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. ..... :	4951348.50
Date of issue ..... :	2026-03-24
Total number of pages ..... :	347
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 ..... :	IVGM3KLP3G2, IVGM4KLP3G2, IVGM5KLP3G2, IVGM6KLP3G2, IVGM8KLP3G2, IVGM10KLP3G2, IVGM12KLP3G2
Trade Mark ..... :	Felicitysolar® Make life full of hope
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)

Testing Summary

Tests performed:

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 φ 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 φ (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

Note:

- 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 IVGM12KLP3G2 to represent the other models.

Date (s) of performance of tests: 2026-01-29 to 2026-03-12

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:

The product is a Hybrid Inverter, which works with battery to store energy or convert PV/battery energy to the AC load or convert PV/battery energy to the grid.

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.

When connected to the grid, an isolation transformer must be installed in serial to the AC input.

Model difference:

Model IVGM3KLP3G2, IVGM4KLP3G2, IVGM5KLP3G2, IVGM6KLP3G2, IVGM8KLP3G2, IVGM10KLP3G2 and IVGM12KLP3G2 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

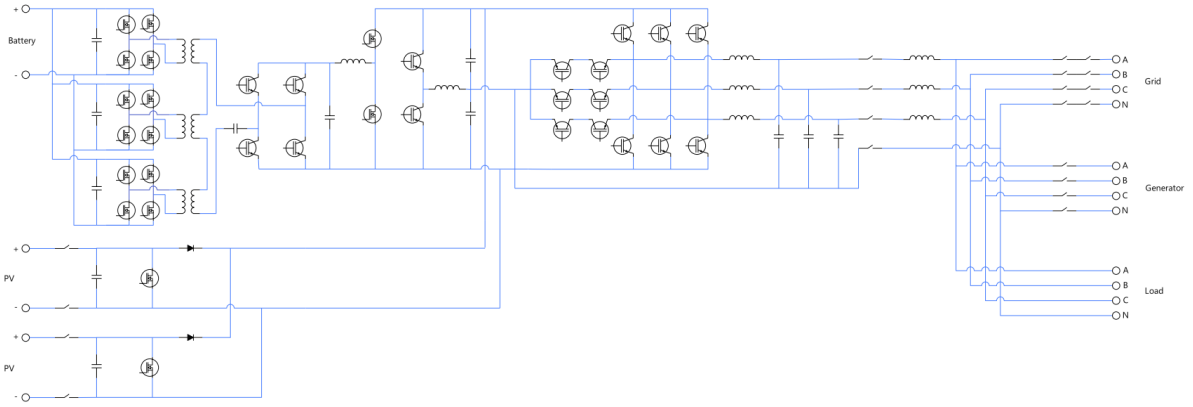
Hardware version	100
Firmware version	100

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:



Model List and Ratings:						
Model		**IVGM3KL P3G2**	**IVGM4KL P3G2**	**IVGM5KL P3G2**	**IVGM6KL P3G2**	**IVGM8KL P3G2**
Battery	Battery type	Li-ion/Lead-acid				
	Battery Voltage Range [Vdc]	40 - 60				
	Rated Battery Voltage [Vdc]	50				
	Max. charge/discharge current [Adc]	70	95	120	135	190
	Max. charge/discharge Power [kW]	3.0	4.0	5.0	6.0	8.0
PV input	Max. PV input Voltage [Vdc]	800				
	Rated PV input Voltage [Vdc]	550				
	MPPT Voltage Range [Vdc]	200 - 650				
	Max. PV input current [Adc]	20*2				
	Isc current [Adc]	30*2				
	Max. PV input power [kW]	4.5	6.0	7.5	9.0	12.0
AC terminal (On-grid)	Rated AC Voltage [Vac]	230/400V, 3W+N+PE				
	Rated Frequency [Hz]	50/60				
	Max. AC input current [Aac]	5.0	6.7	8.3	10.0	13.3
	Max. AC input tpower [kW]	3.3	4.4	5.5	6.6	8.8
	Rated AC output current [Aac]	4.3	5.8	7.2	8.7	11.6
	Max. AC output current [Aac]	4.8	6.4	7.9	9.6	12.8
	Rated AC output Power [kW]	3.0	4.0	5.0	6.0	8.0
	Max. AC output Apparent power [kVA]	3.3	4.4	5.5	6.6	8.8
	Power factor	0.8 leading to 0.8 lagging				
EPS output	Rated AC output Voltage [Vac]	230/400V, 3W+N+PE				
	Rated Frequency [Hz]	50/60				
	Rated AC output current [Aac]	4.3	5.8	7.2	8.7	11.6
	Max. AC output current [Aac]	4.8	6.4	7.9	9.6	12.8
	Rated AC output Power [kW]	3.0	4.0	5.0	6.0	8.0
	Max. AC output Apparent power [kVA]	3.3	4.4	5.5	6.6	8.8
	Power factor	0.8 leading to 0.8 lagging				
General	Type of inverter	Non-isolated				
	Ingress Protection	IP65				
	Operating Temperature Range [ºC]	-40 to 60 (Derating above 45 ºC)				

