L1:	--	L1:	--	L1:	--	65.2	500	
	L2:	5.22	L2:	6.49	L2:	5.80			1.18
	L3:	--	L3:	--	L3:	--			--
P _R : -10% Q _C : +5%	L1:	--	L1:	--	L1:	--	142.0	500	
	L2:	5.22	L2:	6.19	L2:	5.80			1.15
	L3:	--	L3:	--	L3:	--			--
P _R : -10% Q _C : 0%	L1:	--	L1:	--	L1:	--	118.8	500	
	L2:	5.22	L2:	5.90	L2:	5.80			1.12
	L3:	--	L3:	--	L3:	--			--
P _R : -10% Q _C : -5%	L1:	--	L1:	--	L1:	--	120.0	500	
	L2:	5.22	L2:	5.60	L2:	5.80			1.09
	L3:	--	L3:	--	L3:	--			--
P _R : -10% Q _C : -10%	L1:	--	L1:	--	L1:	--	199.5	500	
	L2:	5.22	L2:	5.31	L2:	5.80			1.06
	L3:	--	L3:	--	L3:	--			--
P _R : -5% Q _C : +10%	L1:	--	L1:	--	L1:	--	148.5	500	
	L2:	5.51	L2:	6.49	L2:	5.80			1.11
	L3:	--	L3:	--	L3:	--			--
P _R : -5% Q _C : -10%	L1:	--	L1:	--	L1:	--	218.1	500	
	L2:	5.51	L2:	5.31	L2:	5.80			1.01
	L3:	--	L3:	--	L3:	--			--
P _R : 0% Q _C : +10%	L1:	--	L1:	--	L1:	--	64.8	500	
	L2:	5.80	L2:	6.49	L2:	5.80			1.06
	L3:	--	L3:	--	L3:	--			--
P _R : -5% Q _C : +5%	L1:	--	L1:	--	L1:	--	62.2	500	
	L2:	5.51	L2:	6.19	L2:	5.80			1.09
	L3:	--	L3:	--	L3:	--			--
P _R : -5% Q _C : 0%	L1:	--	L1:	--	L1:	--	47.6	500	
	L2:	5.51	L2:	5.90	L2:	5.80			1.06
	L3:	--	L3:	--	L3:	--			--
P _R : -5% Q _C : -5%	L1:	--	L1:	--	L1:	--	61.2	500	
	L2:	5.51	L2:	5.61	L2:	5.80			1.03

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	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +5%	L1: --	L1: --	L1: --	--	38.8	500
	L2: 5.80	L2: 6.20	L2: 5.80	1.03		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : 0%	L1: --	L1: --	L1: --	--	45.8	500
	L2: 5.80	L2: 5.90	L2: 5.80	1.01		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -5%	L1: --	L1: --	L1: --	--	98.4	500
	L2: 5.80	L2: 5.61	L2: 5.80	0.98		
	L3: --	L3: --	L3: --	--		
P _R : +5% Q _C : +5%	L1: --	L1: --	L1: --	--	141.5	500
	L2: 6.09	L2: 6.20	L2: 5.80	0.98		
	L3: --	L3: --	L3: --	--		
P _R : +5% Q _C : 0%	L1: --	L1: --	L1: --	--	54.6	500
	L2: 6.09	L2: 5.9	L2: 5.80	0.96		
	L3: --	L3: --	L3: --	--		
P _R : +5% Q _C : -5%	L1: --	L1: --	L1: --	--	46.1	500
	L2: 6.09	L2: 5.61	L2: 5.80	0.94		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -10%	L1: --	L1: --	L1: --	--	92.0	500
	L2: 5.80	L2: 5.31	L2: 5.80	0.96		
	L3: --	L3: --	L3: --	--		
P _R : +5% Q _C : +10%	L1: --	L1: --	L1: --	--	155.3	500
	L2: 6.09	L2: 6.49	L2: 5.80	1.01		
	L3: --	L3: --	L3: --	--		
P _R : +5% Q _C : -10%	L1: --	L1: --	L1: --	--	114.0	500
	L2: 6.09	L2: 5.31	L2: 5.80	0.91		
	L3: --	L3: --	L3: --	--		
P _R : +10% Q _C : +10%	L1: --	L1: --	L1: --	--	168.5	500
	L2: 6.38	L2: 6.49	L2: 5.80	0.96		
	L3: --	L3: --	L3: --	--		
P _R : +10% Q _C : +5%	L1: --	L1: --	L1: --	--	75.1	500
	L2: 6.38	L2: 6.20	L2: 5.80	0.94		
	L3: --	L3: --	L3: --	--		
P _R : +10% Q _C : 0%	L1: --	L1: --	L1: --	--	80.4	500
	L2: 6.38	L2: 5.90	L2: 5.80	0.92		

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	L3: --	L3: --	L3: --	--		
P _R : +10% Q _C : -5%	L1: --	L1: --	L1: --	--	174.1	500
	L2: 6.38	L2: 5.61	L2: 5.80	0.89		
	L3: --	L3: --	L3: --	--		
P _R : +10% Q _C : -10%	L1: --	L1: --	L1: --	--	63.2	500
	L2: 6.38	L2: 5.31	L2: 5.80	0.87		
	L3: --	L3: --	L3: --	--		

Power 66%						
Input : Vdc						
Conditions	P _R [kW]	Q _L [kVar]	Q _C [kVar]	Q _f	Trip time [ms]	Limitation [ms]
P _R : 0% Q _C : -5%	L1: --	L1: --	L1: --	--	63.2	500
	L2: 3.85	L2: 3.71	L2: 3.85	0.98		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -4%	L1: --	L1: --	L1: --	--	121.1	500
	L2: 3.85	L2: 3.74	L2: 3.85	0.99		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -3%	L1: --	L1: --	L1: --	--	216.5	500
	L2: 3.85	L2: 3.78	L2: 3.85	0.99		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -2%	L1: --	L1: --	L1: --	--	153.3	500
	L2: 3.85	L2: 3.82	L2: 3.85	1.00		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -1%	L1: --	L1: --	L1: --	--	108.4	500
	L2: 3.85	L2: 3.86	L2: 3.85	1.00		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : 0%	L1: --	L1: --	L1: --	--	8.9	500
	L2: 3.85	L2: 3.90	L2: 3.85	1.01		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +1%	L1: --	L1: --	L1: --	--	104.8	500
	L2: 3.85	L2: 3.94	L2: 3.85	1.01		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +2%	L1: --	L1: --	L1: --	--	170.5	500
	L2: 3.85	L2: 3.98	L2: 3.85	1.02		
	L3: --	L3: --	L3: --	--		

