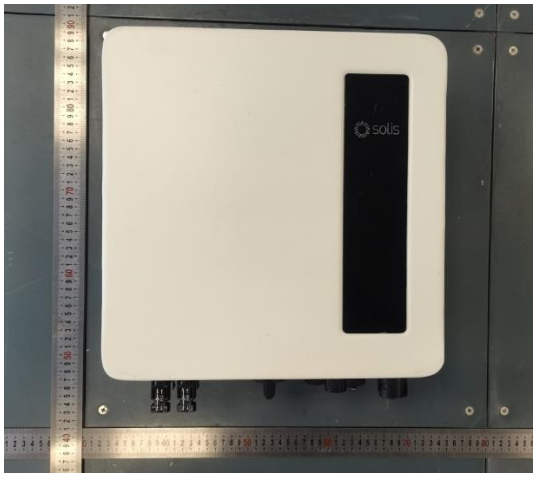
Prüfbericht-Nr.: *Test report no.:*	**CN23J12O 001**	**Auftrags-Nr.:** *Order no.*:	244517757	**Seite 1 von 13** *Page 1 of 13*
Kunden-Referenz-Nr.: *Client reference no.:*	2177511	**Auftragsdatum:** *Order date:*	2023.05.24	
Auftraggeber: *Client:*	Ginlong technologies Co., Ltd. No.57 Jintong Road, Binhai, (seafront) industrial Park, Xiangshan, Ningbo, zhejiang, 315712, P.R. China			
Prüfgegenstand: *Test item:*	Grid Connected PV Inverter			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	S6-GR1P2.5K-S, S6-GR1P3K-S, S6-GR1P3.6K-S, S6-GR1P4K-S, S6-GR1P4.6K-S, S6-GR1P5K-S, S6-GR1P6K-S			
Auftrags-Inhalt: *Order content*:	AK certificate			
Prüfgrundlage: *Test specification:*	G99/1-9 *Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019*			

Wareneingangsdatum: *Date of sample receipt:*	2023.05.24
Prüfmuster-Nr.: *Test sample no:*	A003492951-002
Prüfzeitraum: *Testing period:*	2023.05.24 – 2023.06.08
Ort der Prüfung: *Place of testing:*	TÜV Rheinland (Shanghai) Co., Ltd.
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shanghai) Co., Ltd.
Prüfergebnis*: *Test result*:*	Pass



geprüft von: *tested by:*	Eva Wu	**genehmigt von:** *authorized by:*	Jingge Pan
Datum: *Date:*	2023.06.12	**Ausstellungsdatum:** *Issue date:*	2023.06.12
Stellung / *Position:*	Engineer	**Stellung** / *Position:*	Reviewer

Sonstiges /
Other:

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

V05

Anmerkungen
Remarks

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. *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.* *Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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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. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen 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 bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *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.*

Liste der verwendeten Prüfmittel
List of used test equipment

Equip.	Description	Model	Manufacturer
9017073	Power Analyser(DEWETRON)	DEWE2-PA7	Austria, DEWETRON
9017078	Programmable AC Source(61860)	61860	Chroma ATE INC.
G1819269	Harmonic impedance analog flicker system	ACLT-6150	QUNLING Energy Resources
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

Produktbeschreibung
Product description

Copy of marking plate:

solis

Model:	S6-GR1P2.5K-S
Max.input voltage d.c.	550V
Mppt voltage range d.c.	50-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	2500W
Max.AC output active power	2500W
Max.AC output apparent power	2500VA
Max.continuous output current a.c.	11.4A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310004

CE UKCA

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

solis

Model:	S6-GR1P3K-S
Max.input voltage d.c.	550V
Mppt voltage range d.c.	90-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	3000W
Max.AC output active power	3000W
Max.AC output apparent power	3000VA
Max.continuous output current a.c.	13.6A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310006

CE UKCA

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

Produktbeschreibung
Product description

solis

Model:	S6-GR1P3.6K-S
Max.input voltage d.c.	550V
Mppt voltage range d.c.	90-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	3600W
Max.AC output active power	3600W
Max.AC output apparent power	3600VA
Max.continuous output current a.c.	16A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310015

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

solis

Model:	S6-GR1P4K-S
Max.input voltage d.c.	550V
Mppt voltage range d.c.	90-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	4000W
Max.AC output active power	4000W
Max.AC output apparent power	4000VA
Max.continuous output current a.c.	18.2A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310008

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

Produktbeschreibung
Product description

solis

Model:	S6-GR1P4.6K-S
Max.input voltage d.c.	550V
Mppt voltage range d.c.	90-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	4600W
Max.AC output active power	4600W
Max.AC output apparent power	4600VA
Max.continuous output current a.c.	20.9A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310007

CE UKCA

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

solis

Model:	S6-GR1P5K-S
Max.input voltage d.c.	550V
Mppt voltage range d.c.	90-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	5000W
Max.AC output active power	5000W
Max.AC output apparent power	5000VA
Max.continuous output current a.c.	22.7A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310009

CE UKCA

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

Produktbeschreibung
Product description

solis

Model: S6-GR1P6K-S

Max.input voltage d.c.	550V
Mppt voltage range d.c.	90-550V
Max.input current d.c.	2X16A
Isc PV(absolute maximum) d.c.	2X22A
Rated grid voltage a.c.	1/N/PE,220V/230V
Rated grid frequency	50/60Hz
Rated output power	6000W
Max.AC output active power	6000W
Max.AC output apparent power	6000VA
Max.continuous output current a.c.	27.3A
Adjustable cos(φ)	-0.8...1...+0.8
Operating temperature range	-25...+60℃
Ingress protection	IP66
Protective class	I
Overvoltage category	II(PV) III(MAINS)
Inverter topology	Non-isolated

