TEST REPORT

NTS 631 SENP

Norma Técnica de Supervisión (NTS) de la conformidad de los módulos de generación de electricidad según el PO 12.2 SENP. Revisión 1.1 de 09/07/2021 + Corrección de errores 08/10/2021

Report reference number ..... :	**PVES2408WDG0290-1-R1**
Date of issue ..... :	2025-09-25
Total number of pages ..... :	27
Testing laboratory name ..... :	**Bureau Veritas Consumer Products Services Germany GmbH**
Address ..... :	Businesspark A96, 86842 Türkheim, Germany
Accrediation ..... :	ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-12024-03-00
Applicant's name ..... :	**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
Test specification	
Standard..... :	Norma Técnica de Supervisión (NTS) de la conformidad de los módulos de generación de electricidad según el PO 12.2 SENP. Revisión 1.1 de 09/07/2021 + Corrección de errores 08/10/2021 (Type A)
Certificate ..... :	**Certificate of compliance**
Test report form number. ..... :	NTS 631 SENP
Master TRF ..... :	Bureau Veritas Consumer Products Services Germany GmbH
Test item description..... :	**Photovoltaic (PV) and battery inverter**
Trademark..... :	Felicitysolar® Make life full of hope
Model / Type ..... :	IVGM25KHP3G2, IVGM29K9HP3G2, IVGM30KHP3G2, IVGM40KHP3G2, IVGM50KHP3G2

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Ratings .....:	**IVGM25KHP3G2**	**IVGM29K9HP3G2**	**IVGM30KHP3G2**
Max. input DC voltage [V].....:	1000		
MPP DC voltage range [V] .....:	150-850		
Max. Input DC current [A].....:	36/36	36/36/36	36/36/36
Output AC voltage .....:	230Vac, 50Hz, 3L/N/PE		
Nominal. Output AC current [A] :	36,3	43,4	43,5
Max. Output AC current [A] .....:	39,9	43,4	47,9
Rated Output power [kW] .....:	25,0	29,9	30,0
Max. Output power [kVA].....:	27,5	29,9	33,0
Battery Voltage Range[V] .....:	160-800		
Max. Battery Discharging /Charging Current[A] .....:	50/50		

Ratings .....:	**IVGM40KHP3G2**	**IVGM50KHP3G2**
Max. input DC voltage [V].....:	1000	
MPP DC voltage range [V] .....:	150-850	
Max. Input DC current [A].....:	36/36/36/36	
Output AC voltage .....:	230Vac, 50Hz, 3L/N/PE	
Nominal. Output AC current [A] :	58,0	72,5
Max. Output AC current [A] .....:	63,8	79,7
Rated Output power [kW] .....:	40,0	50,0
Max. Output power [kVA].....:	44,0	55,0
Battery Voltage Range[V] .....:	160-800	
Max. Battery Discharging /Charging Current[A] .....:	50/50	

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Testing Location ..... :	**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

Tested by (name and signature) ..... :	Max Li PV Project Engineer	Digitally signed by Max Li DN: cn=Max Li, o=Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, ou=New energy, email=Max.li@bureauveritas.com, c=CN Date: 2025.10.19 15:52:53 +08'00'
Approved by (name and signature) ..... :	Ryan He PV Project Manager	Digitally signed by Ryan He DN: cn=Ryan He, o=Bureau Veritas Shenzhen Co., LTD. Dongguan Branch, ou=New Energy, email=ryan.he@bureauveritas.com, c=CN Date: 2025.10.20 11:29:43 +08'00'

Manufacturer's name ..... :	**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, P. R. China
Factory's name ..... :	**Guangzhou Felicity Solar Technology Co., Ltd.**
Factory address ..... :	(Airport Baiyun)No.2, 4, 6, 8, 10 and 12 Donghua Huaye Road, Renhe Town, Baiyun District, Guangzhou, Guangdong, P. R. China

Document History

Date	Internal reference	Modification / Change / Status	Revision
2024-11-01	Chason Ye	Initial report was written	0
2025-09-25	Max Li	1. Change MPP Voltage range 200-850 to 150-850V 2. Change inverter model name 3. Update the hardware version to 100 and software version to 100 4. Update inverter photos, weight, label and manual 5. Change Applicant, Manufacturer, and Factory	R1

Supplementary information:

According to the standard Norma Técnica de Supervisión (NTS) de la conformidad de los módulos de generación de electricidad según el PO 12.2 SENP. Revisión 1.1 de 09/07/2021 + Corrección de errores 08/10/2021 (Type A), no tests need to be retest with above changes.

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Test items particulars

Equipment mobility..... :	Permanent connection
Operating condition..... :	Continuous
Class of equipment ..... :	Class I
Protection against ingress of water.. :	IP65 according to EN 60529
Mass of equipment [kg]..... :	IVGM25KHP3G2, IVGM29K9HP3G2, IVGM30KHP3G2: 80,0, IVGM40KHP3G2, IVGM50KHP3G2: 87,1

Test case verdicts

Test case does not apply to the test object..... :	N/A
Test item does meet the requirement..... :	P(ass)
Test item does not meet the requirement..... :	F(ail)

Testing

Date of receipt of test item ..... :	2024-08-26
Date(s) of performance of test ..... :	2024-08-26 to 2024-10-31

General remarks:

The test result presented in this report relate only to the object(s) tested. The report shall state compliance of the tested objects with the requirements of NTS 631 SENP. This report shall not be reproduced in part or in full without the written approval of the issuing testing laboratory.

”(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

This Test Report consists of the following documents:

1. Test Report
   5.1 Limited frequency sensitive mode--overfrequency
2. Annex No. 1 – Datasheet of the relay
3. Annex No. 2 – Pictures of the unit
4. Annex No. 3 – Test equipment list

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Copy of marking plate



felicitysolar®
Make life full of hope

IVGM25KHP3G2	
Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	40 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	150~850Vd.c.
Full Load DC Voltage Range	555~850Vd.c.
PV Input Current	36+36(A)
Max. PV Isc	55+55(A)
AC Input/Output Data	
Rated AC Input/Output Power	25 kW
Max. AC Input/Output Power	27.5kW
AC Input/Output Rated Current	36.3 A
Max. AC Input/Output Current	39.9 A
Rated AC Voltage	220/380,230/400 Vac(-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)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

