

**TEST REPORT**

**EN 50549-1**

**Requirements for generating plants to be connected in parallel with distribution networks - Part 1:**

**Connection to a LV distribution network**

**EN 50549-10**

**Requirements for generating plants to be connected in parallel with distribution networks - Part 10:**

**Tests for conformity assessment of generating units**

**Report Number** ..... : 4952425.50

**Date of issue** ..... : 2026-04-13

**Total number of pages** ..... : 316

**Testing Laboratory** ..... : DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou Branch

**Address** ..... : Block 5. No.3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China

**Applicant** ..... : Guangzhou Felicity Solar Technology Co., Ltd.

**Applicant Address**..... : (Airport Baiyun) No. 2, 4, 6, 8, 10 and 12 Donghua Huaye Road, Renhe Town, Baiyun District, Guangzhou, Guangdong, China


**Standard** ..... : EN 50549-1:2019  
 EN 50549-1:2019/A1:2023  
 EN 50549-10:2022

**Test Report Form No**..... : EN50549-1&10\_V1.0

**Test Report Form(s) Originator** . : DEKRA Guangzhou

**Test item description** ..... : Hybrid Inverter

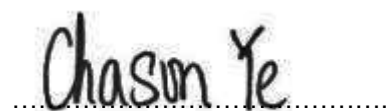
**Model/Type reference** ..... : IVGM8KHP3G3, IVGM9K9HP3G3, IVGM10KHP3G3, IVGM12KHP3G3, IVGM15KHP3G3, IVGM20KHP3G3, IVGM25KHP3G3

**Trade Mark** ..... : 

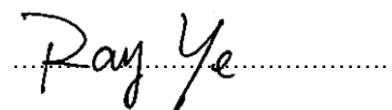
**Manufacturer** ..... : Guangzhou Felicity Solar Technology Co., Ltd.

**Manufacturer Address** ..... : (Airport Baiyun) No. 2, 4, 6, 8, 10 and 12 Donghua Huaye Road, Renhe Town, Baiyun District, Guangzhou, Guangdong, China

**Prepared by**..... : Chason Ye (Project Handler)



**Verified and approved by** ..... : Ray Ye (Reviewer)



<b>Testing Summary</b>			
<b>Tests performed:</b>			
The following scope of assessment was implemented according to EN 50549-1 and EN 50549-10.			
EN 50549-1	EN 50549-10	Test Items	Result
4.4.2 & 4.4.4	5.2.1 & 5.2.2	Frequency operating range & Voltage operating range	P
4.4.3	5.2.1	Minimal requirement for active power delivery at under-frequency	P
4.5.2	5.3.1	Rate of change of frequency (ROCOF) immunity	P
4.5.3	5.3.3	Under-voltage ride through (UVRT)	P
4.5.4	5.3.3	Over-voltage ride through (OVRT)	P
4.5.5	5.3.2	Phase jump immunity	P
4.6.1	5.4	Power response to over-frequency (LFSM-O)	P
4.6.2	5.4	Power response to under-frequency (LFSM-U)	P
4.7.2.3.2	5.5.2.3	Setpoint control modes –Q setpoint mode	P
4.7.2.3.2	5.5.2.3	Setpoint control modes –Cos $\phi$ setpoint mode	P
4.7.2.3.3	5.5.2.5	Voltage related control mode – Q(U)	P
4.7.2.3.4	5.5.2.5	Power related control mode –Q(P) / cos $\phi$ (P)	P
4.7.3	5.5.2.5	Voltage related active power reduction – P(U)	P
4.8	5.7.2.2	Power quality - Harmonic emissions	P
4.8	5.7.2.3	Power quality - Flicker	P
4.8	5.7.2.3	Power quality - Voltage fluctuations ( $K_{imax}$ )	P
4.8	5.7.2.4	Power quality - DC Injection	P
4.8	--	Power quality - Unbalance (Imbalance)	P
4.9.3.2 & 4.9.3.3	5.8.3	Under-voltage protection & Overvoltage protection	P
4.9.3.4	5.8.3	Overvoltage 10-min mean protection	P
4.9.3.5 & 4.9.3.6	5.8.3	Underfrequency protection & Overfrequency protection	P
--	5.8.3.2.4	Voltage and frequency protections - NOP	P
--	5.8.3.2.6	Voltage and frequency protections - Immunity to voltage harmonics	P
--	5.8.3.4	ROCOF protection	P
4.9.4	5.8.6	Means to detect island situation	P
4.10.2 & 4.10.3	5.9.3 & 5.9.4	Automatic reconnection after tripping & Starting to generate electrical power	P
4.11.1	5.10	Ceasing active power	P
4.11.2	5.10	Reduction of active power on set point	P
<b>Note:</b> - test case does not apply to the test object: N/A - this clause is information reference for installation: Info. - test object does meet the requirement: P (Pass)			