S/N:
11021222A310000

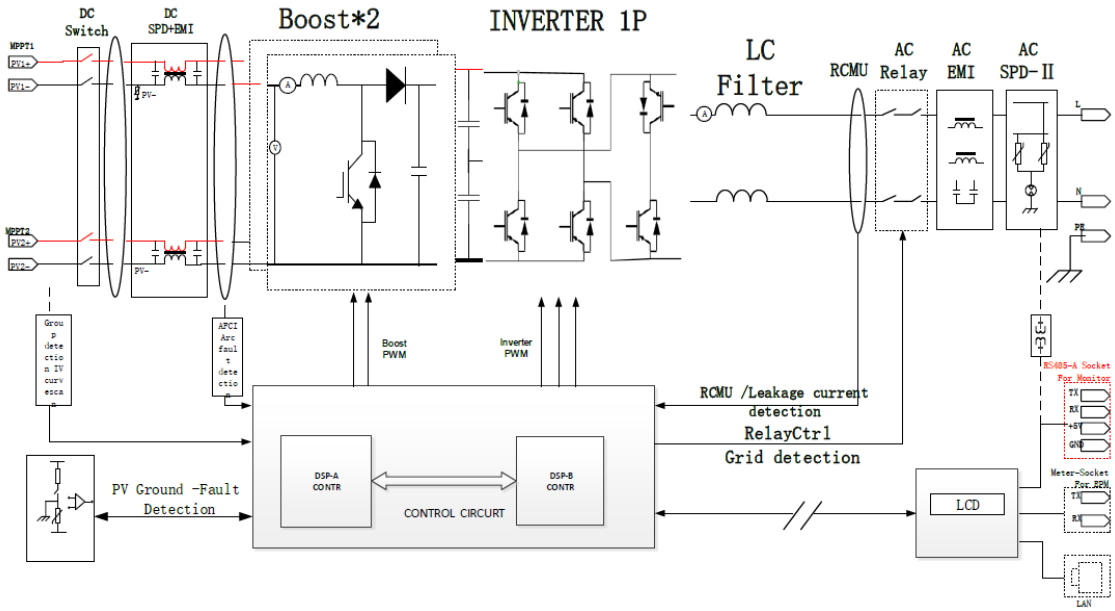
CE UKCA

Name: Ginlong Technologies Co.,Ltd.
Address:No.57 Jintong Road,Binhai Industrial Park,
Xiangshan,Ningbo,Zhejiang,315712,P.R.China
www.solisinverters.com Made in China

Produktbeschreibung
Product description

Breif description:

The PCEs under test S6-GR1P2.5K-S, S6-GR1P3K-S, S6-GR1P3.6K-S, S6-GR1P4K-S, S6-GR1P4.6K-S, S6-GR1P5K-S, and S6-GR1P6K-S are three-phase grid connected inverter for solar power generation. The Grid-connected PV Inverter utilize the advanced power conversion technology IGBT to convert the DC power normally from the photovoltaic array to stable three-phase AC power and then feed the power to the utility grid.



Block diagram

Interface relays disconnect the equipment from utility in case any one of following grid faults occurred:

1. PV array insulation resistance fault
2. Residual current fault
3. Over & under grid voltage
4. Over & under grid frequecny
5. Islanding operation
6. Over DC injection current

Model Difference:
All models are technical equivalent on hard and software, except for MPPT numbers, electrical ratings and model name.

Unless otherwise specified, all tests were performed on S6-GR1P6K-S to represent other family models.
All tests were performed under 230V, 50Hz grid condition.

The product was tested on:

Software version: A1

Test condition:
Temperature: 25°C Relative humidity: 65%

Produktbeschreibung
Product description

Model List:

MODELS LIST		S6-GR1P2.5K-S	S6-GR1P3K-S	S6-GR1P3.6K-S
PV INPUT	$V_{MAX\ PV}$ [Vdc]	550		
	MPP Voltage Range V_{MPP} [Vdc]	50-550	90-550	
	MPP Full Power Voltage Range [Vdc]	114-400	141-500	169-500
	$I_{SC\ PV}$ [A]	22/22		
	Max. Input Current I_{MAX} [A]	16/16		
	Overvoltage Category (OVC)	II		
AC OUTPUT	Rated Output Voltage Un [Vac]	1/N/PE, 220/230		
	Rated Output Frequency Fn [Hz]	50/60		
	Grid frequency range[Hz]	45-55/55-65		
	Rated Output Power P_n [W]	2500	3000	3600
	Max. Active Power P_{Emax} [W]	2500	3000	3600
	Max. Output Current I_{max} [A]	11.4	13.6	16.0
	Power Factor Range cosφ [λ]	> 0.99 (0.8 leading - 0.8 lagging)		
	Overvoltage Category (OVC)	III		
General Data	Operation Temperature (℃)	-25°C to +60°C		
	Enclosure Protection (IP)	IP66		
	Protective class	I		
	Dimensions (W*H*D)[mm]	330*371*161		
	Weight [kg]	8.2	8.3	
	Firmware version	A1		