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

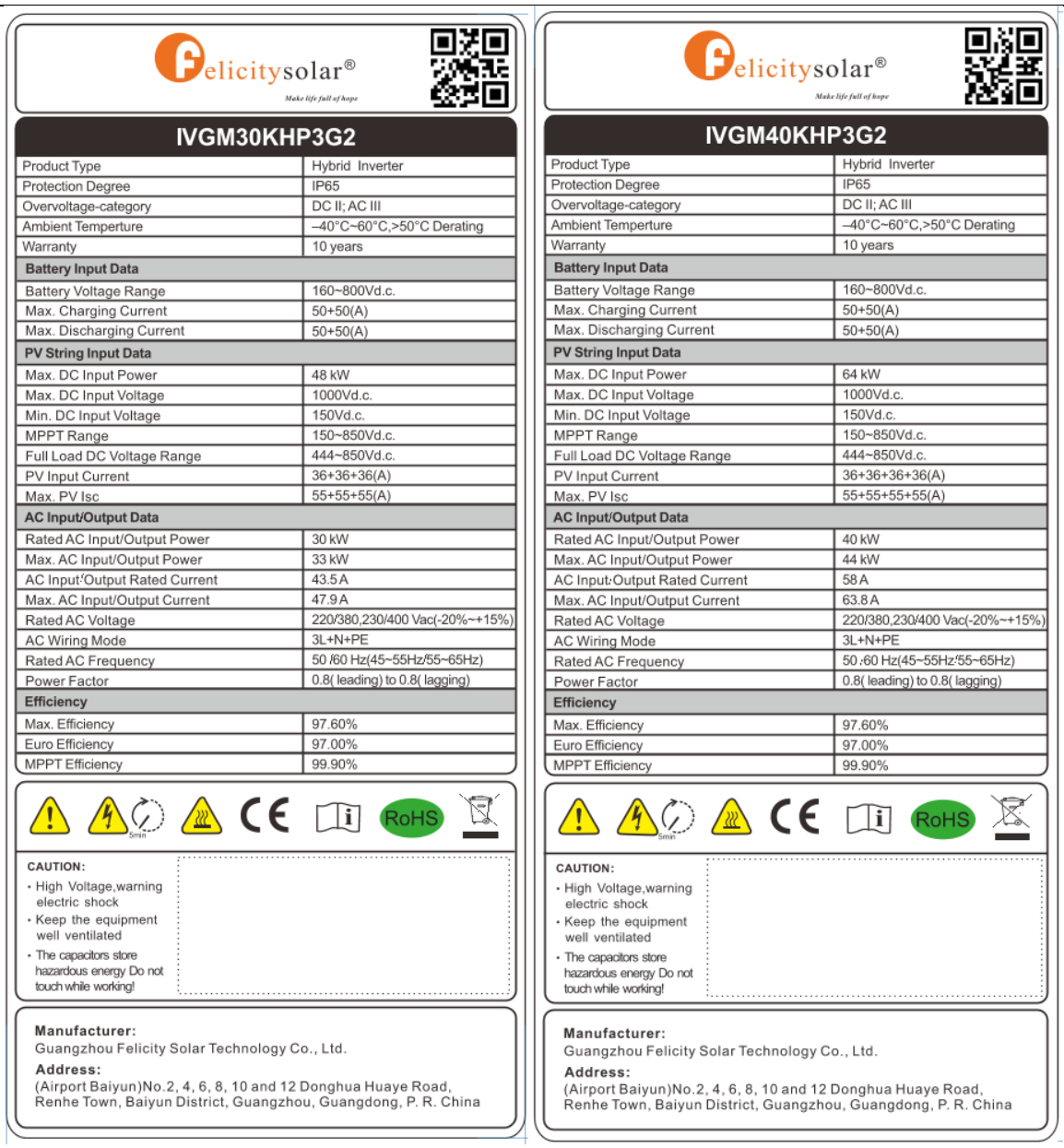
felicitysolar®
Make life full of hope

IVGM29K9HP3G2	
Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	47.84 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	150~850Vd.c.
Full Load DC Voltage Range	443~850Vd.c.
PV Input Current	36+36+36(A)
Max. PV Isc	55+55+55(A)
AC Input/Output Data	
Rated AC Input/Output Power	29.9 kW
Max. AC Input/Output Power	29.9 kW
AC Input/Output Rated Current	43.4 A
Max. AC Input/Output Current	43.4 A
Rated AC Voltage	220/380,230/400 Vac(-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)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

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

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.



Felicitysolar®
Make life full of hope

IVGM30KHP3G2

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	48 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	150~850Vd.c.
Full Load DC Voltage Range	444~850Vd.c.
PV Input Current	36+36+36(A)
Max. PV Isc	55+55+55(A)
AC Input/Output Data	
Rated AC Input/Output Power	30 kW
Max. AC Input/Output Power	33 kW
AC Input/Output Rated Current	43.5 A
Max. AC Input/Output Current	47.9 A
Rated AC Voltage	220/380,230/400 Vac(-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)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

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

Felicitysolar®
Make life full of hope

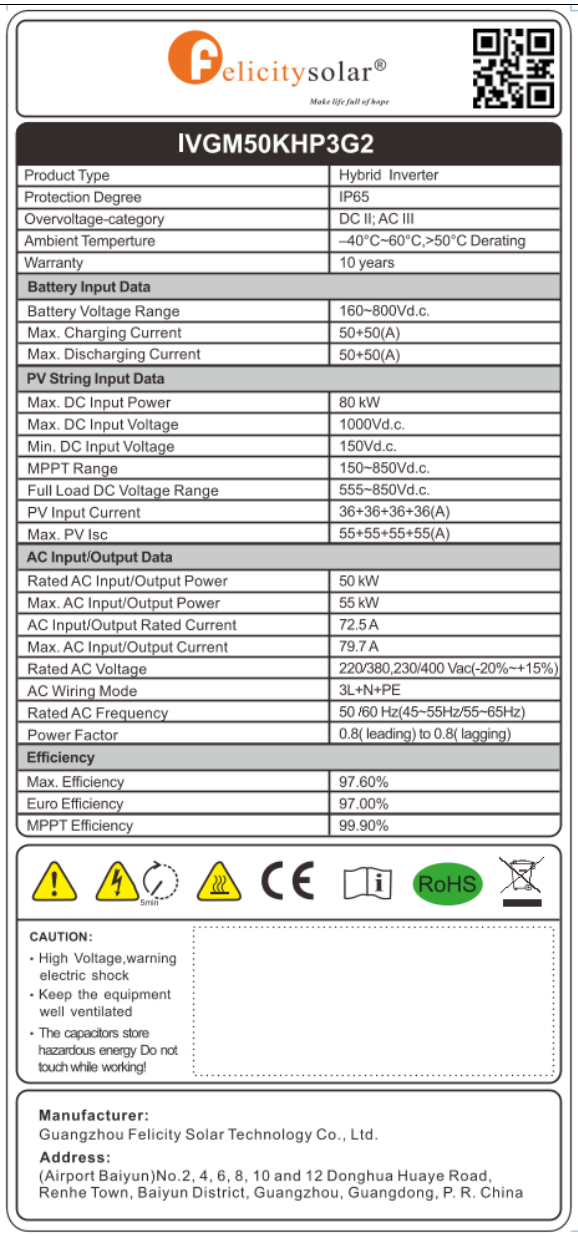
IVGM40KHP3G2

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	64 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	150~850Vd.c.
Full Load DC Voltage Range	444~850Vd.c.
PV Input Current	36+36+36+36(A)
Max. PV Isc	55+55+55+55(A)
AC Input/Output Data	
Rated AC Input/Output Power	40 kW
Max. AC Input/Output Power	44 kW
AC Input/Output Rated Current	58 A
Max. AC Input/Output Current	63.8 A
Rated AC Voltage	220/380,230/400 Vac(-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)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

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

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.