**Performed tests:**

Unless otherwise specified, all the tests were performed under ISO/IEC 17025 accreditation on the model IVGM25KHP3G3 to represent the other models.

**Date (s) of performance of tests:** 2026-02-02 to 2026-04-03

**Testing location:**

Guangzhou Felicity Solar Technology Co., Ltd.

(Airport Baiyun) No. 2, 4, 6, 8, 10 and 12 Donghua Huaye Road, Renhe Town, Baiyun District, Guangzhou, Guangdong, China

**Conclusion:**

The equipment under test complies with the following documents:

**EN 50549-1:2019+A1:2023**

Requirements for generating plants to be connected in parallel with distribution networks - Part 1: Connection to a LV distribution network - Generating plants up to and including Type B.

**EN 50549-10:2022**

Requirements for generating plants to be connected in parallel with distribution networks - Part 10: Tests for conformity assessment of generating units

**NC RfG:2016/631**

Commission Regulation (EU) 2016/631 of 14 April 2016 establishing a network code on requirements for grid connection of generators (Journal of Laws UE L 112/1 of 27 April 2016).

**Product Information**

**General:**

Felicitysolar IVGM Series is a multifunctional inverter, combining functions of inverter, solar charger and battery charger to offer uninterruptible power support with portable size. Its comprehensive LCD display offers user configurable and easily accessible button operation such as battery charging, AC/solar charging, and acceptable input voltage based on different applications.

Double/reinforced insulation provided between primary circuits or hazardous voltage to secondary circuits and DVC A circuits by application of safety isolation transformers, optocoupler and sufficient clearances and creepage distances within the unit.

In order to protect the inverter, user and installer, external circuit breaker shall be equipped for all source ports at the end-use application except for AC input port.

The unit provides two relays in series on each inverter output conductors. The internal control is redundantly built. It contains a main DSP and a slave DSP. Both DSP can open relays independently and communicate with each other.

**Model difference:**

Model IVGM8KHP3G3, IVGM9K9HP3G3, IVGM10KHP3G3, IVGM12KHP3G3, IVGM15KHP3G3, IVGM20KHP3G3 and IVGM25KHP3G3 are same as the construction, hardware and software, expect that the model's name and output power is different due to be adjusted by software.

**Hardware & Firmware version**

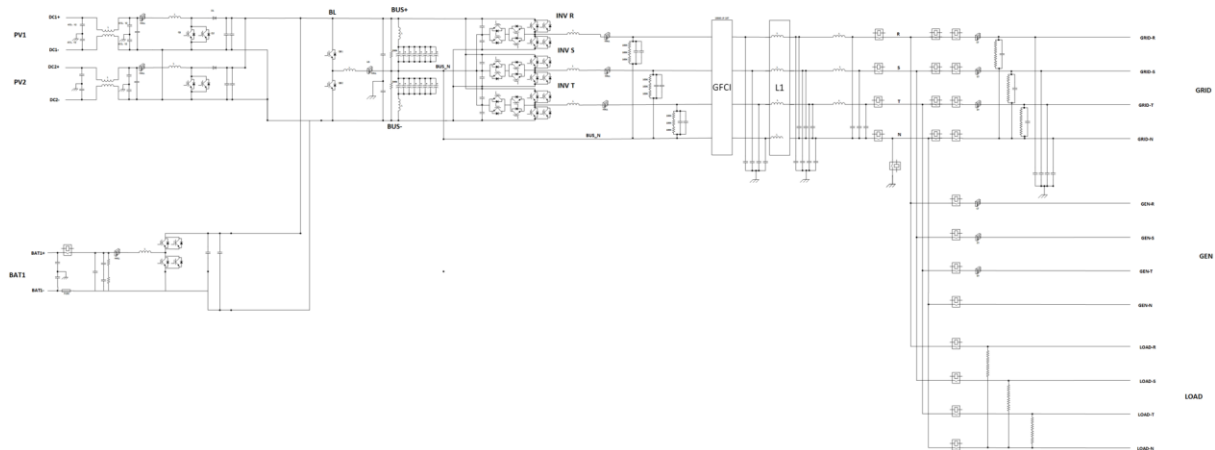
Hardware version	100
Firmware version	100

**Factory:**

Guangzhou Felicity Solar Technology Co., Ltd.