Produktbeschreibung
Product description

MODELS LIST		S6-GR1P4K-S	S6-GR1P4.6K-S
PV INPUT	$V_{MAX\ PV}$ [Vdc]	550	
	MPP Voltage Range V_{MPP} [Vdc]	90-550	
	MPP Full Power Voltage Range [Vdc]	187-500	216-500
	$I_{SC\ PV}$ [A]	22/22	
	Max. Input Current I_{MAX} [A]	16/16	
	Overvoltage Category (OVC)	II	
AC OUTPUT	Rated Output Voltage Un [Vac]	1/N/PE, 220/230	
	Rated Output Frequency Fn [Hz]	50/60	
	Grid frequency range[Hz]	45-55/55-65	
	Rated Output Power P_n [W]	4000	4600
	Max. Active Power P_{Emax} [W]	4000	4600
	Max. Output Current I_{max} [A]	18.2	20.9
	Power Factor Range cosφ [λ]	> 0.99 (0.8 leading - 0.8 lagging)	
	Overvoltage Category (OVC)	III	
General Data	Operation Temperature (℃)	-25°C to +60°C	
	Enclosure Protection (IP)	IP66	
	Protective class	I	
	Dimensions (W*H*D)[mm]	330*371*161	
	Weight [kg]	8.9	8.9
	Firmware version	A1	

Produktbeschreibung
Product description

MODELS LIST		S6-GR1P5K-S	S6-GR1P6K-S
PV INPUT	$V_{MAX\ PV}$ [Vdc]	550	
	MPP Voltage Range V_{MPP} [Vdc]	90-550	
	MPP Full Power Voltage Range [Vdc]	234-500	281-500
	$I_{SC\ PV}$ [A]	22/22	
	Max. Input Current I_{MAX} [A]	16/16	
	Overvoltage Category (OVC)	II	
AC OUTPUT	Rated Output Voltage Un [Vac]	1/N/PE, 220/230	
	Rated Output Frequency Fn [Hz]	50/60	
	Grid frequency range[Hz]	45-55/55-65	
	Rated Output Power P_n [W]	5000	6000
	Max. Active Power P_{Emax} [W]	5000	6000
	Max. Output Current I_{max} [A]	22.7	27.3
	Power Factor Range cosφ [λ]	> 0.99 (0.8 leading - 0.8 lagging)	
	Overvoltage Category (OVC)	III	
General Data	Operation Temperature (℃)	-25°C to +60°C	
	Enclosure Protection (IP)	IP66	
	Protective class	I	
	Dimensions (W*H*D)[mm]	330*371*161	
	Weight [kg]	8.9	9
	Firmware version	A1	

Absatz *Clause*	Anforderungen - Prüfungen *Requirements - Tests*	Messergebnisse - Bemerkungen *Measuring results - Remarks*	Bewertung *Evaluation*
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.: CN23J12O 001
APPENDIX to Test Report No.:

ZUSATZ-DOKUMENTATION
ADDITIONAL DOCUMENTATION

See attachment for test data.

Prüfbericht-Nr.: CN23J12O 001
Test report no.:

Project Engineer:	Eva Wu	Reviewer:	Jingge Pan
Signature:		Signature:	

Testing Location:	
Name:	TÜV Rheinland (Shanghai) Co., Ltd.
Address:	No.177, 178, Lane 777 West Guangzhong Road, Jing'an District,Shanghai, China

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

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.

2.1	TABLE: Harmonics current (THDi) （model 6K）				P
P/Pn[%]	50		100		Limit
Order No.	Measurement				
	[A]	Ih/In [%]	[A]	Ih/In [%]	Ih/In [%]
1	13.07	47.875	25.84	94.652	--
2	0.041	0.157	0.106	0.405	8.0
3	0.174	0.666	0.173	0.662	--
4	0.011	0.041	0.085	0.327	4.0
5	0.179	0.687	0.380	1.457	10.7
6	0.015	0.059	0.077	0.296	2.67
7	0.139	0.532	0.236	0.906	7.2
8	0.010	0.037	0.017	0.065	2.0
9	0.097	0.373	0.158	0.605	--
10	0.010	0.038	0.017	0.066	1.6
11	0.081	0.309	0.136	0.522	3.1
12	0.003	0.010	0.010	0.038	1.33
13	0.060	0.231	0.107	0.411	2.0
THD[27]	1.28%		THD[29]	2.23%	13
PWHD[28]	3.30%		PWHD[30]	5.99%	22

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

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

3.1	TABLE: Power Quality – Voltage fluctuations and Flicker: (model 6K)							P
	Starting			Stopping			Running	
	dmax[%]	dc[%]	d(t)[ms]	dmax[%]	dc[%]	d(t)[ms]	P_{st}	P_{lt} 2 hours
Measured value at test impedance	0.174	0.064	0.0	0.173	0.062	0.0	0.226	0.240
Z_{ref} Normalised to standard impedance	0.174	0.064	0.0	0.173	0.062	0.0	0.226	0.240
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 choosed. Since the nominal current of product In>75A, the following extra flicker table 3.2 has been also impelmented per BS EN 61400-21, as the requirement of EREC P28, clause 8.8.								

4	TABLE: Power quality – DC injection:		P
Test power level	10%	55%	100%
Recorded DC value in Amps	0.0294	0.0376	0.0461
as % of rated AC current	0.113%	0.144%	0.177%
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 [Var]	cosφ	U [V]	I [A]	cosφ
100%	1.00	0.94	5902.75	25.76	0.9995	216.2	25.86	>0.95
100%	1.00	1.0	5921.98	23.99	0.9997	230	25.79	>0.95
100%	1.00	1.1	6021.91	26.57	0.9995	253	25.13	>0.95
Note(s):								

6	TABLE: Protection-Frequency tests (OF/UF)		P
Condition	Setting [Hz]	Measurement	Limitation
		Trip value [Hz]	
F>>	52.0	52.01	± 0.1% of f_n
F<	47.5	47.48	
F<<	47	47.01	
Condition	Setting [ms]	Measurement	Limitation [ms]
		Time delay	
F>>	500	522.0	500-600
F<	20000	20032	20000-20100
F<<	500	521	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):			