felicitysolar®
Make life full of hope

IVGM50KHP3G2

Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input Power	80 kW
Max. DC Input Voltage	1000Vd.c.
Min. DC Input Voltage	150Vd.c.
MPPT Range	150~850Vd.c.
Full Load DC Voltage Range	555~850Vd.c.
PV Input Current	36+36+36+36(A)
Max. PV Isc	55+55+55+55(A)
AC Input/Output Data	
Rated AC Input/Output Power	50 kW
Max. AC Input/Output Power	55 kW
AC Input/Output Rated Current	72.5 A
Max. AC Input/Output Current	79.7 A
Rated AC Voltage	220/380,230/400 Vac(-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)
Efficiency	
Max. Efficiency	97.60%
Euro Efficiency	97.00%
MPPT Efficiency	99.90%

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

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

General product information:



Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Hybrid inverter

Appendix I

Model	IVGM 50KHP3G2	IVGM 40KHP3G2	IVGM 30KHP3G2	IVGM 29K9HP3G2	IVGM 25KHP3G2
Battery Input Data					
Battery Type	LFP (LiFePO4)				
Battery Voltage Range	160~800Vd.c.				
Max. Charging Current	50+50(A)				
Max. Discharging Current	50+50(A)				
Number of battery input	2				
PV String Input Data					
Max. DC access power	100 kW	80 kW	60 kW	59.8 kW	50 kW
Max. DC Input Power	80 kW	64 kW	48 kW	47. 84 kW	40 kW
Max. DC Input Voltage	1000Vd.c.				
Min. DC Input Voltage	150Vd.c.				
Start-up Voltage	180Vd.c.				
Rated DC Input Voltage	600Vd.c.				
MPPT Range	150~850Vd.c.				
Full Load DC Voltage Range	555~850Vdc	444~850Vdc	444~850Vdc	443~850Vdc	555~850Vdc
PV Input Current	36+36+36+36(A)		36+36+36(A)		36+36(A)
Max. PV Isc	55+55+55+55(A)		55+55+55(A)		55+55(A)
No.of MPP Trackers	4		3		2
No.of Strings per MPP Tracker	2		2		2
AC Input/Output Data					
Rated AC Input/Output Power	50 kW	40 kW	30 kW	29. 9 kW	25 kW
Max. AC Input/Output Power	55 kW	44 kW	33 kW	29. 9 kW	27. 5 kW
AC Input/Output Rated Current	72.5 A	58 A	43. 5 A	43. 4 A	36.3 A
Max. AC Input/Output Current	79.7 A	63.8 A	47. 9A	43. 4 A	39.9 A
Max. Output Overcurrent Protection (A)	192(A)		144(A)		
Peak Power (off-grid)(W)	1.5 time of rated power, 10S				
Max. Continuous AC Passthrough (grid to load)(A)	200(A)				
Rated AC Voltage	220/380,230/400 Vac(-20%~+15%)				
AC Wiring Mode	3L+N+PE				
Rated AC Frequency	50 /60 Hz (45~55Hz/55~65Hz)				
THDI	<3% (At Rated Power)				
Power Factor	0.8(leading) to 0.8(lagging)				
DC Injection Current	<0.5% In				

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Hybrid inverter

Efficiency					
Max. Efficiency	97.60%				
Euro Efficiency	97.00%				
MPPT Efficiency	99.90%				
Protection					
PV Input Lightning Protection	Integrated				
PV String Input Reverse Polarity Protection	Integrated				
Battery Input Lightning Protection	Integrated				
Battery Input Reverse Polarity Protection	Integrated				
Insulation Resistor Detection	Integrated				
Residual Current Monitoring Unit	Integrated				
Output Over Current Protection	Integrated				
Output Shorted Protection	Integrated				
Output Over Voltage Protection	Integrated				
Anti-islanding Protection	Integrated				
AC Output Lightning Protection	Integrated				
Safety and Standards					
Surge Protection Level	TYPE II(DC), TYPE II(AC)				
Over Voltage Category	OVC II(DC), OVC III(AC)				
Grid Regulation	NRS 097-2-1,VDE4105,EN50549-1,AS 4777.2,GB/T 34120 ,GB/T 34133,GB/T 34129				
Safety EMC / Standard	IEC/EN 61000-6-1/2/3/4,IEC/EN 62109-1,IEC/EN 62109-2				
General Data					
Net Weight	87.1KG	87.1KG	80KG	80KG	80KG
Gross Weight	107.1KG	107.1KG	101KG	101KG	101KG
Product Dimension	940*582*340mm				
Package Dimension	1114*774*469mm				
Protection Degree	IP65				
Operating Temperature Range	-40 to 60 ℃ (> 50 ℃ derating)				
Humidity	0 ~ 95 % (No condensation)				
Cooling	Smart cooling				
Altitude	3000 m (> 2000 m derating)				
Communication with BMS	RS485,CAN				
Monitor module	WiFi/GPRS				
Installation Style	Wall-mounted				
Warranty[1]	10 years				
[1]Conditions apply, refer to Felicitysolar Warranty policy.					

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Description of the power circuit:

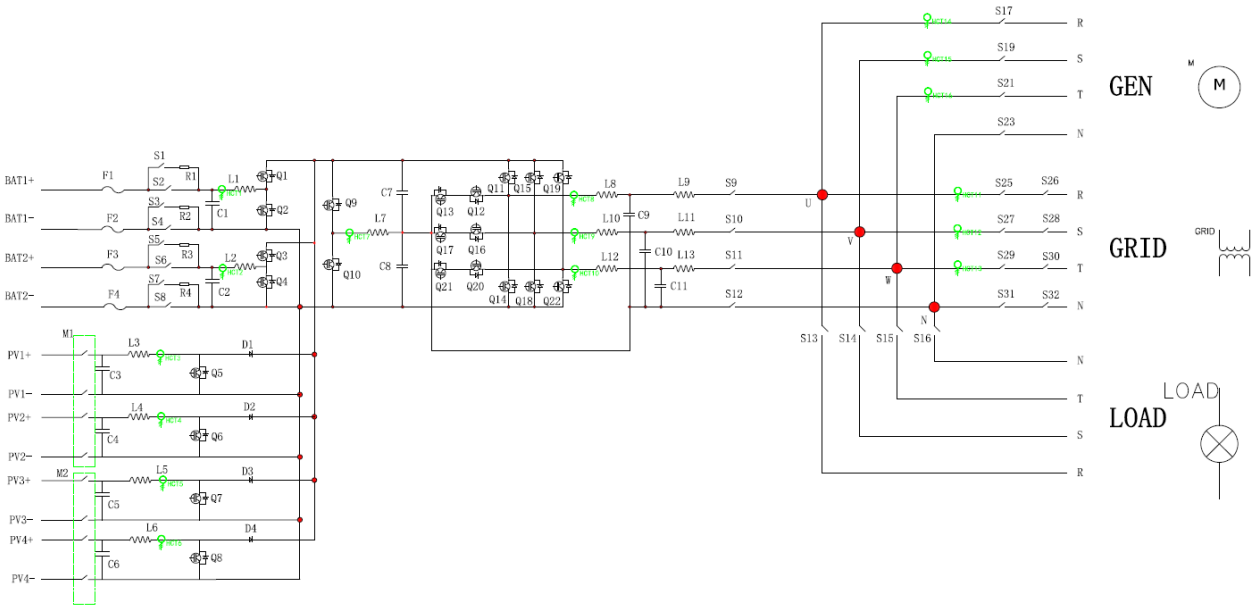


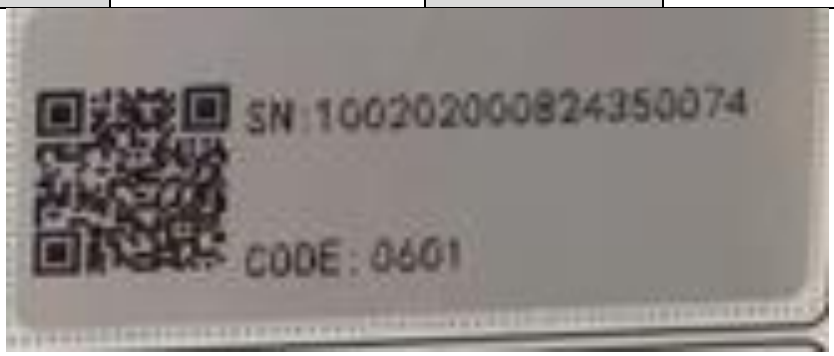
Figure 3 – Block Diagram

Differences of the models:

The PGUs including model IVGM25KHP3G2, IVGM29K9HP3G2, IVGM30KHP3G2, IVGM40KHP3G2 and IVGM50KHP3G2. All the models use the same control unit, control system, software, and similar hardware platform. The different powers are realized by software derating. The model IVGM25KHP3G2 is equipped with two DC inputs and with two MPP trackers. The models IVGM29K9HP3G2 and IVGM30KHP3G2 are equipped with two DC inputs and with three MPP trackers. The models IVGM40KHP3G2 and IVGM50KHP3G2 are equipped with two DC inputs and with four MPP trackers.

The product was tested on:

Model:	IVGM50KHP3G2	Serial number:	10020200824350074



Hardware version: 100

Software version: 100

All tests were performed on IVGM50KHP3G2.Tests of the EUT of IVGM50KHP3G2 not applicable for the models IVGM25KHP3G2, IVGM29K9HP3G2, IVGM30KHP3G2 and IVGM40KHP3G2 were performed on the concerned models and a statement is given at the relevant test.

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

General remarks:

The test results presented in this report relate only to the object(s) tested.
This document may be published or passed on in full only. Extraction of parts needs the written permission of Bureau Veritas Consumer Products Services GmbH.

”(see Annex #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

Conformity statements are decided in accordance with IEC GUIDE 115:2021 Procedure 2 (accuracy method), unless otherwise normatively specified or contractually agreed.

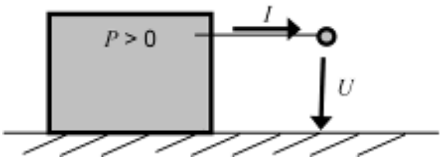
The following suffixes are used for variables in tables and figures:

- “P_n” for the 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)
- “P_M” for the momentary power
- “(c)” for over-excited
- “(i)” for under-excited

Active and reactive power:

The regarded system of the voltage and current vectors is the load view (Figure 2):

- If the inverter feeds to the grid the active power is measured with negative sign. For the sake of reading the document the measured active infeed power has a positive sign



- If the inverter consumes inductive reactive power the reactive power is marked “inductive” or has a positive sign.
- If the inverter consumes capacitive reactive power the reactive power is marked “capacitive” or has a negative sign.

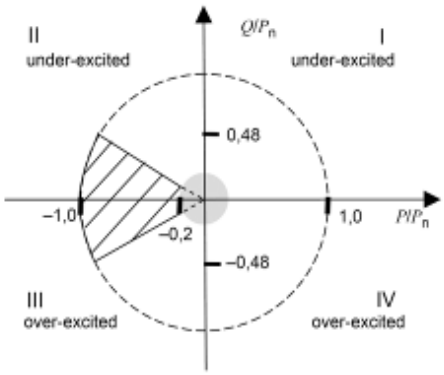


Figure 4

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

NTS 631 SENP: Tests		
Clause	**Test requirement**	**Result**
5.1	Limited frequency sensitive mode--overfrequency	**P**
5.2	Limited frequency sensitive mode--underfrequency	**N/A**
5.3	Power frequency sensitive mode (MRPF)	**N/A**
5.4	Limited frequency sensitive mode—response time	**N/A**
5.5	Active power controllability and contorl range	**N/A**
5.6	Inertia emulation	**N/A**
5.7	Reactive Power Capability	**N/A**
5.8	Reactive Power Control modes	**N/A**
5.9	Reactive power control in MPE	**N/A**
5.10	Damping of power oscillations in MPE	**N/A**
5.11	Fault-right Through capability	**N/A**

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

5.1 Limited frequency senstive mode--overfrequency	P

Test : IVGM50KHP3G2

Table 3: F_{start}: 50,2Hz; s=2%; Pini=Pmax

Test point No.	f_0(Hz)	f_{fin}(Hz)	ΔP expected (%Pmax)	ΔP Registred (%Pmax)	Dev.(%Pmax)(< 5%Pmax)	90%ΔP reg. (%Pmax)	tr (s) (at 90% ΔP reg.)	ta(s)	te (s) (Band±5% ΔPmax)
1	50,00	50,10	0,00	-0,06	-0,06	--	--	--	--
2	50,10	50,50	-30,00	-29,88	-0,12	-26,89	0,300	0,050	0,350
3	50,50	50,70	-20,00	-20,11	0,11	-18,10	0,300	0,050	0,350
4	50,70	50,50	20,00	20,14	-0,14	18,13	0,300	0,050	0,350
5	50,50	50,10	30,00	29,91	0,09	26,92	--	--	--
6	50,10	50,70	-50,00	-50,01	0,01	-45,01	0,550	0,050	0,600

Table 4: F_{start}: 50,5Hz; s=2%; Pini=Pmax

Test point No.	f_0(Hz)	f_{fin}(Hz)	ΔP expected (%Pmax)	ΔP Registred (%Pmax)	Dev,(%Pmax)(< 5%Pmax)	90%ΔP reg, (%Pmax)	tr (s) (at 90% ΔP reg.)	ta(s)	te (s) (Band±5% ΔPmax)
1	50,00	50,40	0,00	-0,10	0,10	--	--	--	--
2	50,40	50,80	-30,00	-30,10	0,10	-27,09	0,400	0,050	0,450
3	50,80	51,00	-20,00	-20,01	0,01	-18,01	0,350	0,050	0,400
4	51,00	50,80	20,00	20,05	-0,05	18,04	0,250	0,050	0,300
5	50,80	50,10	30,00	29,98	0,02	26,98	--	--	--
6	50,10	51,00	-50,00	-50,03	0,03	-45,03	0,350	0,050	0,400