(Airport Baiyun) No. 2, 4, 6, 8, 10 and 12 Donghua Huaye Road, Renhe Town, Baiyun District, Guangzhou, Guangdong, China

**Block diagram:**



<b>Model List and Ratings:</b>					
<b>Model</b>		<b>IVGM8KHP 3G3</b>	<b>IVGM9K9HP 3G3</b>	<b>IVGM10KHP 3G3</b>	<b>IVGM12KHP 3G3</b>
<b>Battery</b>	Battery type	LiFePO4			
	Battery Voltage Range [Vdc]	160 - 700			
	Rated Battery Voltage [Vdc]	500			
	Max. charge/discharge current [Adc]	50			
	Max. charge/discharge Power [kW]	8.0	9.9	10.0	12.0
<b>PV input</b>	Max. PV input Voltage [Vdc]	1000			
	Rated PV input Voltage [Vdc]	600			
	MPPT Voltage Range [Vdc]	200 - 850			
	Max. PV input current [Adc]	20+20			30+20
	Isc current [Adc]	26+26			39+26
	Max. PV input power [kW]	12.8	15.8	16.0	19.2
<b>AC terminal (On-grid)</b>	Rated Voltage [Vac]	230/400V, 3W+N+PE			
	Rated Frequency [Hz]	50/60			
	Max. input current [Aac]	12.8	14.3	16.0	19.2
	Max. input Power [kW]	8.8	9.9	11.0	13.2
	Rated output current [Aac]	11.6	14.3	14.5	17.4
	Max. output current [Aac]	12.8	14.3	16.0	19.2
	Rated output Power [kW]	8.0	9.9	10.0	12.0
	Max. output Apparent power [kVA]	8.8	9.9	11.0	13.2
Power factor	0.8 leading to 0.8 lagging				
<b>EPS output</b>	Rated output Voltage [Vac]	230/400V, 3W+N+PE			
	Rated Frequency [Hz]	50/60			
	Rated output current [Aac]	11.6	14.3	14.5	17.4
	Max. output current [Aac]	12.8	14.3	16.0	19.2
	Rated output Power [kW]	8.0	9.9	10.0	12.0
	Max. output Apparent power [kVA]	8.8	9.9	11.0	13.2
	Power factor	0.8 leading to 0.8 lagging			
<b>General</b>	Type of inverter	Non-isolated			
	Ingress Protection	IP65			
	Operating Temperature Range [°C]	-40 to 60 (Derating above 45 °C)			

Model		IVGM15KHP3G3	IVGM20KHP3G3	IVGM25KHP3G3
Battery	Battery type	LiFePO4		
	Battery Voltage Range [Vdc]	160 - 700		
	Rated Battery Voltage [Vdc]	500		
	Max. charge/discharge current [Adc]	50		
	Max. charge/discharge Power [kW]	15.0	20.0	25.0
PV input	Max. PV input Voltage [Vdc]	1000		
	Rated PV input Voltage [Vdc]	600		
	MPPT Voltage Range [Vdc]	200 - 850		
	Max. PV input current [Adc]	30+20	30+30	
	Isc current [Adc]	39+26	39+39	
	Max. PV input power [kW]	24.0	32.0	40.0
AC terminal (On-grid)	Rated Voltage [Vac]	230/400V, 3W+N+PE		
	Rated Frequency [Hz]	50/60		
	Max. input current [Aac]	23.8	32.0	39.8
	Max. input Power [kW]	16.5	22.0	27.5
	Rated output current [Aac]	21.7	29.0	36.3
	Max. output current [Aac]	23.8	32.0	39.8
	Rated output Power [kW]	15.0	20.0	25.0
	Max. output Apparent power [kVA]	16.5	22.0	27.5
	Power factor	0.8 leading to 0.8 lagging		
EPS output	Rated output Voltage [Vac]	230/400V, 3W+N+PE		
	Rated Frequency [Hz]	50/60		
	Rated output current [Aac]	21.7	29.0	36.3
	Max. output current [Aac]	23.8	32.0	39.8
	Rated output Power [kW]	15.0	20.0	25.0
	Max. output Apparent power [kVA]	16.5	22.0	27.5
	Power factor	0.8 leading to 0.8 lagging		
General	Type of inverter	Non-isolated		
	Ingress Protection	IP65		
	Operating Temperature Range [°C]	-40 to 60 (Derating above 45 °C)		