Model List and Ratings:			
Model		**IVGM10KLP3G2**	**IVGM12KLP3G2**
Battery	Battery type	Li-ion/Lead-acid	
	Battery Voltage Range [Vdc]	40 - 60	
	Rated Battery Voltage [Vdc]	50	
	Max. charge/discharge current [Adc]	210	240
	Max. charge/discharge Power [kW]	10.0	12.0
PV input	Max. PV input Voltage [Vdc]	800	
	Rated PV input Voltage [Vdc]	550	
	MPPT Voltage Range [Vdc]	200 - 650	
	Max. PV input current [Adc]	26*2	
	Isc current [Adc]	39*2	
	Max. PV input power [kW]	15.0	18.0
AC terminal (On-grid)	Rated AC Voltage [Vac]	230/400V, 3W+N+PE	
	Rated Frequency [Hz]	50/60	
	Max. AC input current [Aac]	16.7	20.0
	Max. AC input tpower [kW]	11.0	13.2
	Rated AC output current [Aac]	14.5	17.4
	Max. AC output current [Aac]	15.9	19.1
	Rated AC output Power [kW]	10.0	12.0
	Max. AC output Apparent power [kVA]	11.0	13.2
	Power factor	0.8 leading to 0.8 lagging	
EPS output	Rated AC output Voltage [Vac]	230/400V, 3W+N+PE	
	Rated Frequency [Hz]	50/60	
	Rated AC output current [Aac]	14.5	17.4
	Max. AC output current [Aac]	15.9	19.1
	Rated AC output Power [kW]	10.0	12.0
	Max. AC output Apparent power [kVA]	11.0	13.2
	Power factor	0.8 leading to 0.8 lagging	
General	Type of inverter	Non-isolated	
	Ingress Protection	IP65	
	Operating Temperature Range [ºC]	-40 to 60 (Derating above 45 ºC)	

Copy of marking plate:

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IVGM3KLP3G2	
Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	70Ad.c./70Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	20Ad.c./20Ad.c.
Max.Shorted Current	30Ad.c./30Ad.c.
Max.PV Input Power	4500W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	4.5/4.3Aa.c.
Max. AC Input/Output Current	5/4.8Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	3000W
AC Input/Output Apparent Power	3300VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	5/4.8Aa.c.
Max. AC Output Apparent Power	3300VA
Non-isolated topology, IP65, 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

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IVGM4KLP3G2	
Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	95Ad.c./95Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	20Ad.c./20Ad.c.
Max.Shorted Current	30Ad.c./30Ad.c.
Max.PV Input Power	6000W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	6.1/5.8Aa.c.
Max. AC Input/Output Current	6.7/6.4Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	4000W
AC Input/Output Apparent Power	4400VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	6.7/6.4Aa.c.
Max. AC Output Apparent Power	4400VA
Non-isolated topology, IP65, Class I protective class	