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)	273.4	--	--	--	± 1% of U_n
U>	1.14 (262.2 V)	261.9	--	--	--	
U<<	0.80(184 V)	184.2	--	--	--	
Condition	Setting [ms]	Measurement				Limitation
		Time delay				
		L1	L2	L3	L123	
U>>	500	528	--	--	--	500-600
U>	1000	1023	--	--	--	1000-1100
U<<	2500	2524	--	--	--	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):						

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: 6.07	L1: 7.40	L1: 7.39	1.11	347	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -10% Q_C: +5%	L1: 6.09	L1: 7.25	L1: 7.21	1.14	347	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -10% Q_C: 0%	L1: 6.07	L1: 7.18	L1: 7.23	1.08	365	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -10% Q_C: -5%	L1: 6.06	L1: 7.25	L1: 7.27	1.05	342	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -10% Q_C: -10%	L1: 6.09	L1: 7.25	L1: 7.21	1.11	378	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -5% Q_C: +10%	L1: 6.07	L1: 7.27	L1: 7.29	1.15	394	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -5% Q_C: -10%	L1: 6.08	L1: 7.27	L1: 7.26	1.16	341	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: +10%	L1: 6.09	L1: 7.21	L1: 7.26	1.09	373	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -5% Q_C: +5%	L1: 6.09	L1: 7.28	L1: 7.25	1.05	362	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: -5% Q_C: 0%	L1: 6.09	L1: 7.26	L1: 7.24	1.11	367	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			

P_R: -5% Q_C: -5%	L1: 6.06	L1: 7.25	L1: 7.28	1.10	346	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: +5%	L1: 6.10	L1: 7.26	L1: 7.27	1.05	349	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: 0%	L1: 6.08	L1: 7.24	L1: 7.26	1.05	335	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: -5%	L1: 6.05	L1: 7.27	L1: 7.33	1.05	321	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +5% Q_C: +5%	L1: 6.06	L1: 7.28	L1: 7.29	1.13	330	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +5% Q_C: 0%	L1: 6.08	L1: 7.26	L1: 7.26	1.13	302	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +5% Q_C: -5%	L1: 6.05	L1: 7.24	L1: 7.28	1.03	315	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: -10%	L1: 6.07	L1: 7.26	L1: 7.23	1.06	302	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +5% Q_C: +10%	L1: 6.06	L1: 7.25	L1: 7.29	1.11	330	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +5% Q_C: -10%	L1: 6.10	L1: 7.32	L1: 7.29	1.20	444	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +10% Q_C: +10%	L1: 6.08	L1: 7.26	L1: 7.25	1.13	329	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
	L1: 6.04	L1: 7.24	L1: 7.26	1.12	323	

P_R: +10% Q_C: +5%	L2:	L2:	L2:			500
	L3:	L3:	L3:			
P_R: +10% Q_C: 0%	L1: 6.10	L1: 7.20	L1: 7.22	1.22	330	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +10% Q_C: -5%	L1: 6.08	L1: 7.15	L1: 7.18	1.11	245	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: +10% Q_C: -10%	L1: 6.11	L1: 7.23	L1: 7.23	1.17	342	500
	L2:	L2:	L2:			
	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: 4.01	L1: 4.54	L1: 4.52	1.17	312	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: -4%	L1: 4.00	L1: 4.53	L1: 4.53	1.17	329	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: -3%	L1: 4.02	L1: 4.60	L1: 4.61	1.05	380	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: -2%	L1: 4.02	L1: 4.71	L1: 4.69	1.14	325	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: -1%	L1: 4.00	L1: 4.71	L1: 4.75	1.11	342	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: 0%	L1: 4.01	L1: 4.75	L1: 4.72	1.06	328	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
	L1: 4.03	L1: 4.82	L1: 4.80	1.08	307	

P_R: 0% Q_C: +1%	L2: L3:	L2: L3:	L2: L3:			500
P_R: 0% Q_C: +2%	L1: 4.01 L2: L3:	L1: 4.84 L2: L3:	L1: 4.87 L2: L3:	1.17	335	500
P_R: 0% Q_C: +3%	L1: 4.02 L2: L3:	L1: 4.89 L2: L3:	L1: 4.90 L2: L3:	1.13	331	500
P_R: 0% Q_C: +4%	L1: 4.00 L2: L3:	L1: 4.93 L2: L3:	L1: 4.96 L2: L3:	1.12	333	500
P_R: 0% Q_C: +5%	L1: 4.01 L2: L3:	L1: 4.98 L2: L3:	L1: 4.98 L2: L3:	1.17	229	500

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: 2.01 L2: L3:	L1: 2.28 L2: L3:	L1: 2.27 L2: L3:	1.07	321	500
P_R: 0% Q_C: -4%	L1: 2.00 L2: L3:	L1: 2.33 L2: L3:	L1: 2.33 L2: L3:	1.04	344	500
P_R: 0% Q_C: -3%	L1: 2.01 L2: L3:	L1: 2.32 L2: L3:	L1: 2.34 L2: L3:	1.17	351	500
P_R: 0% Q_C: -2%	L1: 2.00 L2: L3:	L1: 2.37 L2: L3:	L1: 2.38 L2: L3:	1.13	361	500
P_R: 0% Q_C: -1%	L1: 2.01 L2: L3:	L1: 2.38 L2: L3:	L1: 2.38 L2: L3:	1.19	347	500
P_R: 0% Q_C: 0%	L1: 2.02 L2:	L1: 2.41 L2:	L1: 2.40 L2:	1.06	358	500