Table 5: F_{start}: 50,2Hz; s=12%; Pini=Pmax

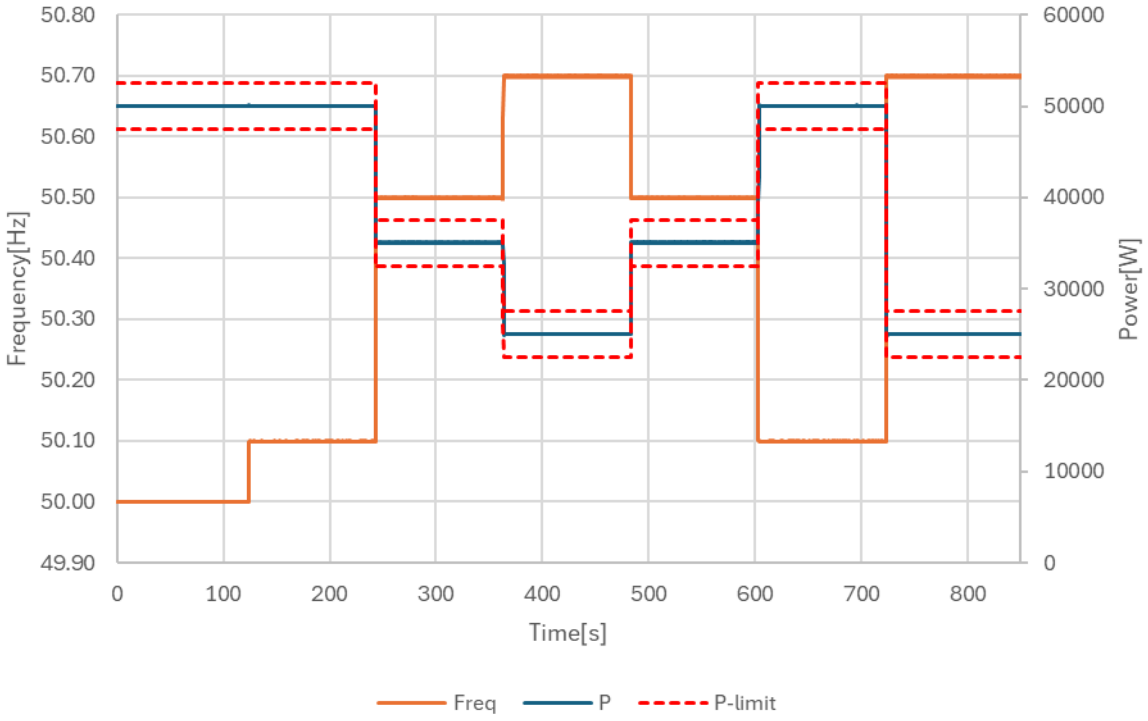
Test point No.	f_0(Hz)	f_{fin}(Hz)	ΔP expected (%Pmax)	ΔP Registred (%Pmax)	Dev,(%Pmax)(< 5%Pmax)	90%ΔP reg, (%Pmax)	tr (s) (at 90% ΔP reg.)	ta(s)	te (s) (Band±5% ΔPmax)
1	50,00	50,10	0,00	-0,05	0,05	--	--	--	--
2	50,10	51,40	-20,00	-19,59	-0,41	-17,64	0,300	0,050	0,350
3	51,40	50,30	18,33	18,11	0,22	16,30	0,250	0,050	0,300

Table 6: F_{start}: 50,5Hz; s=12%; Pini=Pmax

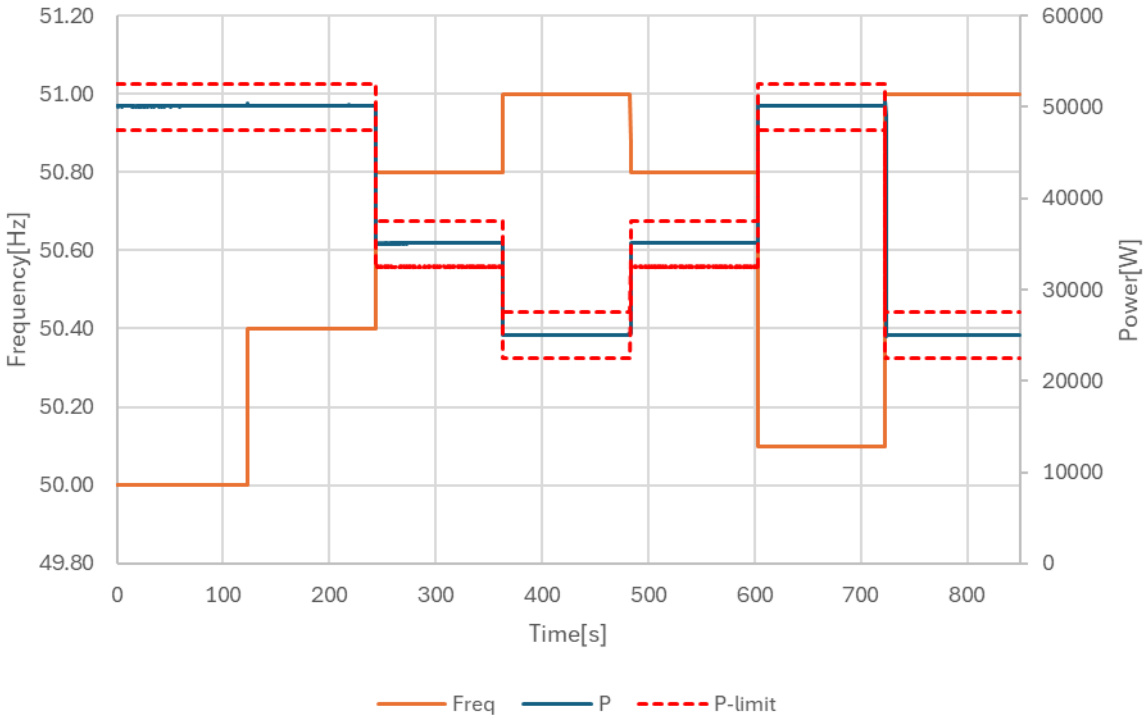
Test point No.	f_0(Hz)	f_{fin}(Hz)	ΔP expected (%Pmax)	ΔP Registred (%Pmax)	Dev,(%Pmax)(< 5%Pmax)	90%ΔP reg, (%Pmax)	tr (s) (at 90% ΔP reg.)	ta(s)	te (s) (Band±5% ΔPmax)
1	50,00	50,40	0,00	0,09	0,09	--	--	--	--
2	50,40	51,40	-15,00	-14,79	-0,21	-13,31	0,250	0,050	0,300
3	51,40	50,60	13,33	13,09	0,24	11,78	0,400	0,050	0,450

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Graph Table 3: F_{start}: 50,2Hz; s=2%; Pini=Pmax