**Copy of marking plate:**

IVGM8KHP3G3

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperature	-40°C-60°C, >45°C Derating
Warranty	10 years
<b>Battery Input Data</b>	
Battery Voltage Range	160Vd.c. ~700Vd.c.
Max. Charging Current	50Ad.c.
Max. Discharging Current	50Ad.c.
<b>PV String Input Data</b>	
Max. DC Input Power	12.8kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200-850Vd.c.
Full Load DC Voltage Range	320-850Vd.c.
PV Input Current	20+20Ad.c.
Max. PV Isc	26+26Ad.c.
<b>AC Input/Output Data</b>	
Rated AC Input/Output Power	8kW
Max. Apparent Input/Output Power	8.8kVA
AC Input/Output Rated Current	11.6Aa.c.
Max. AC Input/Output Current	12.8Aa.c.
Max. Continuous AC Passthrough	40Aa.c.
Rated AC Voltage	220/380Va.c./230/400Va.c.(-20%~+15%)
AC Wiring Mode	3L+N+PE
Rated AC Frequency	50 /60 Hz(45-55Hz/55-65Hz)
Power Factor	0.8( leading) to 0.8( lagging)
<b>Efficiency</b>	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	>99%
Non-isolated topology, Class I protective class	

**CAUTION:**

- High Voltage, warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working!

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IVGM9K9HP3G3







Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperature	-40°C-60°C, >45°C Derating
Warranty	10 years
<b>Battery Input Data</b>	
Battery Voltage Range	160Vd.c. ~700Vd.c.
Max. Charging Current	50Ad.c.
Max. Discharging Current	50Ad.c.
<b>PV String Input Data</b>	
Max. DC Input Power	15.8kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200-850Vd.c.
Full Load DC Voltage Range	395-850Vdc
PV Input Current	20+20Ad.c.
Max. PV Isc	26+26Ad.c.
<b>AC Input/Output Data</b>	
Rated AC Input/Output Power	9.9kW
Max. Apparent Input/Output Power	9.9kVA
AC Input/Output Rated Current	14.3Aa.c.
Max. AC Input/Output Current	14.3Aa.c.
Max. Continuous AC Passthrough	40Aa.c.
Rated AC Voltage	220/380Va.c./230/400Va.c.(-20%~+15%)
AC Wiring Mode	3L+N+PE
Rated AC Frequency	50 /60 Hz(45-55Hz/55-65Hz)
Power Factor	0.8( leading) to 0.8( lagging)
<b>Efficiency</b>	
Max. Efficiency	97.60%
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MPPT Efficiency	>99%
Non-isolated topology, Class I protective class	