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P _R : 0% Q _C : +3%	L1: --	L1: --	L1: --	--	64.6	500
	L2: 3.85	L2: 4.02	L2: 3.85	1.02		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +4%	L1: --	L1: --	L1: --	--	60.2	500
	L2: 3.85	L2: 4.06	L2: 3.85	1.03		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +5%	L1: --	L1: --	L1: --	--	47.6	500
	L2: 3.85	L2: 4.10	L2: 3.85	1.03		
	L3: --	L3: --	L3: --	--		

Power 33%						
Input : Vdc						
Conditions	P _R [kW]	Q _L [kVar]	Q _C [kVar]	Q _f	Trip time [ms]	Limitation [ms]
P _R : 0% Q _C : -5%	L1: --	L1: --	L1: --	--	137.8	500
	L2: 1.90	L2: 1.85	L2: 1.90	0.99		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -4%	L1: --	L1: --	L1: --	--	209.5	500
	L2: 1.90	L2: 1.87	L2: 1.90	0.99		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -3%	L1: --	L1: --	L1: --	--	227.1	500
	L2: 1.90	L2: 1.89	L2: 1.90	1.00		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -2%	L1: --	L1: --	L1: --	--	67.6	500
	L2: 1.90	L2: 1.91	L2: 1.90	1.00		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : -1%	L1: --	L1: --	L1: --	--	110.4	500
	L2: 1.90	L2: 1.93	L2: 1.90	1.01		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : 0%	L1: --	L1: --	L1: --	--	143.1	500
	L2: 1.90	L2: 1.95	L2: 1.90	1.01		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +1%	L1: --	L1: --	L1: --	--	190.5	500
	L2: 1.90	L2: 1.97	L2: 1.90	1.02		
	L3: --	L3: --	L3: --	--		
	L1: --	L1: --	L1: --	--	53.2	500

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P _R : 0% Q _C : +2%	L2: 1.90	L2: 1.99	L2: 1.90	1.02		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +3%	L1: --	L1: --	L1: --	--	57.2	500
	L2: 1.90	L2: 2.00	L2: 1.90	1.03		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +4%	L1: --	L1: --	L1: --	--	128.6	500
	L2: 1.90	L2: 2.03	L2: 1.90	1.03		
	L3: --	L3: --	L3: --	--		
P _R : 0% Q _C : +5%	L1: --	L1: --	L1: --	--	105.4	500
	L2: 1.90	L2: 2.05	L2: 1.90	1.04		
	L3: --	L3: --	L3: --	--		

Note(s):

8.2	TABLE: Loss of Mains Protection, Vector Shift Stability test:			P
	Start Frequency	Change	Measurement	Limit
Positive Vector Shift	49.5Hz	+50degree	No trip	No trip
Negative Vector Shift	50.5Hz	-50degree	No trip	No trip

8.3	TABLE: Loss of Mains Protection, RoCoF Stability test:			P
Ramp range	Test frequency ramp	Test Duration	Measurement	Limit
49.0 Hz to 51.0 Hz	+ 0.95 Hz/s	2.1 s	No trip	No trip
51.0 Hz to 49.0 Hz	- 0.95 Hz/s	2.1 s	No trip	No trip

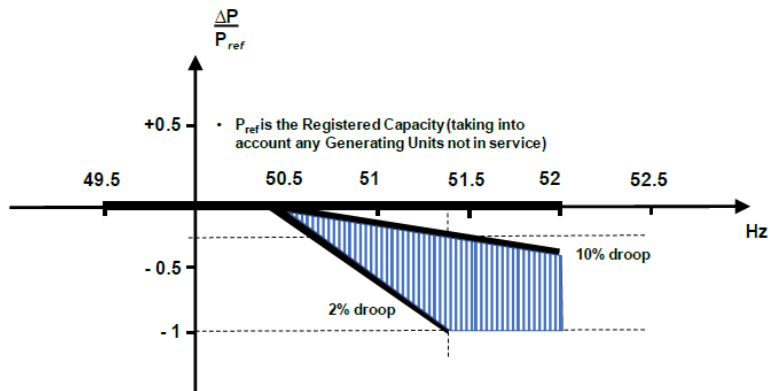
9.1	TABLE: Limitest frequency sensitive mode-over frequency (LFSM-O)								P	
Test No. 1										
Test Conditio ns	Measurements							Limitation		
f [Hz]	P [W]	P/Pn	f [Hz]	T _{rise} [s]	T _{settling} [s]	Tv [s]	Droop	Droop	T _{rise} [s]	Tv [s]
a) 50	5988.99	99.82 %	50	--	--	--	--	8.5%≤Droop ≤12.8%	≤10	≤2
b) 50.45	5935.24	98.92 %	50.45	0.7	0.9	0.1	11.16			
c) 50.7	5639.55	93.99 %	50.7	0.9	2.7	0.1	10.30			
d) 51.15	5024.18	83.74 %	51.15	1.6	2	0.1	9.33			
e) 50.7	5640.41	94.01 %	50.7	6.3	6.6	0.1	10.33			
f) 50.45	5930.88	98.85 %	50.45	1.6	2.8	0.1	10.33			
g) 50	5983.18	99.72 %	50	1.1	1.9	0.1	--			
Test No. 2										
Test Conditio ns	Measurements							Limitation		
f [Hz]	P [W]	P/Pn	f [Hz]	T _{rise} [s]	T _{settling} [s]	Tv [s]	Droop	Droop	T _{rise} [s]	Tv [s]
a) 50	3001.08	50.09 %	50	--	--	--	--	8.5%≤Droop ≤12.8%	≤10	≤2
b) 50.45	2941.14	49.64 %	50.45	1.9	2.1	0.1	10.01			
c) 50.7	2655.16	47.20 %	50.7	1.6	2.2	0.1	10.41			
d) 51.15	2103.34	42.86 %	51.15	1.5	1.7	0.1	10.03			
e) 50.7	2644.40	47.02 %	50.7	1.4	1.6	0.1	10.09			
f) 50.45	2945.39	49.56 %	50.45	1.5	2.1	0.1	10.77			
g) 50	3008.58	50.26 %	50	0.6	1.5	0.1				