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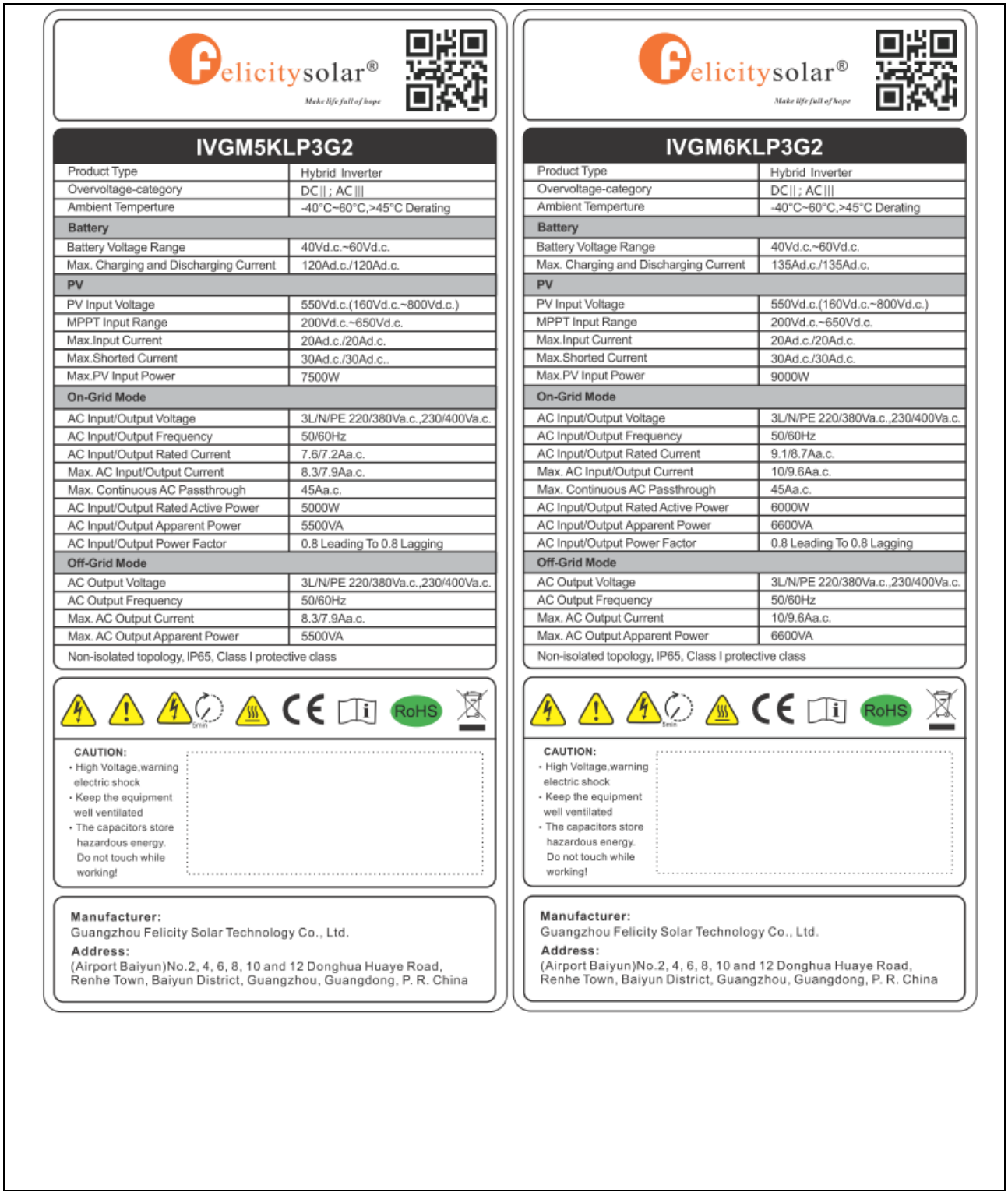

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IVGM5KLP3G2

Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	120Ad.c./120Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	20Ad.c./20Ad.c.
Max.Shorted Current	30Ad.c./30Ad.c..
Max.PV Input Power	7500W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	7.6/7.2Aa.c.
Max. AC Input/Output Current	8.3/7.9Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	5000W
AC Input/Output Apparent Power	5500VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	8.3/7.9Aa.c.
Max. AC Output Apparent Power	5500VA
Non-isolated topology, IP65, Class I protective class	

RoHS

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:
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IVGM6KLP3G2

Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	135Ad.c./135Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	20Ad.c./20Ad.c.
Max.Shorted Current	30Ad.c./30Ad.c.
Max.PV Input Power	9000W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	9.1/8.7Aa.c.
Max. AC Input/Output Current	10/9.6Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	6000W
AC Input/Output Apparent Power	6600VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	10/9.6Aa.c.
Max. AC Output Apparent Power	6600VA
Non-isolated topology, IP65, Class I protective class	