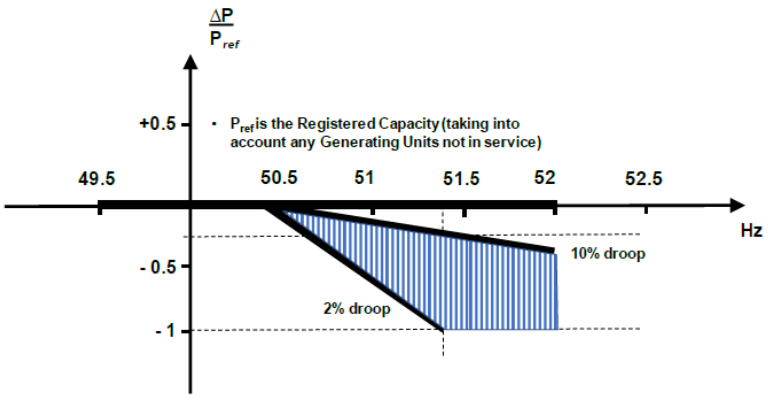
	L3:	L3:	L3:			
P_R: 0% Q_C: +1%	L1: 2.01	L1: 2.44	L1: 2.43	1.18	338	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: +2%	L1: 2.02	L1: 2.46	L1: 2.46	1.16	332	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: +3%	L1: 2.01	L1: 2.49	L1: 2.49	1.01	358	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: +4%	L1: 2.00	L1: 2.51	L1: 2.50	1.13	249	500
	L2:	L2:	L2:			
	L3:	L3:	L3:			
P_R: 0% Q_C: +5%	L1: 2.02	L1: 2.55	L1: 2.55	1.18	259	500
	L2:	L2:	L2:			
	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: RoCoF stability test		P
Ramp range	Test frequency ramp:	Test duration	Confirm no trip
49.0 Hz->51.0 Hz	+ 0.95 Hz/s	2.1s	No trip
51.0 Hz->49.0 Hz	- 0.95 Hz/s	2.1s	No trip

9.1	TABLE: Limitest frequency sensitive mode-over frequency (LFSM-O)								P	
Test No. 1										
Test Conditions	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	5972.31	99.54%	50.00	--	--	--	--	8.5%≤Droop ≤12.8%	≤10	≤2
b) 50.45	5930.32	98.84	50.45	4.0	4.6	0.4	8.57%			
c) 50.7	5589.18	93.15%	50.70	2.6	3.0	0.4	8.76%			
d) 51.15	5062.19	84.37%	51.15	2.4	2.8	0.4	9.60%			
e) 50.7	5589.44	93.16%	50.70	2.2	2.4	0.4	8.76%			
f) 50.45	5932.70	98.88%	50.45	2.6	3.2	0.4	8.82%			
g) 50	5975.10	99.59%	50.00	2.0	3.6	0.4	--			
Test No. 2										
Test Conditions	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	3020.46	50.34%	50.00	--	--	--	--	8.5%≤Droop ≤12.8%	≤10	≤2
b) 50.45	2937.36	48.96%	50.45	3.0	4.4	0.4	9.52%			
c) 50.7	2644.10	44.07%	50.70	2.8	3.4	0.4	10.14%			
d) 51.15	2176.97	36.28%	51.15	3.4	3.8	0.4	10.92%			
e) 50.7	2644.28	44.07%	50.70	3.0	3.4	0.4	10.14%			
f) 50.45	2934.99	48.92%	50.45	2.2	2.8	0.4	9.09%			
g) 50	3022.15	50.37%	50.00	0.4	0.4	0.4	--			

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 mimute]	Delay time [s]	Power Gradient
Reonnection:				
1.12Un	21.03	--	20	--
0.82Un	21.54	--		
47.6Hz	20.32	--		
51.9Hz	22.52	--		
No reconnection:				
1.16Un	No reconnection	--	No reconnection	--
0.78Un	No reconnection	--		
47.4Hz	No reconnection	--		
52.1Hz	No reconnection	--		
Note(s): For “1.12Un”, “0.82Un”, “47.6Hz”, “51.9Hz” are the reconnection value.				

11	TABLE: Fault level contribution		P
Test Condition	Measurement		
	U [V]	I [A]	
20ms after fault	52.4	33.42	
100ms after fault	51.8	0	
250ms after fault	51.6	0	
500ms after fault	51.3	0	
Trip time [s]	0.054		

12	TABLE: Self-Monitoring solid state switching	N/A
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.		N/A

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

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

Logic interface marked “DRM” on inverter which can be operated by a simple switch or contactor. When the switch is closed the inverter can operated normally. When the switch is opened, the inverter will reduce it’s output power to zero within 5s. The signal from the inverter that is being switched is DC about 10 V.

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.		P
Additional comments:		
The test result is based on S6-GR1P6K-S. All the series of inverters electrical character are the same. So the test result can cover all other models.		

Revision History:

Date YYYY-MM-DD	Contents of modification (latest on top)	Prepared by	Approved by
2020-09-17	Originated and released into QM system	Tobias Yang	Weichun Li