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<b>IVGM10KHP3G3</b>	<b>IVGM12KHP3G3</b>																				
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<b>Battery Input Data</b>	<b>Battery Input Data</b>																				
Battery Voltage Range	160Vd.c. ~700Vd.c.	Battery Voltage Range	160Vd.c. ~700Vd.c.																		
Max. Charging Current	50Ad.c.	Max. Charging Current	50Ad.c.																		
Max. Discharging Current	50Ad.c.	Max. Discharging Current	50Ad.c.																		
<b>PV String Input Data</b>	<b>PV String Input Data</b>																				
Max. DC Input Power	16kW	Max. DC Input Power	19.2kW																		
Max. DC Input Voltage	1000Vd.c.	Max. DC Input Voltage	1000Vd.c.																		
Min. DC Input Voltage	150Vd.c.	Min. DC Input Voltage	150Vd.c.																		
MPPT Range	200-850Vd.c.	MPPT Range	200-850Vd.c.																		
Full Load DC Voltage Range	400-850Vd.c.	Full Load DC Voltage Range	384-850Vd.c.																		
PV Input Current	20+20Ad.c.	PV Input Current	30+20Ad.c.																		
Max. PV Isc	26+26Ad.c.	Max. PV Isc	39+26Ad.c.																		
<b>AC Input/Output Data</b>	<b>AC Input/Output Data</b>																				
Rated AC Input/Output Power	10kW	Rated AC Input/Output Power	12kW																		
Max. Apparent Input/Output Power	11kVA	Max. Apparent Input/Output Power	13.2kVA																		
AC Input/Output Rated Current	14.5Aa.c.	AC Input/Output Rated Current	17.4Aa.c.																		
Max. AC Input/Output Current	16Aa.c.	Max. AC Input/Output Current	19.2Aa.c.																		
Max. Continuous AC Passthrough	40Aa.c.	Max. Continuous AC Passthrough	80Aa.c.																		
Rated AC Voltage	220/380Va.c.,230/400Va.c.(-20%~+15%)	Rated AC Voltage	220/380Va.c.,230/400Va.c.(-20%~+15%)																		
AC Wiring Mode	3L+N+PE	AC Wiring Mode	3L+N+PE																		
Rated AC Frequency	50 /60 Hz(45-55Hz/55-65Hz)	Rated AC Frequency	50 /60 Hz(45-55Hz/55-65Hz)																		
Power Factor	0.8( leading) to 0.8( lagging)	Power Factor	0.8( leading) to 0.8( lagging)																		
<b>Efficiency</b>	<b>Efficiency</b>																				
Max. Efficiency	97.60%	Max. Efficiency	97.60%																		
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<p><b>CAUTION:</b></p> <ul style="list-style-type: none"> <li>• High Voltage, warning electric shock</li> <li>• Keep the equipment well ventilated</li> <li>• The capacitors store hazardous energy Do not touch while working!</li> </ul>		<p><b>CAUTION:</b></p> <ul style="list-style-type: none"> <li>• High Voltage, warning electric shock</li> <li>• Keep the equipment well ventilated</li> <li>• The capacitors store hazardous energy Do not touch while working!</li> </ul>																			
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China</p> </div>	Product Type	Hybrid Inverter	Protection Degree	IP65	Overvoltage-category	DC II; AC III	Ambient Temperature	-40°C-60°C,>45°C Derating	Warranty	10 years	<b>Battery Input Data</b>		Battery Voltage Range	160Vd.c. ~700Vd.c.	Max. Charging Current	50Ad.c.	Max. Discharging Current	50Ad.c.	<b>PV String Input Data</b>		Max. DC Input Power	24kW	Max. DC Input Voltage	1000Vd.c.	Min. DC Input Voltage	150Vd.c.	MPPT Range	200-850Vd.c.	Full Load DC Voltage Range	480-850Vd.c.	PV Input Current	30+20Ad.c.	Max. PV Isc	39+26Ad.c.	<b>AC Input/Output Data</b>		Rated AC Input/Output Power	15kW	Max. Apparent Input/Output Power	16.5kVA	AC Input/Output Rated Current	21.7Aa.c.	Max. AC Input/Output Current	23.8Aa.c.	Max. Continuous AC Passthrough	80Aa.c.	Rated AC Voltage	220/380Va.c.,230/400Va.c.(-20%~+15%)	AC Wiring Mode	3L+N+PE	Rated AC Frequency	50 /60 Hz(45-55Hz/55-65Hz)	Power Factor	0.8( leading) to 0.8( lagging)	<b>Efficiency</b>		Max. 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### IVGM25KHP3G3

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperature	-40°C~60°C,>45°C Derating
Warranty	10 years
<b>Battery Input Data</b>	
Battery Voltage Range	160Vd.c. ~700Vd.c.
Max. Charging Current	50Ad.c.
Max. Discharging Current	50Ad.c.
<b>PV String Input Data</b>	
Max. DC Input Power	40kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	200~850Vd.c.
Full Load DC Voltage Range	666~850Vd.c.
PV Input Current	30+30Ad.c.
Max. PV Isc	39+39Ad.c.
<b>AC Input/Output Data</b>	
Rated AC Input/Output Power	25kW
Max. Apparent Input/Output Power	27.5kVA
AC Input/Output Rated Current	36.3Aa.c.
Max. AC Input/Output Current	39.8Aa.c.
Max. Continuous AC Passthrough	80Aa.c.
Rated AC Voltage	220/380Va.c.,230/400 Va.c.(-20%~+15%)
AC Wiring Mode	3L+N+PE
Rated AC Frequency	50 /60 Hz(45~55Hz/55~65Hz)
Power Factor	0.8( leading) to 0.8( lagging)
<b>Efficiency</b>	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	>99%
Non-isolated topology, Class I protective class	



**CAUTION:**

- High Voltage,warning electric shock
- Keep the equipment well ventilated
- The capacitors store hazardous energy Do not touch while working!