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Note(s):

P(f) curve setting for test: f1: 50.4Hz; fstop: 50.4Hz (Deactivated); Droop: 10%



10	TABLE: Protection-Reconnection timer (Reconnection)				P
Condition	Measurement		Limitation		
	Delay time [s]	Power Gradient [per minute]	Delay time [s]	Power Gradient	
Reconnection:					
1.12Un	60.2	--	60	--	
0.82Un	61.8	--			
47.6Hz	61.6	--			
51.9Hz	61.8	--			
1.16Un	No reconnection	--	No reconnection	--	
0.78Un	No reconnection	--			
47.4Hz	No reconnection	--			
52.1Hz	No reconnection	--			
Note(s):					

11	TABLE: Fault level contribution		P
Test Condition	Measurement		
	U [V]	I [A]	
20ms after fault	234.30	26.15	
100ms after fault	230.21	25.72	
250ms after fault	152.18	0.94	
500ms after fault	149.04	0.69	
Trip time [s]	0.116		

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12	TABLE: Self-Monitoring solid state switching	P
It has been verified that in the event of the solid state switching device failing to disconnect the Power Park Module, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0.5 s.		P

13	TABLE: Wiring functional tests	P
Confirm that the relevant test schedule is attached (tests to be undertaken at time of commissioning)		P

14	TABLE: Logic interface (input port).	P
Confirm that an input port is provided and can be used to shut down the module.		P

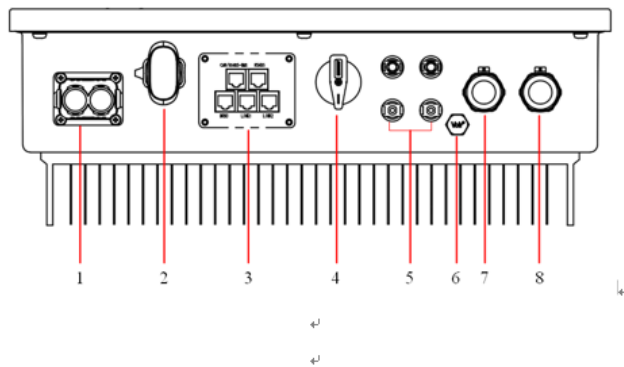


Table 4-2 Definition of external terminals

1	Battery DC input port (BAT+/-)	5	PV DC input port (PV+/-)
2	WIFI/4G/Bluetooth	6	Explosion-proof ventilation device
3	Multifunctional communication interface	7	Grid-connected AC wiring port
4	PV DC input switch	8	Load wiring port



DRM0 interface

PIN	Definition	Function	Remarks
1	DRM0+	When DRM0+ and DRM0- are shorted, the inverter will be off the grid within 5s. Note1: In normal cases, the two interfaces should remain disconnected. Note2: These two points cannot input high levels, , only short or disconnect.	DRM0 logical interface
2	/		
3	/		
4	/		
5	/		
6	DRM0-		
7	OP-	Normally open dry contact signal ($\leq 1A$)	External dry contact interface
8	OP+		

15	TABLE: Cyber security	P
Confirm that the Power Generating Module has been designed to comply with cyber security requirements, as detailed in 9.1.7. The manufacturer has provided the declaration document that the products meet the requirements. In accordance with the provisions of the relevant specific protocol PDPP_A_001, In reference with General Data Protection Regulation (EU) 2016/679.		P

PHOTO DOCUMENTATION

CN23HOMA 001 attachment 2

for

Hybrid Inverter

Isuna 3000S, Isuna 3600S, Isuna 4000S,
Isuna 4600S, Isuna 5000S, Isuna 6000S

**Shenzhen Sinexcel isuna Energy
Technology Co., Ltd**



This documentation consists of 10 pages (excluding this cover page)

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S



Figure 1 overall view



Figure 2 Top view

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Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