TÜVRheinland®

PHOTO DOCUMENTATION

CN23J12O 001

for

Grid Connected PV Inverter

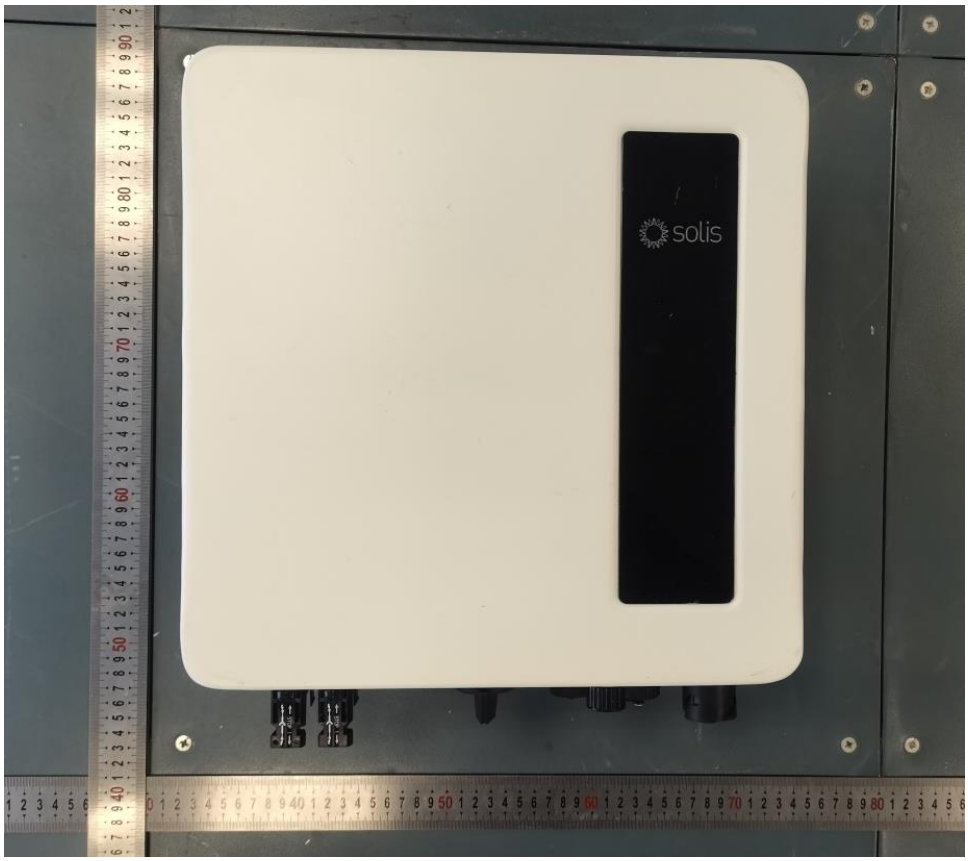
S6-GR1P2.5K-S, S6-GR1P3K-S, S6-GR1P3.6K-S,
S6-GR1P4K-S, S6-GR1P4.6K-S,
S6-GR1P5K-S, S6-GR1P6K-S

Ginlong technologies Co., Ltd.

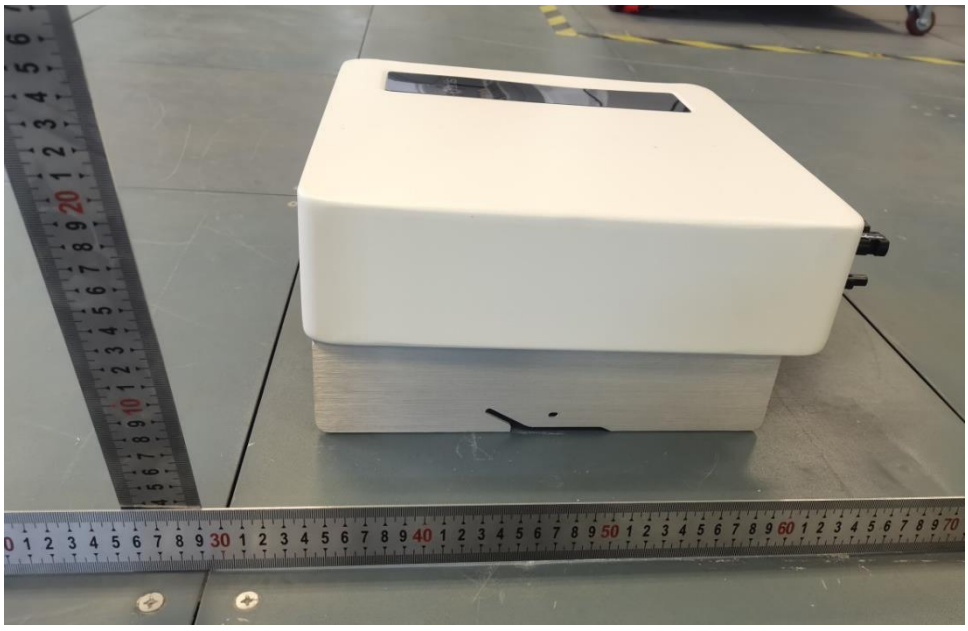
This documentation consists of 4 pages (excluding this cover page)

Report Number: CN23J12O 001

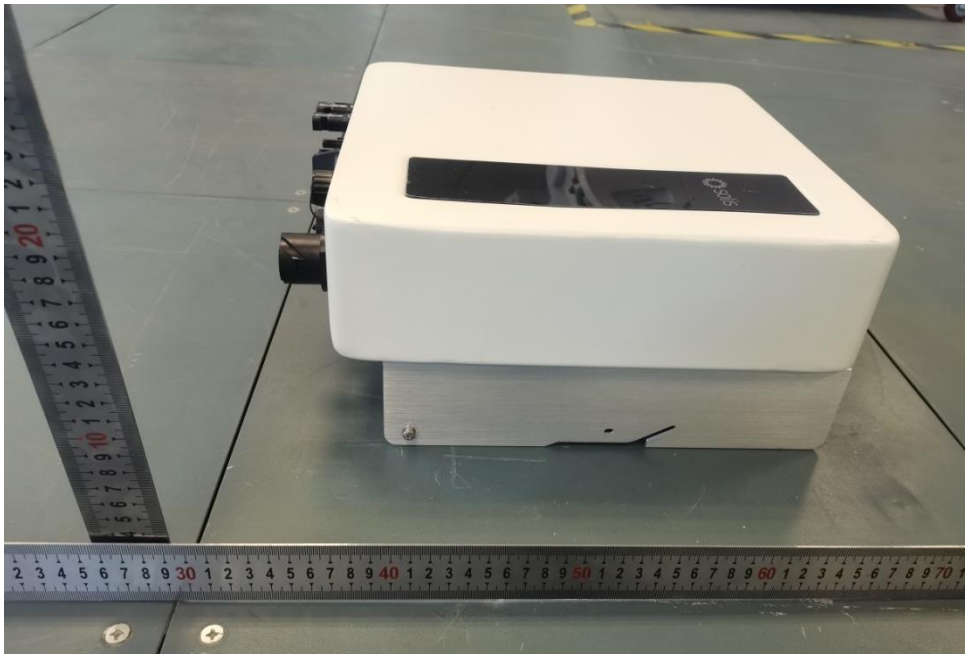
Model: S6-GR1P2.5K-S, S6-GR1P3K-S, S6-GR1P3.6K-S, S6-GR1P4K-S, S6-GR1P4.6K-S, S6-GR1P5K-S, S6-GR1P6K-S