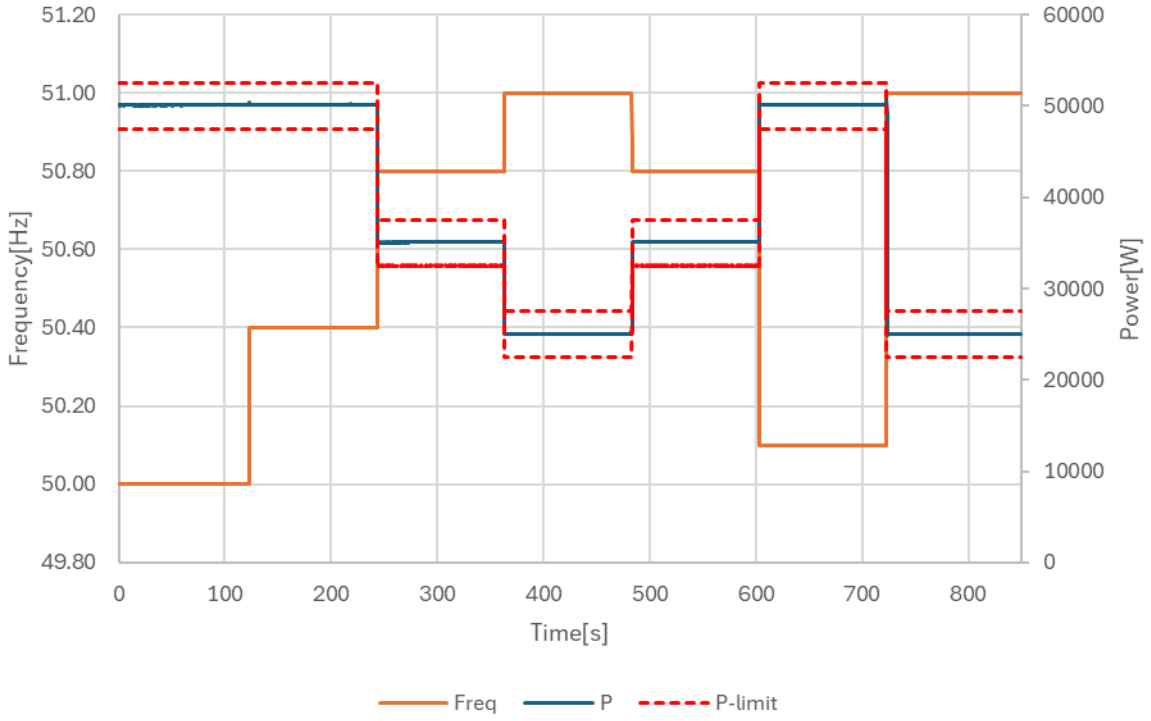


Graph Table 4: F_{start}: 50,5Hz; s=2%; Pini=Pmax

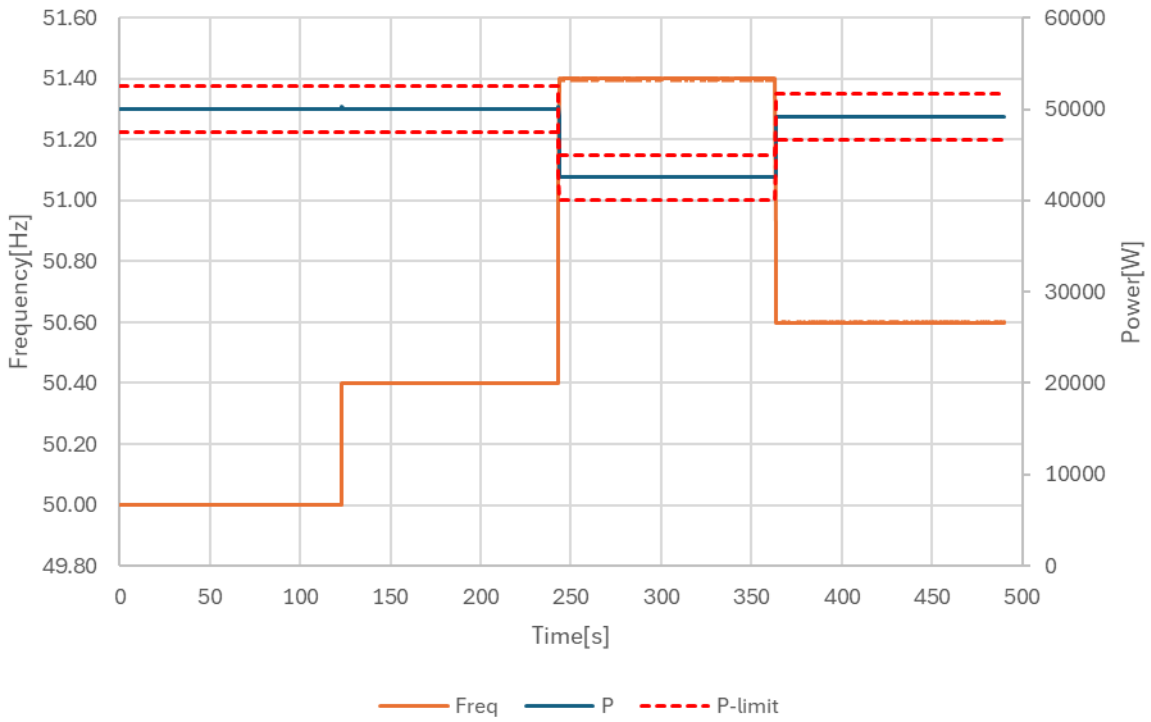


Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Graph Table 5: F_{start}: 50,2Hz; s=12%; Pini=Pmax



Graph Table 6: F_{start}: 50,5Hz; s=12%; Pini=Pmax



Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Assessment criterion:

ta: Time since frequency changes until power initiates automatic response at least 1%Pmax

tr: Time since the beginning of automatic response until power reaches 90% |ΔP|

te: Time until power stabilizes within a band of ±5% |ΔP| (expected power value)

$$|\Delta P| = \frac{|\Delta f| - |\Delta f_1|}{f_n} \times \frac{P_{max}}{s_2} \times 100$$

In the event of active power reductions during frequency rise and when the MRPFL-O is active:

ta limit = 0,15 s (in case of Ta > 2s, the electric generation module owner shall be justified by tests to the network operator this value).

tr limit = 2 s for ≤50% maximum active power variations

te limit = 20 s for active power increments.

In the event of active power increases during frequency dropping and when the MRPFL-O is active:

ta limit = 0,15 s (in case of Ta > 2s, the electric generation module owner shall be justified by tests to the network operator this value).

tr limit = 10 s for ≤50% maximum active power variations

te limit = 30 s for active power increments.

for adjustable PGUs:

To verify this condition, the following test is performed with the following sequence:

1 Connect the generator to a power source that feeds the generator and that is capable of supplying a power equal to or greater than the power of the generator to be tested.

2 Connect the generator to the grid to be tested.

3 Perform the source frequency change in Table 3-6.

4 Measure the power exchanged with the network, with an uncertainty better than or equal to 5% Pmax, making measurements of 50 ms in a time window of 2 min every point.

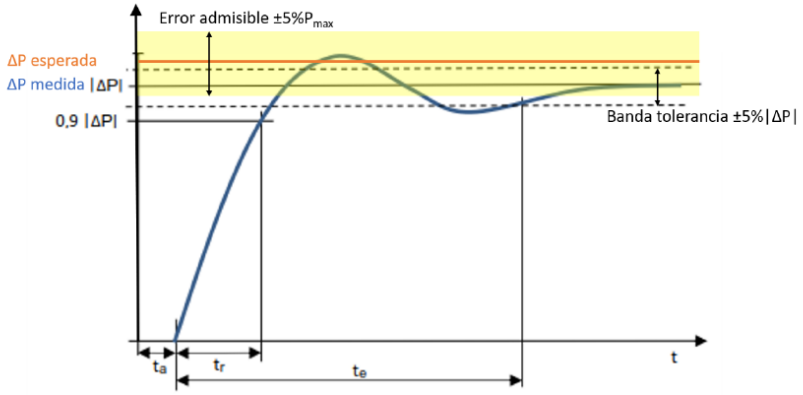


Figura 11. Ejemplo de respuesta en potencia que ilustra los tiempos t_a, t_r, y t_e definidos más arriba.