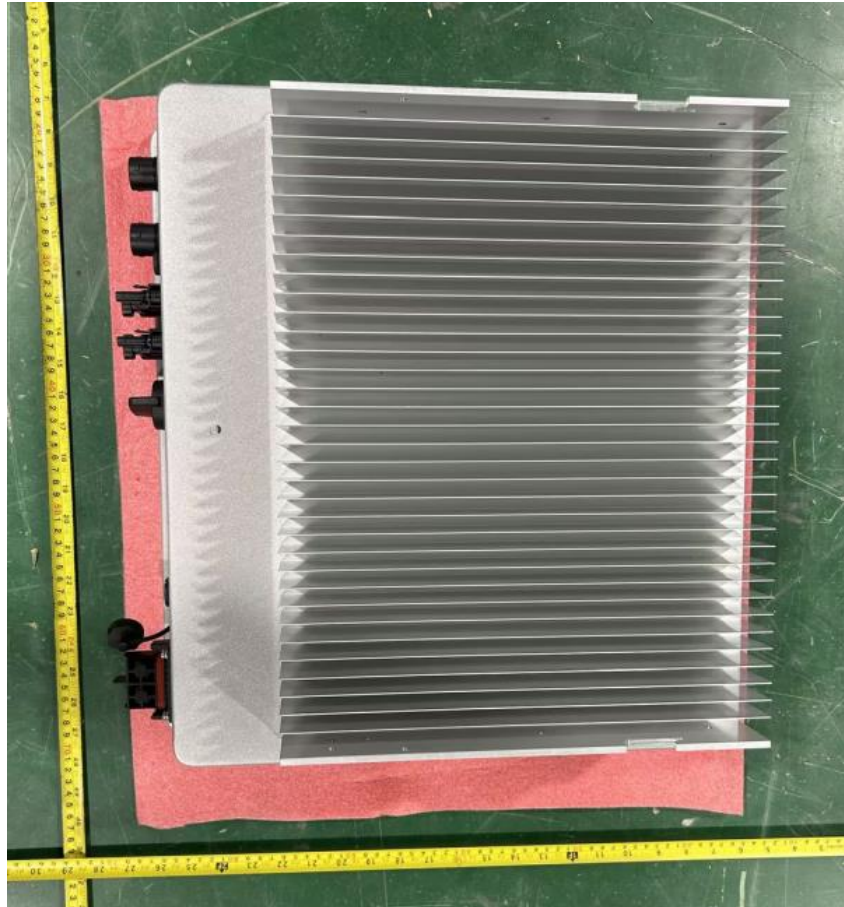


Figure 3 Rear view

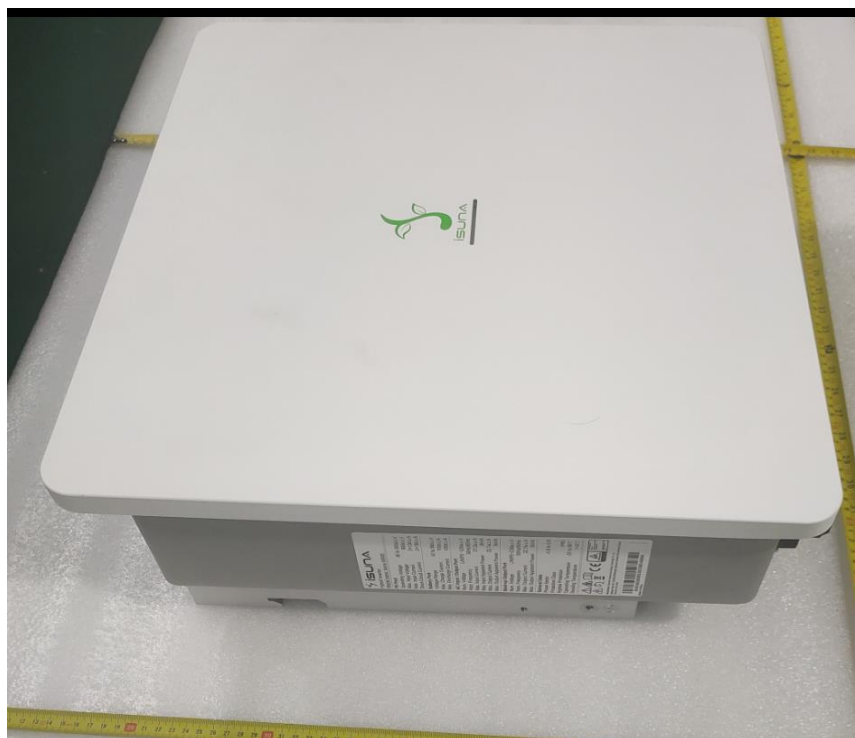


Figure 4 Left side view

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

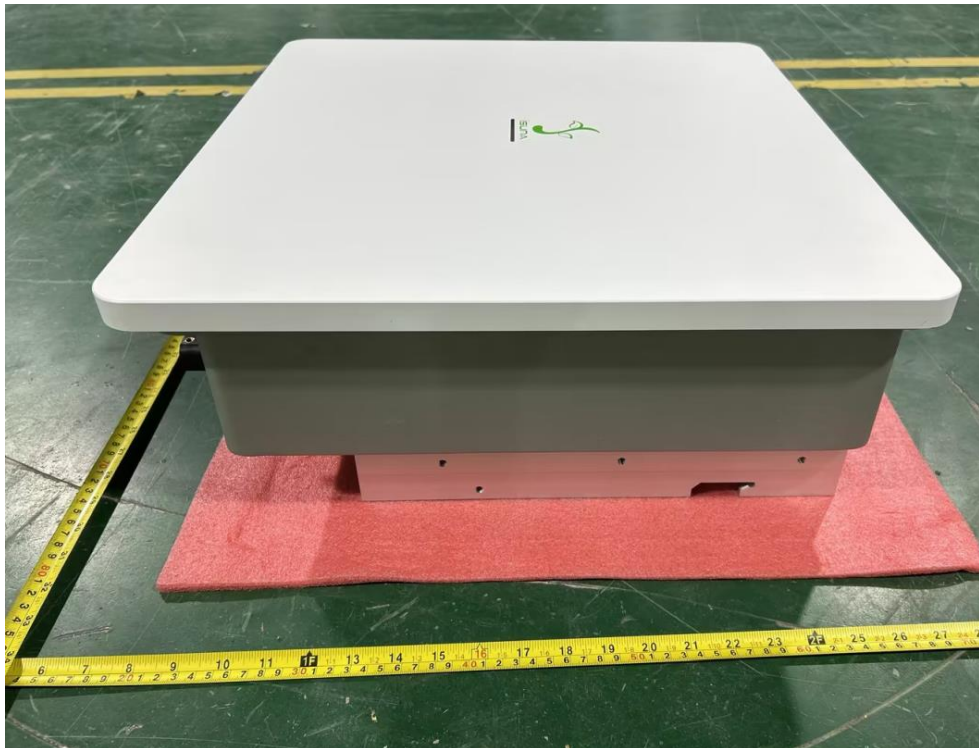


Figure 5 Right side view



Figure 6 Bottom view

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

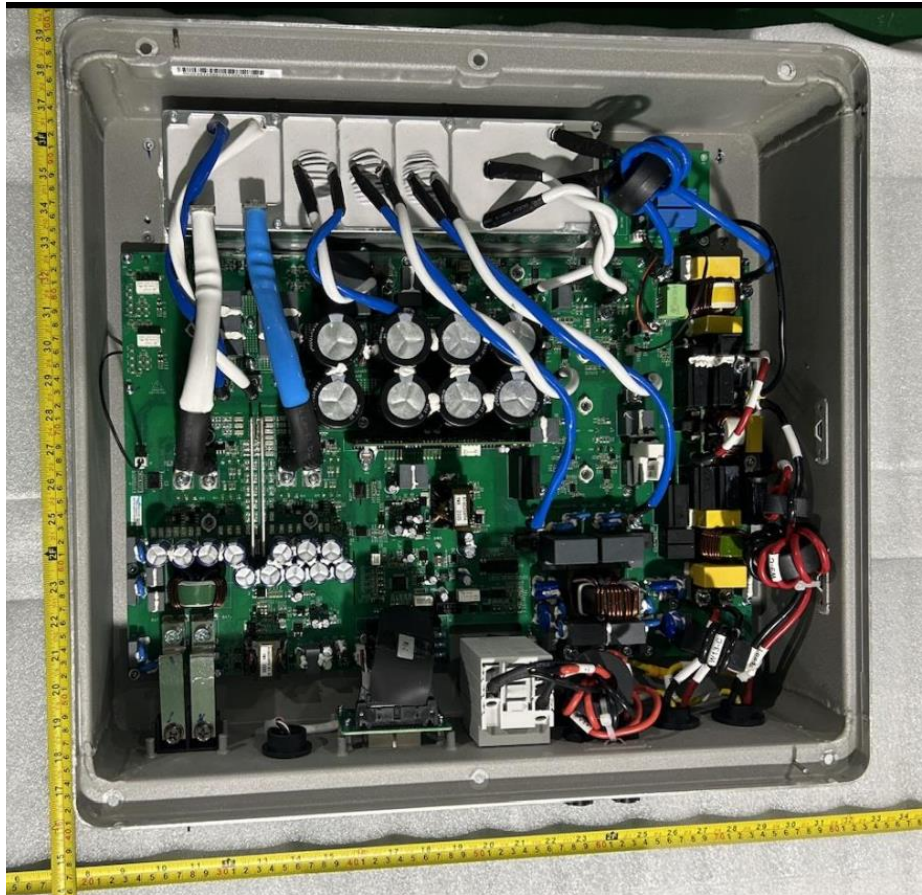