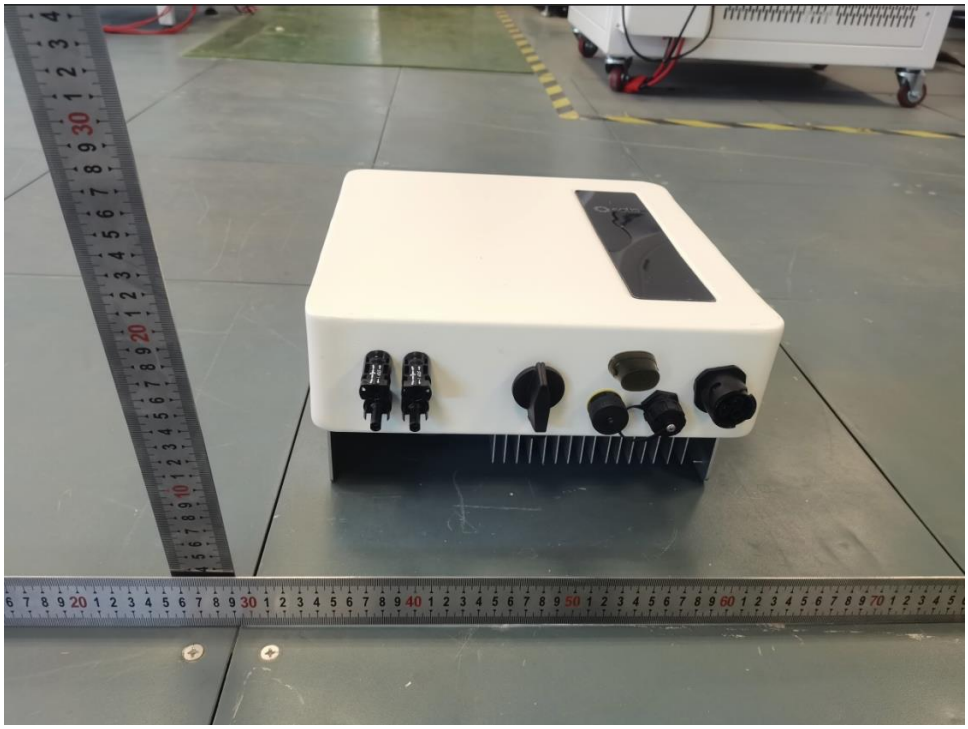
Overall view



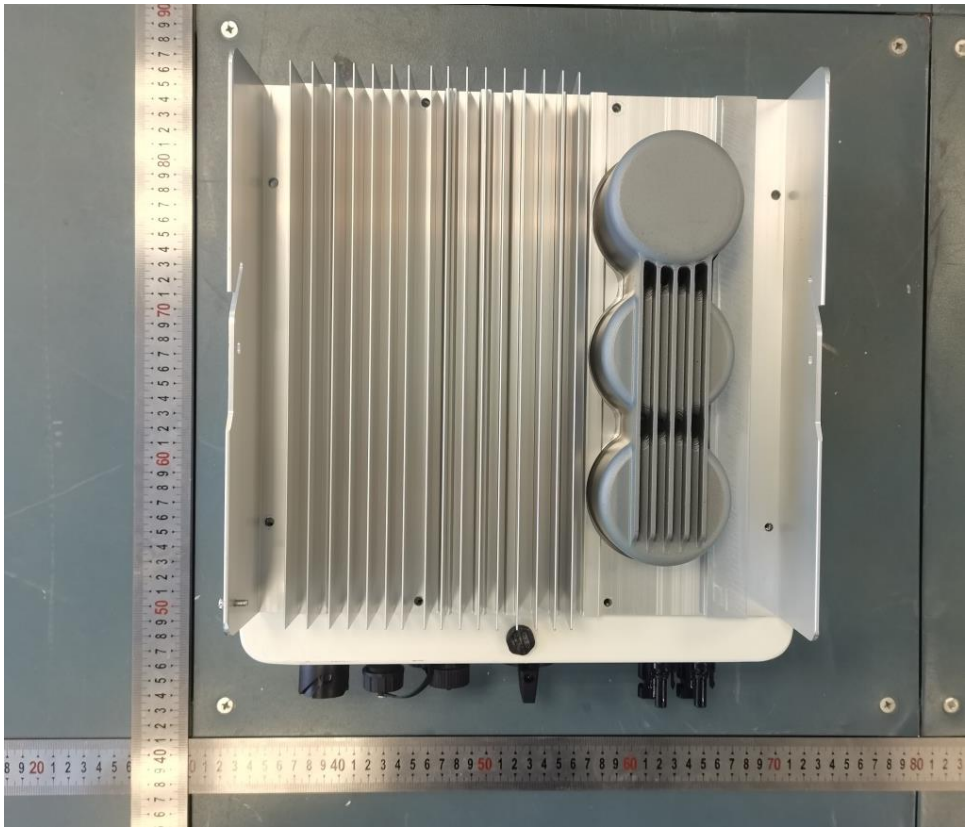
Side view 1