RoHS

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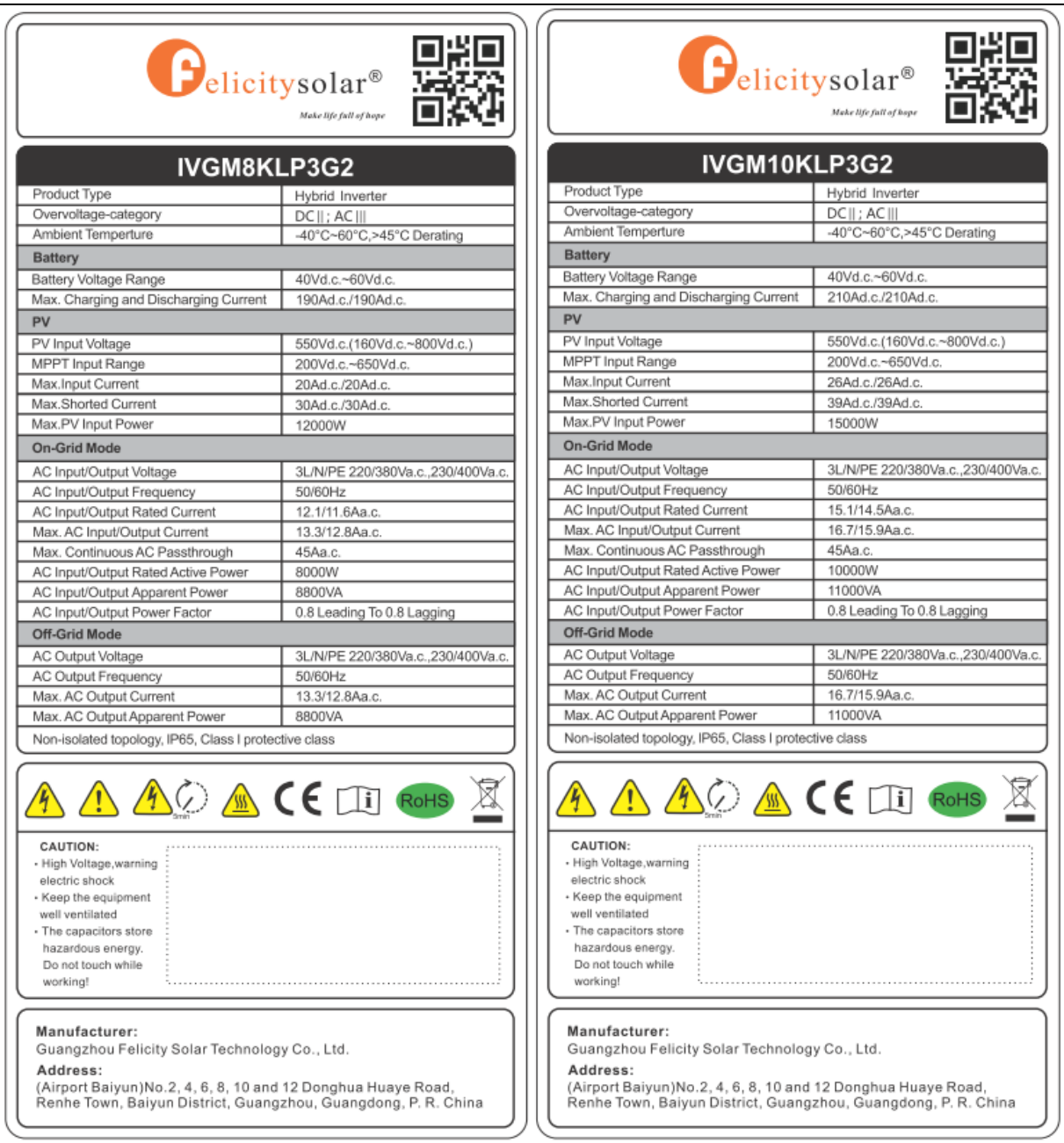

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IVGM8KLP3G2

Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	190Ad.c./190Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	20Ad.c./20Ad.c.
Max.Shorted Current	30Ad.c./30Ad.c.
Max.PV Input Power	12000W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	12.1/11.6Aa.c.
Max. AC Input/Output Current	13.3/12.8Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	8000W
AC Input/Output Apparent Power	8800VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	13.3/12.8Aa.c.
Max. AC Output Apparent Power	8800VA
Non-isolated topology, IP65, Class I protective class	

RoHS

CAUTION:
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- The capacitors store hazardous energy. Do not touch while working!

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

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IVGM10KLP3G2

Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	210Ad.c./210Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	26Ad.c./26Ad.c.
Max.Shorted Current	39Ad.c./39Ad.c.
Max.PV Input Power	15000W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	15.1/14.5Aa.c.
Max. AC Input/Output Current	16.7/15.9Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	10000W
AC Input/Output Apparent Power	11000VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	16.7/15.9Aa.c.
Max. AC Output Apparent Power	11000VA
Non-isolated topology, IP65, Class I protective class	