Figure 7 internal view

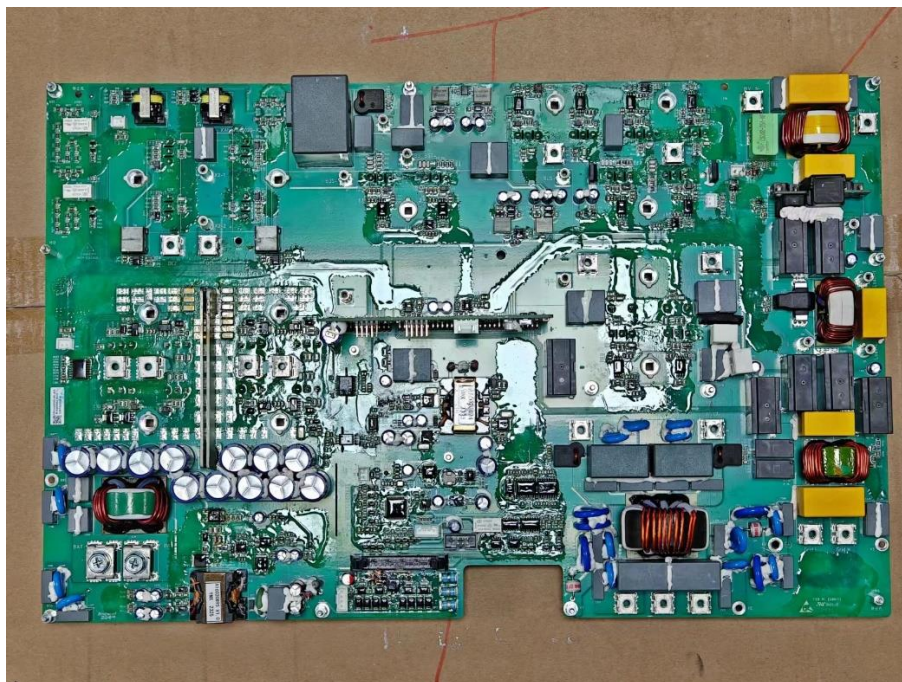


Figure 8 Component side of main power board

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

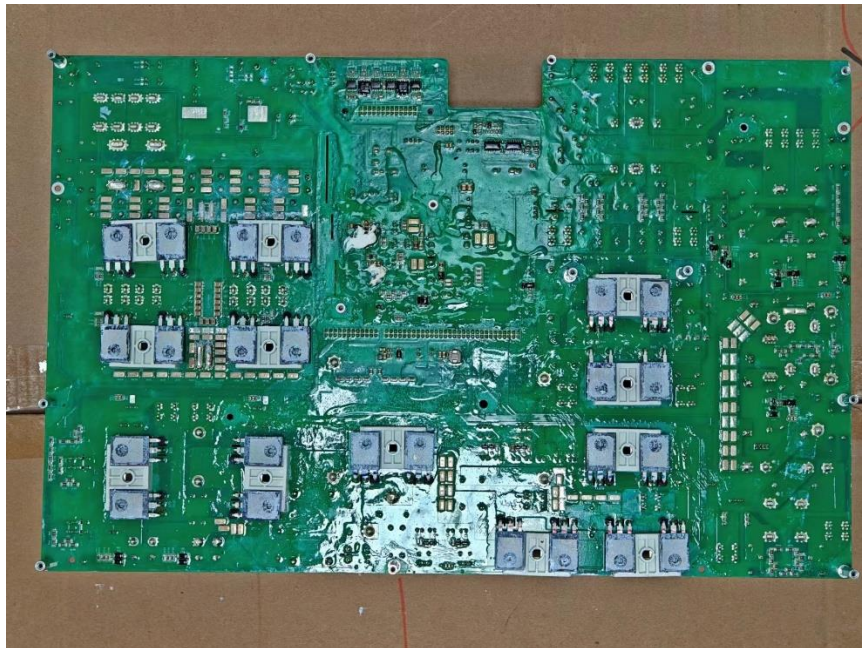


Figure 9 Trace side of main power board

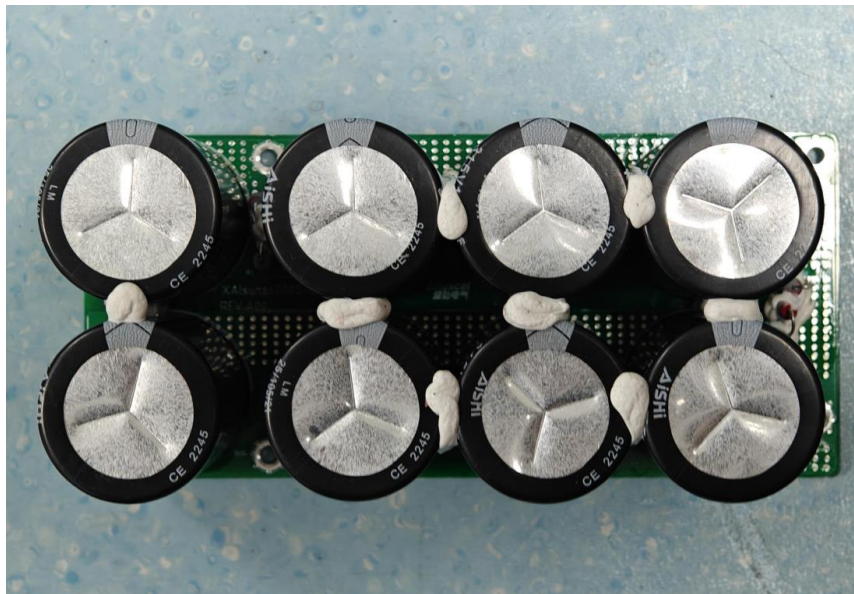


Figure 10 Component side of BUS. capacitor board