Note:

The tests had been performed on the IVGM50KHP3G2 are valid for the IVGM25KHP3G2, IVGM29K9HP3G2, IVGM30KHP3G2 and IVGM40KHP3G2 since it is almost same as in hardware and just power derated by software.

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Annex No. 1

Datasheet of the relay

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

CHAR Series 150A/200A LARGE POWER RELAY

Churod Electronics

FEATURES

- Outline dimension(47.7mm×40.1mm×51.8mm)
- 1 Form X arrangement
- Contact gap,4.0mm Min.
- Designed to meet UL/cUL,TUV requirements
- PCB terminal for the mounting
- RoHS compliance
- REACH SvHC compliance



File NO. E341422

File NO. R50316974

APPLICATION

Solar inverter

Inverter precharging circuit control

Industrial Control

COIL PARAMETER

Coil voltage	12VDC,24VDC,48VDC
Coil power	3.2W

CONTACT DATA

Type	CHAR-A200	CHAR-A150H
Contact arrangement	1 Form X	
Contact material	Ag Alloy	
Initial contact resistance	1mΩ max.@DC20A	
Max. switching voltage	830VAC	
Max. switching current	220A	180A
Max. switching power	182,600VA	149,400VA
Contact rating	Make 50A, Carry 200A, Break 50A 830VAC	Make 50A, Carry 150A, Break 50A 830VAC
Mechanical endurance	1,000,000 ops Min.(no load)	
Electrical endurance	30,000 ops Min.(Resistive load)	
Minimum load (reference value)	100mA @48VAC	

COIL DATA @23℃

CHAR				
Nominal coil voltage (VDC)	Nominal Current (mA)	Coil Resistance (Ω±10%)	Operate Voltage (VDC Max.)	Release Voltage (VDC Min.)
12	267	45	9	0.6
24	133	180	18	1.2
48	67	720	36	2.4

NOTE:

1) The above values is the initial values.

CHARACTERISTICS

Operate voltage		75% of nominal voltage or less
Release voltage		5% of nominal voltage or more
Operate time (At nominal voltage)		35ms max.
Release time(At nominal voltage)		30ms max.
Insulation resistance		1,000MΩ min. (at 1000 VDC)
Dielectric strength	Between coil and contacts	4,500 VAC, 50/60Hz (1min)
	Between open contacts	2,500 VAC, 50/60Hz (1min)
Surge voltage between coil and contacts		6,000V(1.2/50μs)
Vibration resistance	Destruction	10 to 55 Hz.,1.5mm double amplitude
	Malfunction	10 to 55 Hz.,1.5mm double amplitude
Shock resistance	Destruction	1,000 m/s2(100G approximately)
	Malfunction	100 m/s2(10G approximately)
Ambient temperature		Operating: -40~+85℃ (without icing or condensation)
Ambient humidity		Operating: 20% to 85% RH
Terminal		PCB terminals
Enclosure (94V-0 Flammability Ratings)		V: Vented(Flux-tight),plastic cover.(RT II)
Weight		Approx. 194g

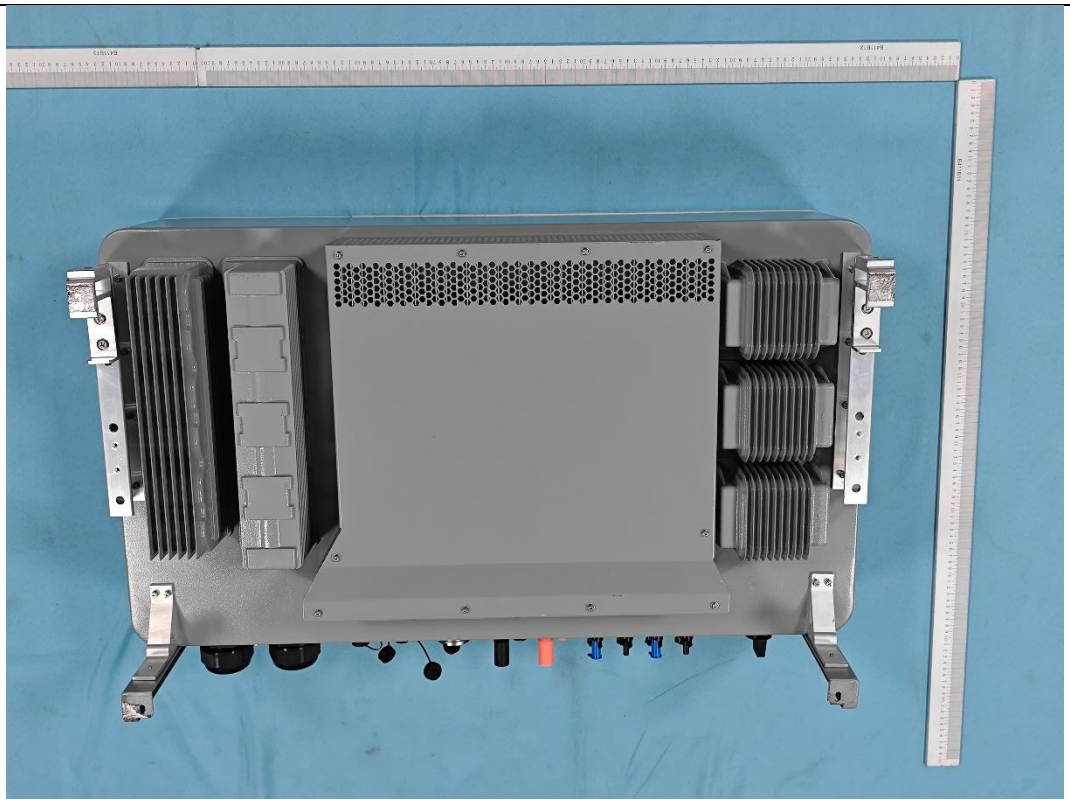
Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Annex No. 2

Pictures of the unit

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Photo of EUT
Enclosure front view