RoHS

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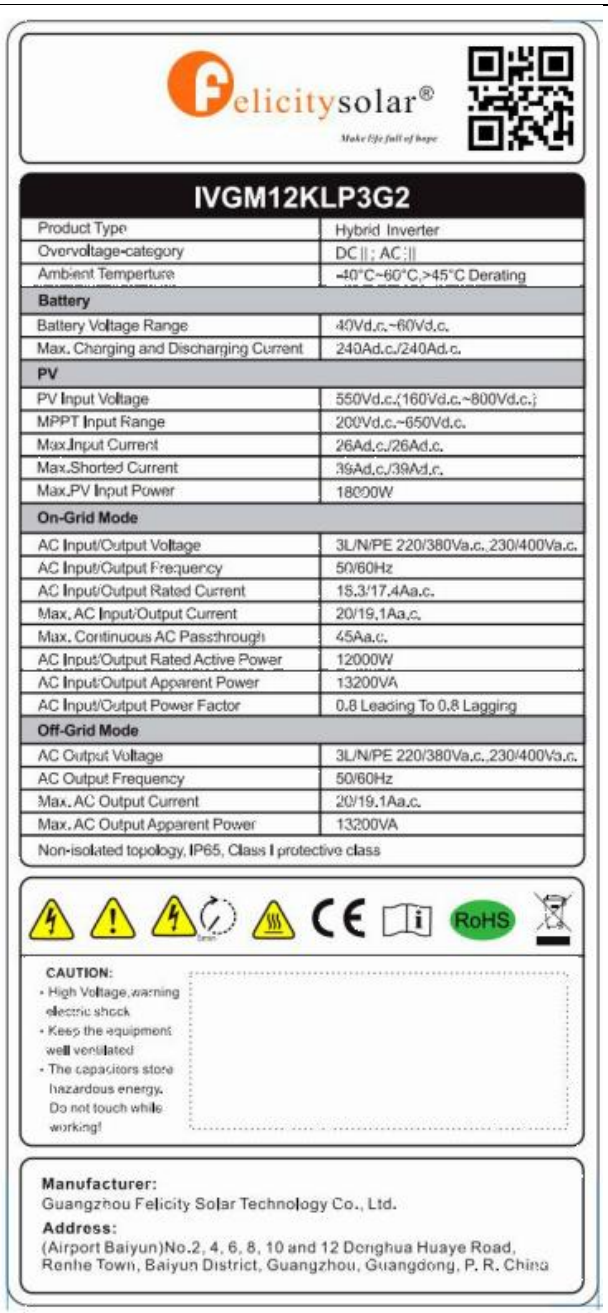

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IVGM12KLP3G2	
Product Type	Hybrid Inverter
Overvoltage-category	DC II ; AC III
Ambient Temperture	-40°C~60°C,>45°C Derating
Battery	
Battery Voltage Range	40Vd.c.~60Vd.c.
Max. Charging and Discharging Current	240Ad.c./240Ad.c.
PV	
PV Input Voltage	550Vd.c.(160Vd.c.~800Vd.c.)
MPPT Input Range	200Vd.c.~650Vd.c.
Max.Input Current	26Ad.c./26Ad.c.
Max.Shorted Current	39Ad.c./39Ad.c.
Max.PV Input Power	18000W
On-Grid Mode	
AC Input/Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Input/Output Frequency	50/60Hz
AC Input/Output Rated Current	18.3/17.4Aa.c.
Max. AC Input/Output Current	20/19.1Aa.c.
Max. Continuous AC Passthrough	45Aa.c.
AC Input/Output Rated Active Power	12000W
AC Input/Output Apparent Power	13200VA
AC Input/Output Power Factor	0.8 Leading To 0.8 Lagging
Off-Grid Mode	
AC Output Voltage	3L/N/PE 220/380Va.c.,230/400Va.c.
AC Output Frequency	50/60Hz
Max. AC Output Current	20/19.1Aa.c.
Max. AC Output Apparent Power	13200VA
Non-isolated topology, IP65, Class I protective class	

RoHS

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Note:

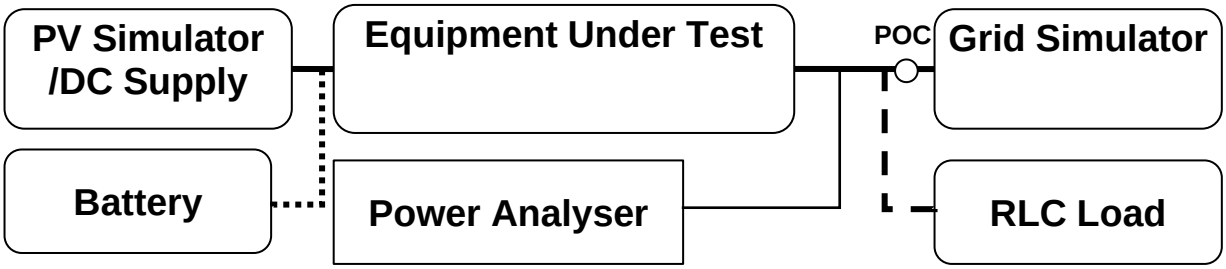
1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation.

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_n" 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.