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S



Figure 11 Trace side of BUS. capacitor board

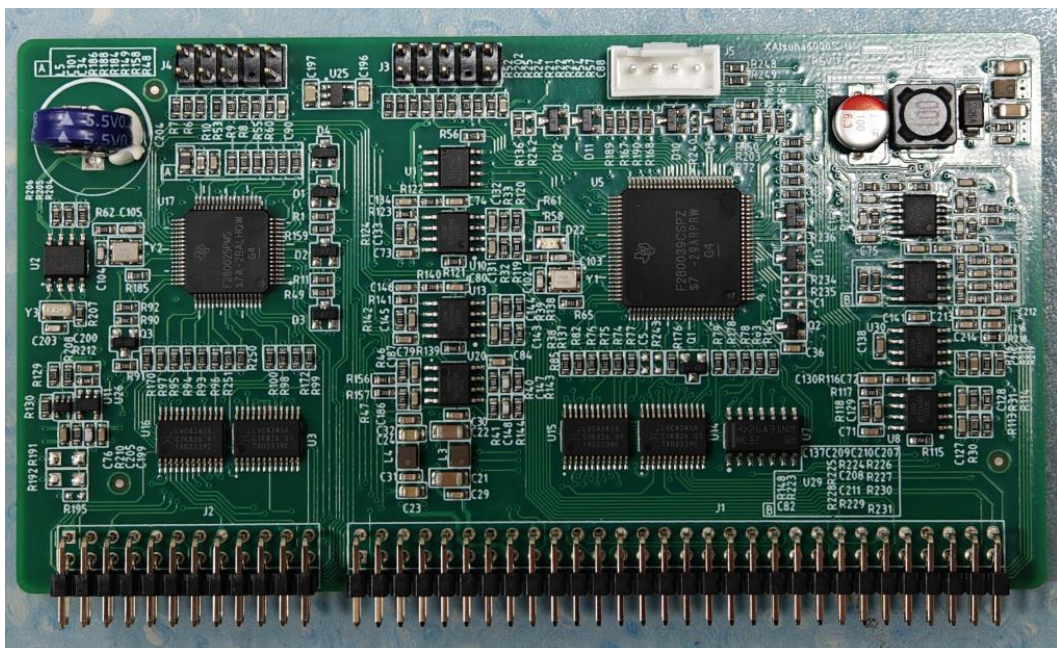


Figure 12 Component side of Control board

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

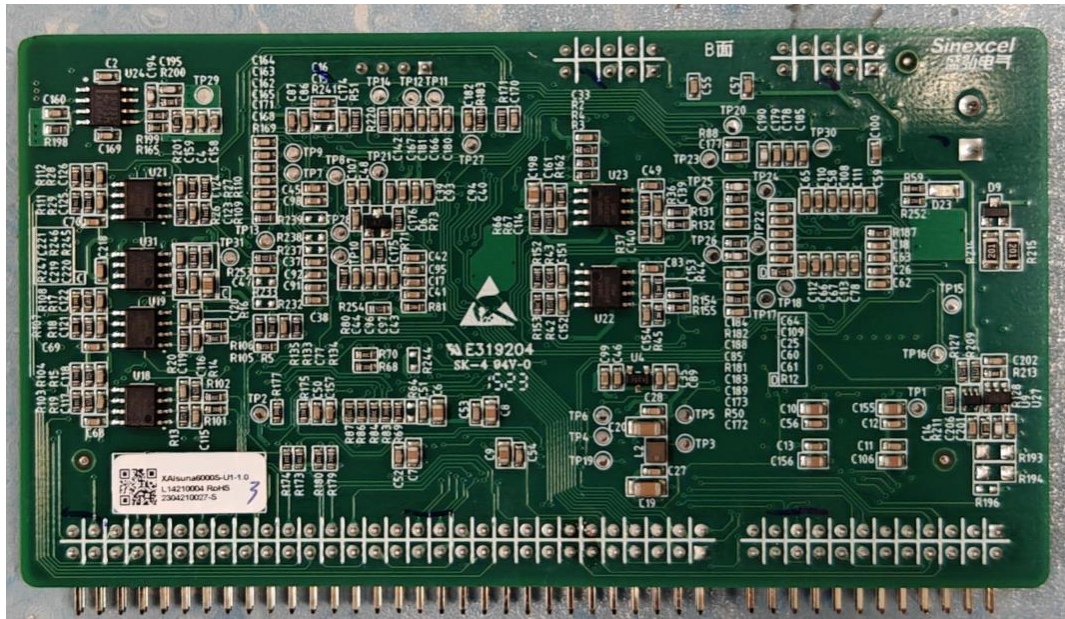


Figure 12 Trace side of Control board

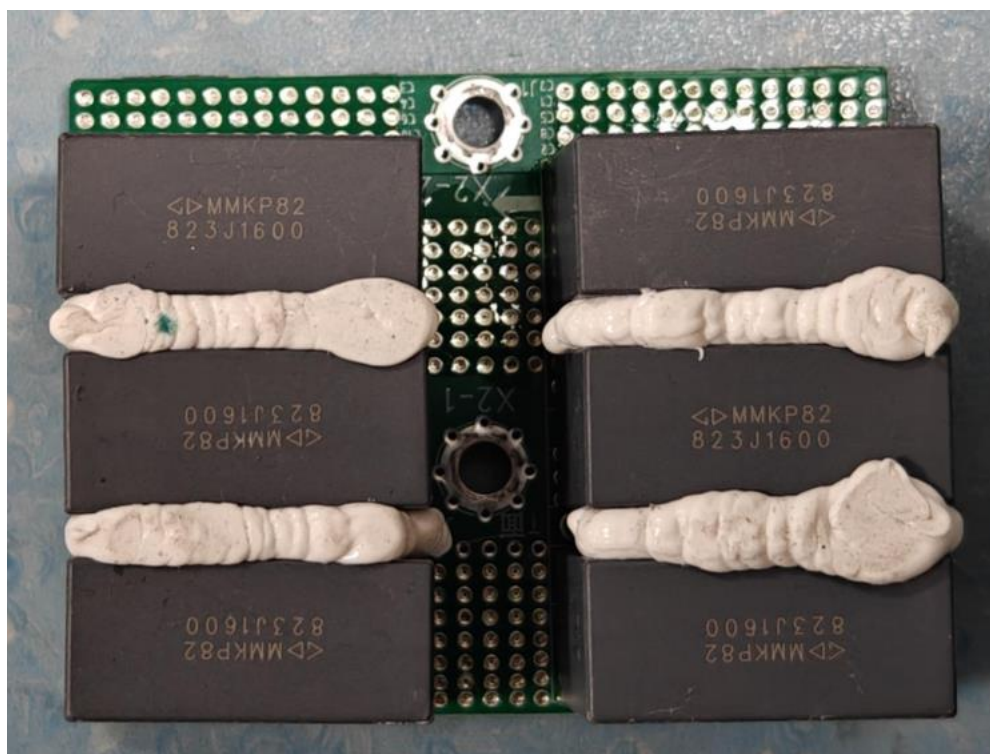