Enclosure rear view


Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Photo of EUT

Enclosure left view



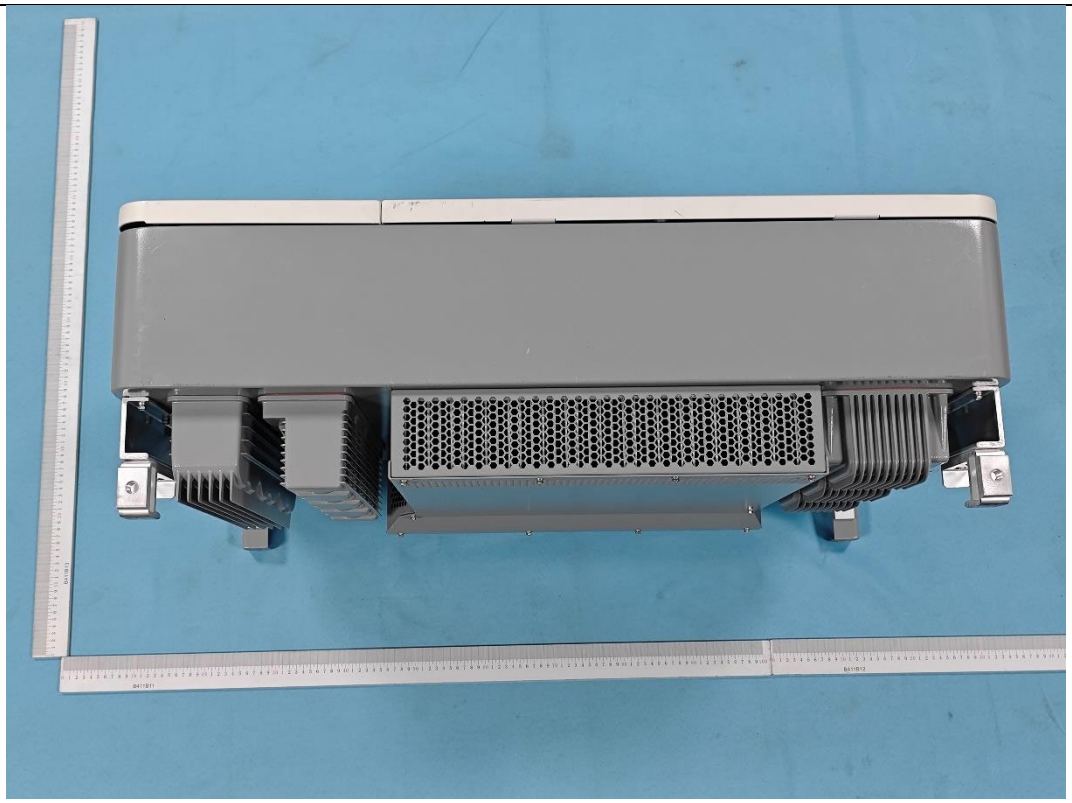
Enclosure right view



Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Photo of EUT

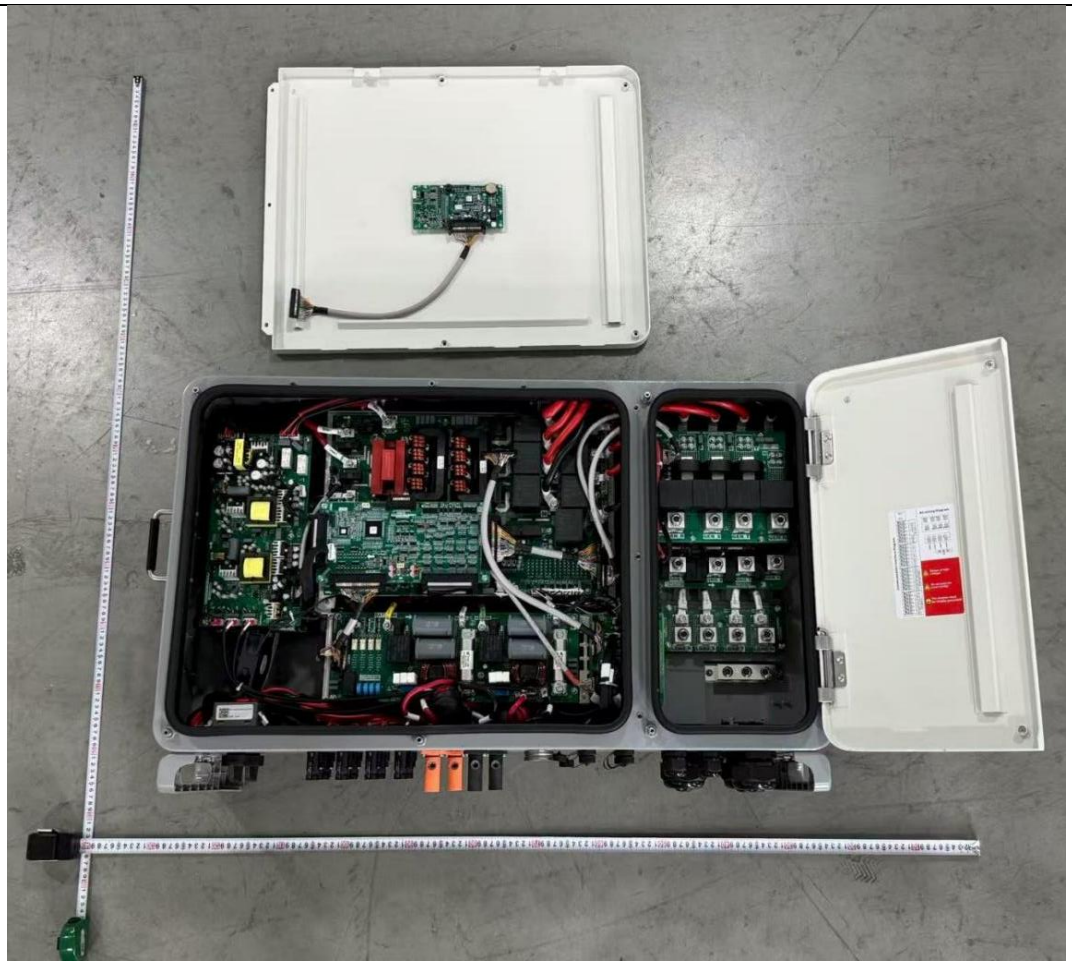
Enclosure top view



Enclosure bottom view



Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Photo of EUT
Internal view


Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Annex No. 3

Test Equipment list

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

Date(s) of performance test: 2024-08-26 to 2024-10-31

Equipment	Internal No.	Manufacturer	Type	Serial No.	Next Calibration
Power Analyzer	FLS*YF0033	DEWESoft	TRTONet+1820-PA	C9220196-CHN	May. 25, 2025
AC Source	XNYYF0068	ACTIONPOWER	AGS-20-4505N	F2042D0013	Monitored by Power Analyzer
DC Simulation Power Supply	XNYYF0081	ACTIONPOWER	PRD1503E	B1042E1023	
	FLS*YF0196	ACTIONPOWER	PRD1503E	B2032I1977	
	FLS*YF0194	ACTIONPOWER	PRD1503E	B2032I1979	
	FLS*YF0191	ACTIONPOWER	PRD1503E	B2032I1990	
RLC Load	A7150027DG	EMAX	IMAX3350-100KW	202409023	
Current transducer	FLS*YF0046	CYBERTEK	CTA 200	CTA2200456	May. 25, 2025
	FLS*YF0049	CYBERTEK	CTA 200	CTA2100425	May. 25, 2025
	FLS*YF0051	CYBERTEK	CTA 200	CTA2200432	May. 25, 2025
	FLS*YF0040	CYBERTEK	CTA 200	CTA2100515	May. 25, 2025
	FLS*YF0045	CYBERTEK	CTA 200	CTA2100512	May. 25, 2025
	FLS*YF0047	CYBERTEK	CTA 200	CTA2100482	May. 25, 2025

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.

END OF TEST REPORT

Copyright © Bureau Veritas Consumer Products Services Germany GmbH
This report must not be reproduced in part or in full without the written approval of the issuing testing laboratory.