**Manufacturer:**  
Guangzhou Felicity Solar Technology Co., Ltd.

**Address:**  
(Airport Baiyun)No.2, 4, 6, 8, 10 and 12 Donghua Huaye Road, Renhe Town, Baiyun District, Guangzhou, Guangdong, P. R. China

**Note:**

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation.

**Specification of equipment under test:**

**Classification of installation and use**..... :  movable  hand-held  stationary  
 fixed  transportable  for building-in

**Supply connection**..... :  pluggable equipment  direct plug-in  
 permanent connection  for building-in

**Environmental category**..... :  outdoor  indoor unconditional  indoor conditional

**Over voltage category Mains** ..... :  OVC I  OVC II  OVC III  OVC IV

**Over voltage category PV** ..... :  OVC I  OVC II  OVC III  OVC IV

**Over voltage category Battery** ..... :  OVC I  OVC II  OVC III  OVC IV

**Mains supply tolerance** ..... : -15% to 10%

**Tested for power systems** ..... : TN

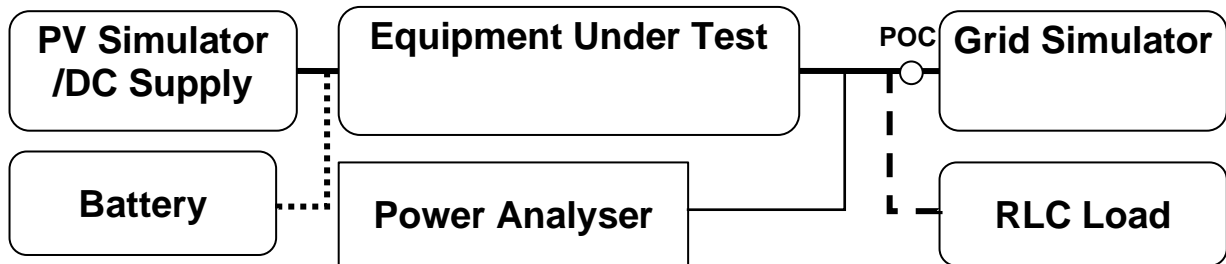
**IT testing, phase-phase voltage (V)**..... : N/A

**Protective class**..... :  Class I  Class II  Class III

**Pollution degree**..... : PD3

**Test setup:**

The tests were performed using a PV simulator as a simulation of the PV module and a grid simulator as a simulation of the power grid and the transmission network. A simplified diagram of the test setup is given below. The measurement data were measured at POC at LV level.



**General remarks:**

"(See appended table)" refers to a table appended to the report.  
 The test 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 Issuing testing laboratory.  
 The measurement result is considered in conformance with the requirement if it is within the prescribed limit.  
 It is not necessary to account the uncertainty associated with the measurement result.  
 This report is only for reference and is not used for legal proof function in China market.  
 The information provided by the customer in this report may affect the validity of the results, the test lab is not responsible for it.  
 Throughout this report a  comma /  point is used as the decimal separator.  
 The following suffixes are used for variables in tables and figures:

- "P<sub>n</sub>" for nominal active power.  $P_n = U_n \times I_n \times \cos \varphi_n$  (single-phase);  $P_n = \sqrt{3} U_n \times I_n \times \cos \varphi_n$  (three-phase).
- "\_E0,2" for gliding average values over 200 milliseconds. "\_E60" for gliding average values over 60 seconds. "\_E600" for gliding average values over 10 minutes.
- "(c)" for over-excited. "(i)" for under-excited.
- If the inverter consumes inductive reactive power the reactive power is marked "leading" or "inductive" (under-excited) or has a negative sign.
- If the inverter consumes capacitive reactive power the reactive power is marked "lagging" or "capacitive" (over-excited) or has a positive sign.