Figure 14 Component side of resonant capacitor board

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

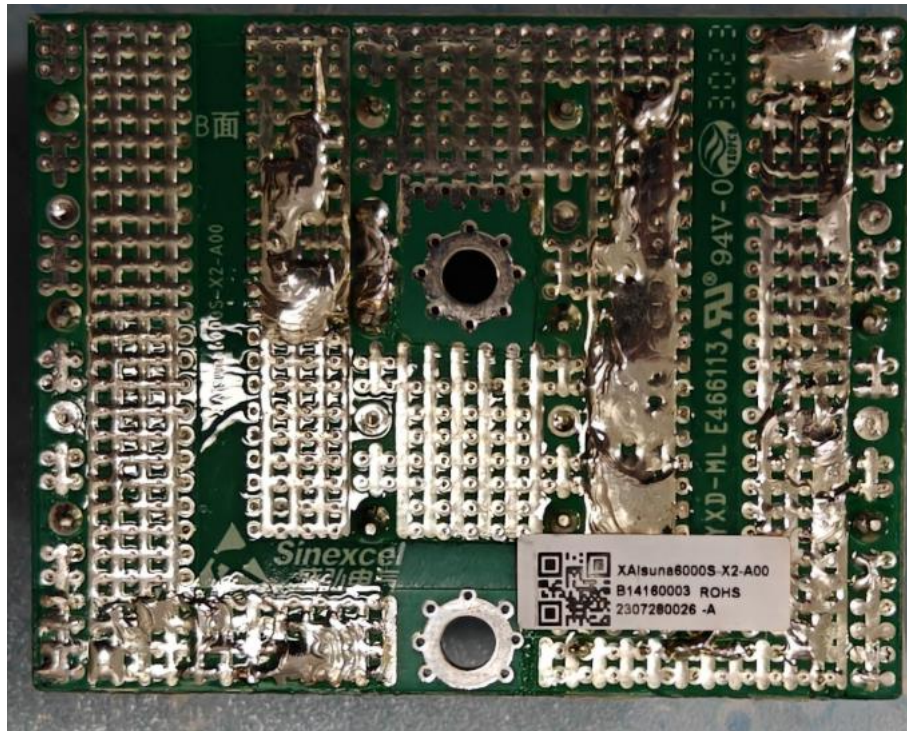


Figure 15 Trace side of resonant capacitor board

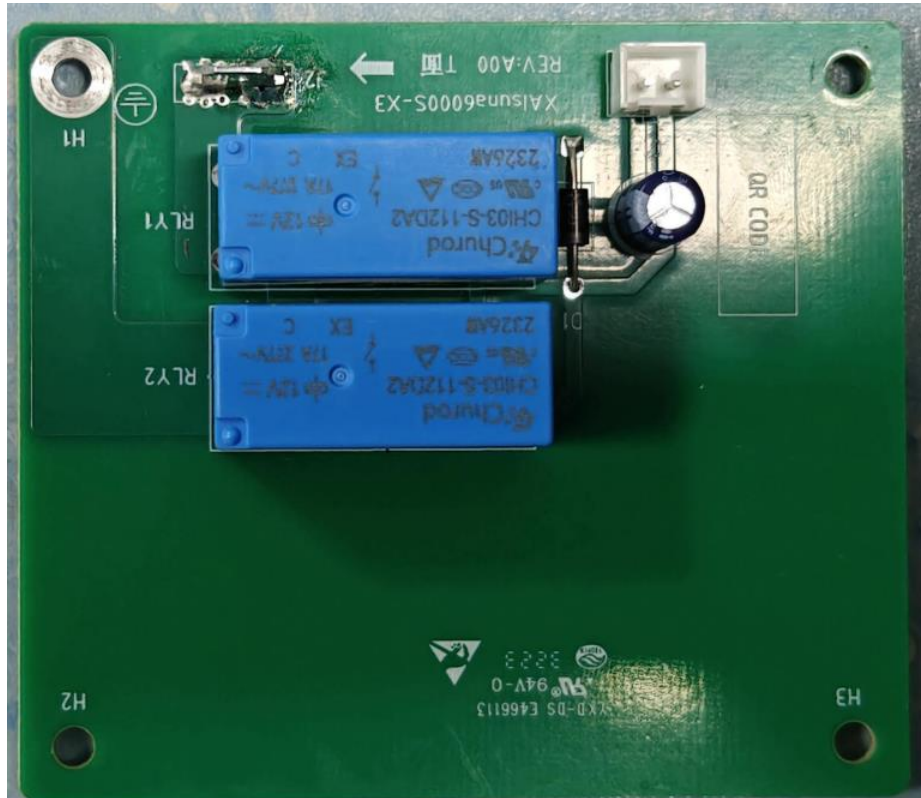


Figure 16 Component side of PE relay board

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

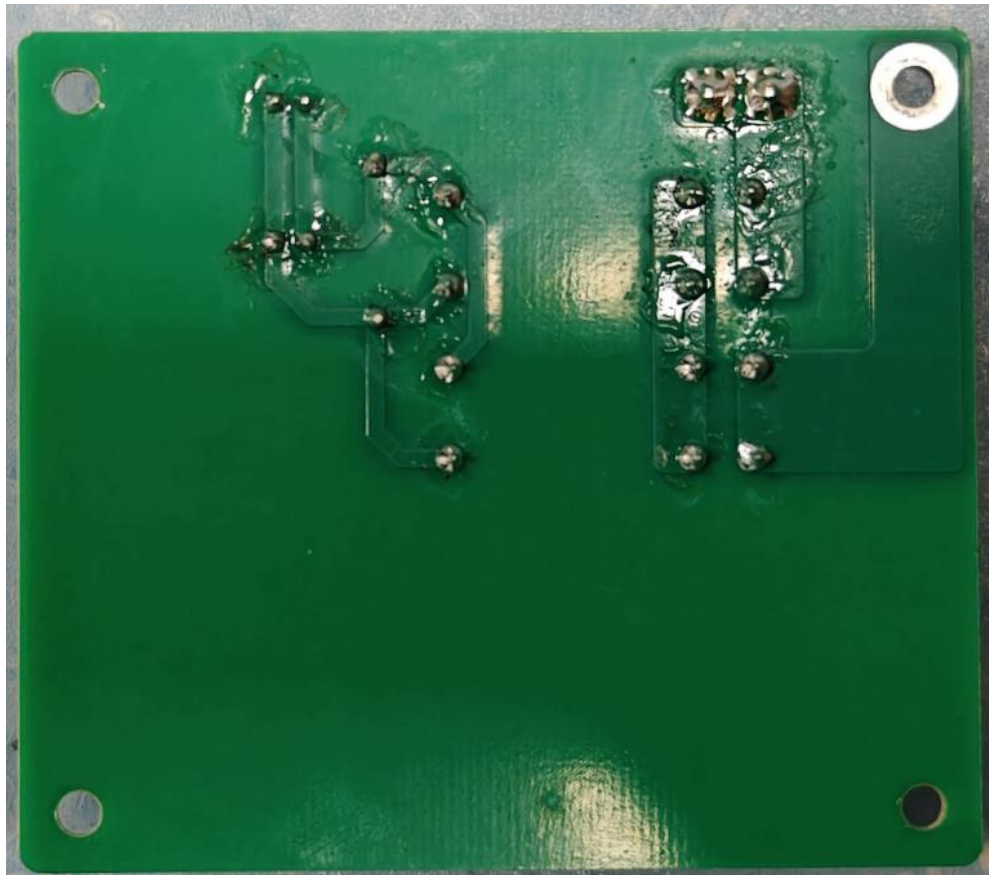