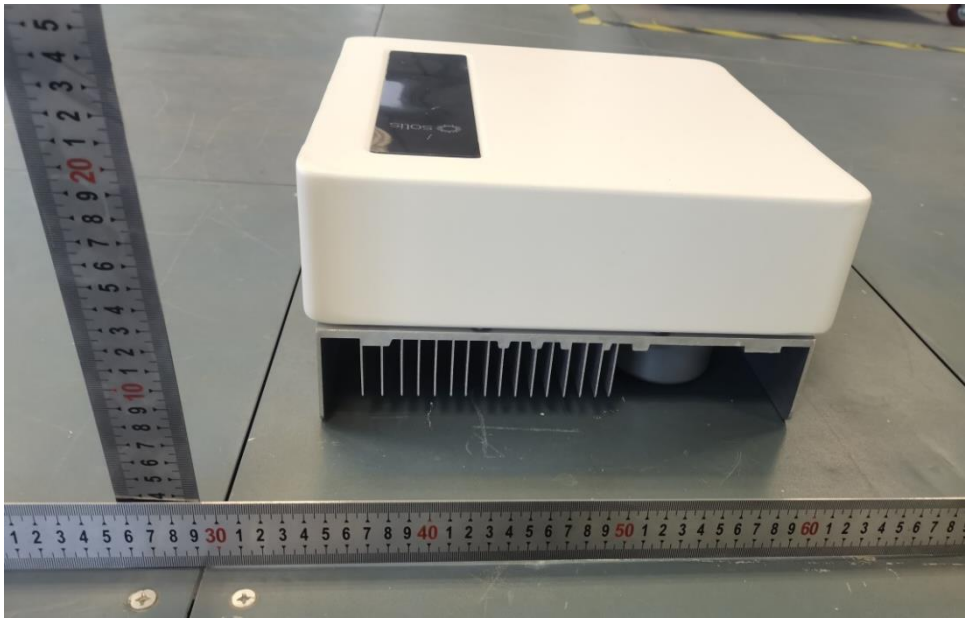
Side view 2



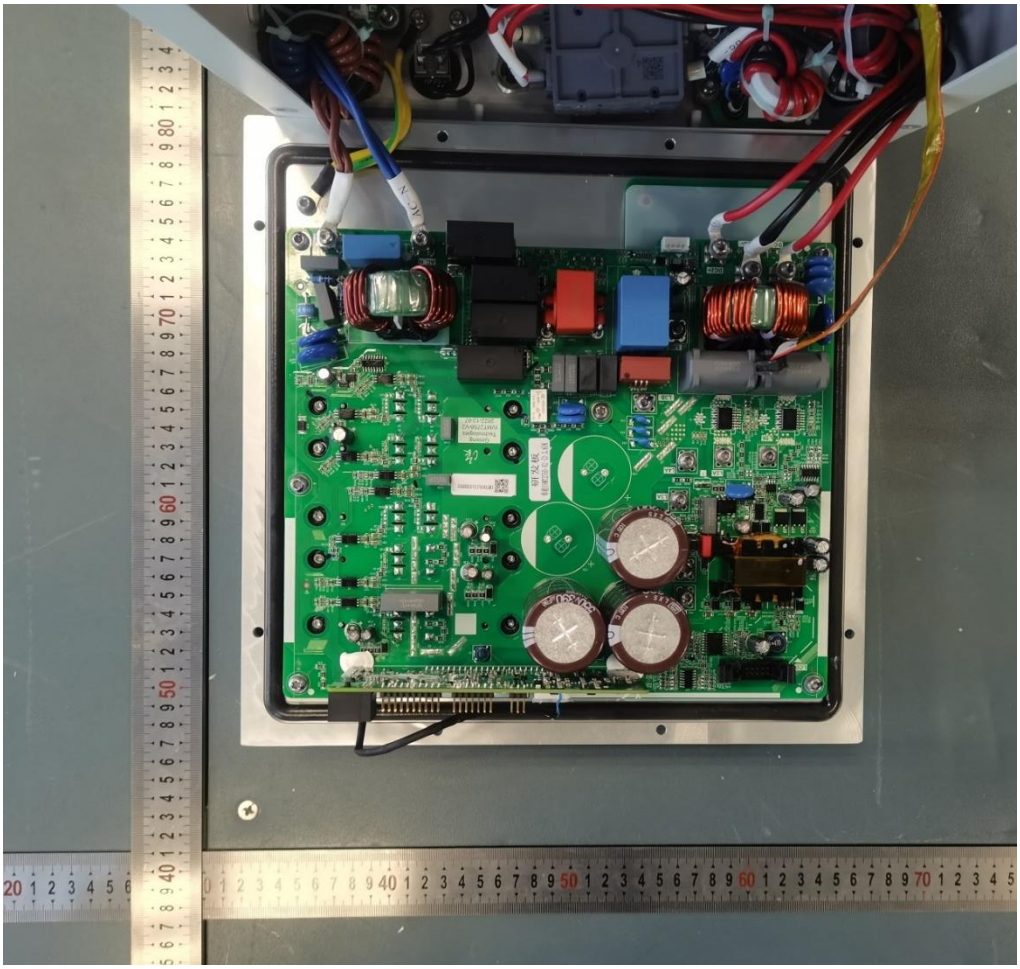
Bottom view



Back view



Top view



Internal view