Figure 17 Trace side of PE relay board



Figure 18 Top of Communication interface board

Report Number: CN23HOMA 001

Model: Isuna 3000S, Isuna 3600S, Isuna 4000S, Isuna 4600S, Isuna 5000S, Isuna 6000S

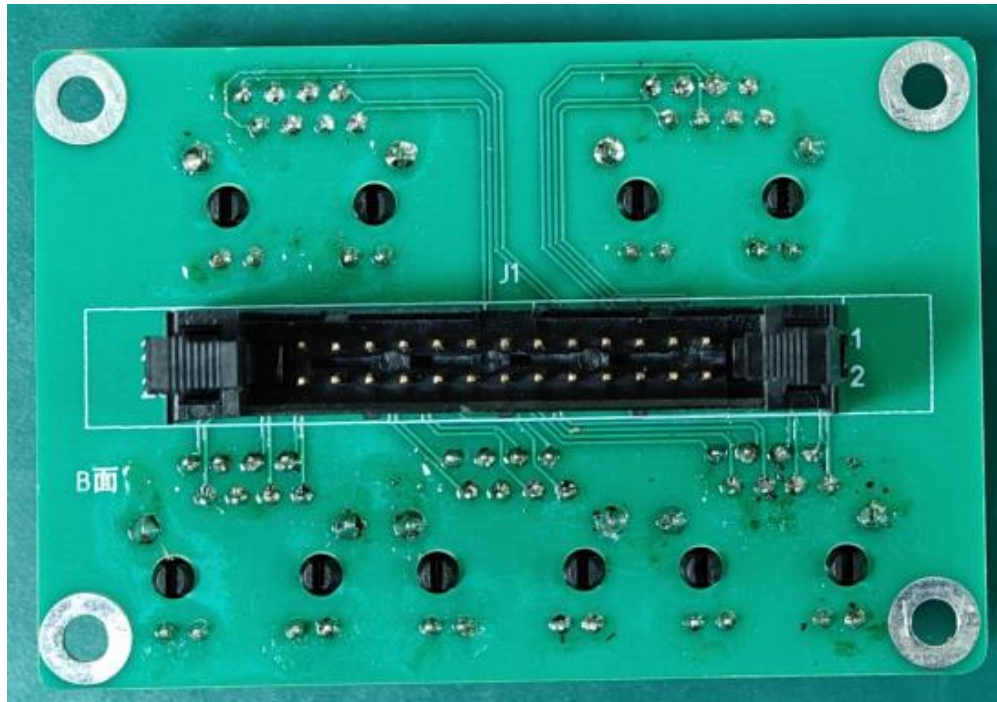


Figure 19 Bottom of Communication interface board



Figure 20 internal view of Transformer T17 and inductors L21~25