TEST REPORT

UNE 217001

Tests for systems intended to avoid the energy transmission to the distribution network

Report reference number..... :	**PVES2408WDG0290-2-R1**
Date of issue.....:	2025-09-25
Total number of pages.....:	46
Testing laboratory name..... :	**Bureau Veritas Consumer Products Services Germany GmbH**
Address.....:	Businesspark A96, 86842 Türkheim, Germany
Accreditation .....:	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 .....:	UNE 217001:2020 Requirements and tests for systems intended to avoid the energy transmission to the distribution network
Test procedure..... :	**Certificate of compliance**
Test report form number. .....:	UNE217001
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

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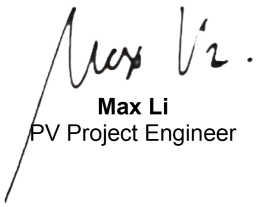
Ratings ..... :	**IVGM25KHP3G2**	**IVGM29K9HP3G2**	**IVGM30KHP3G2**
Max. input DC voltage [V].....:	1000		
MPP DC voltage range [V] .....:	150-850		
Max. Input DC current [A].....:	36/36	36/36/36	36/36/36
Output AC voltage .....:	230Vac, 50Hz, 3L/N/PE		
Nominal. Output AC current [A].....:	36,3	43,4	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	

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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 15:49:26 +08'00'

Approved by
(name and signature) .....:



Ryan He
PV Project Manager

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Date: 2025.10.20 11:29:05 +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 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 6. Change Current Transducer AKH-0.66 K-Φ50-FLS to CTSA050C-300A/5A	R1

Supplementary information:

According to the standard UNE 217001:2020, no tests need to be retest with above changes.

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Test item 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
Possible test case verdicts	
- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing	
Date of receipt of test item ..... :	2024-08-26
Date (s) of performance of tests ..... :	2024-08-26 to 2024-10-31

General remarks

The test results presented in this report relate only to the object(**s**) tested.

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"(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 / ☐ point is used as the decimal separator.

This report consists of the following documents and/or enclosures

1. Test Report
2. Pictures of the unit – Annex No. 1
3. Test equipment list – Annex No. 2

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The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

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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:
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Address:
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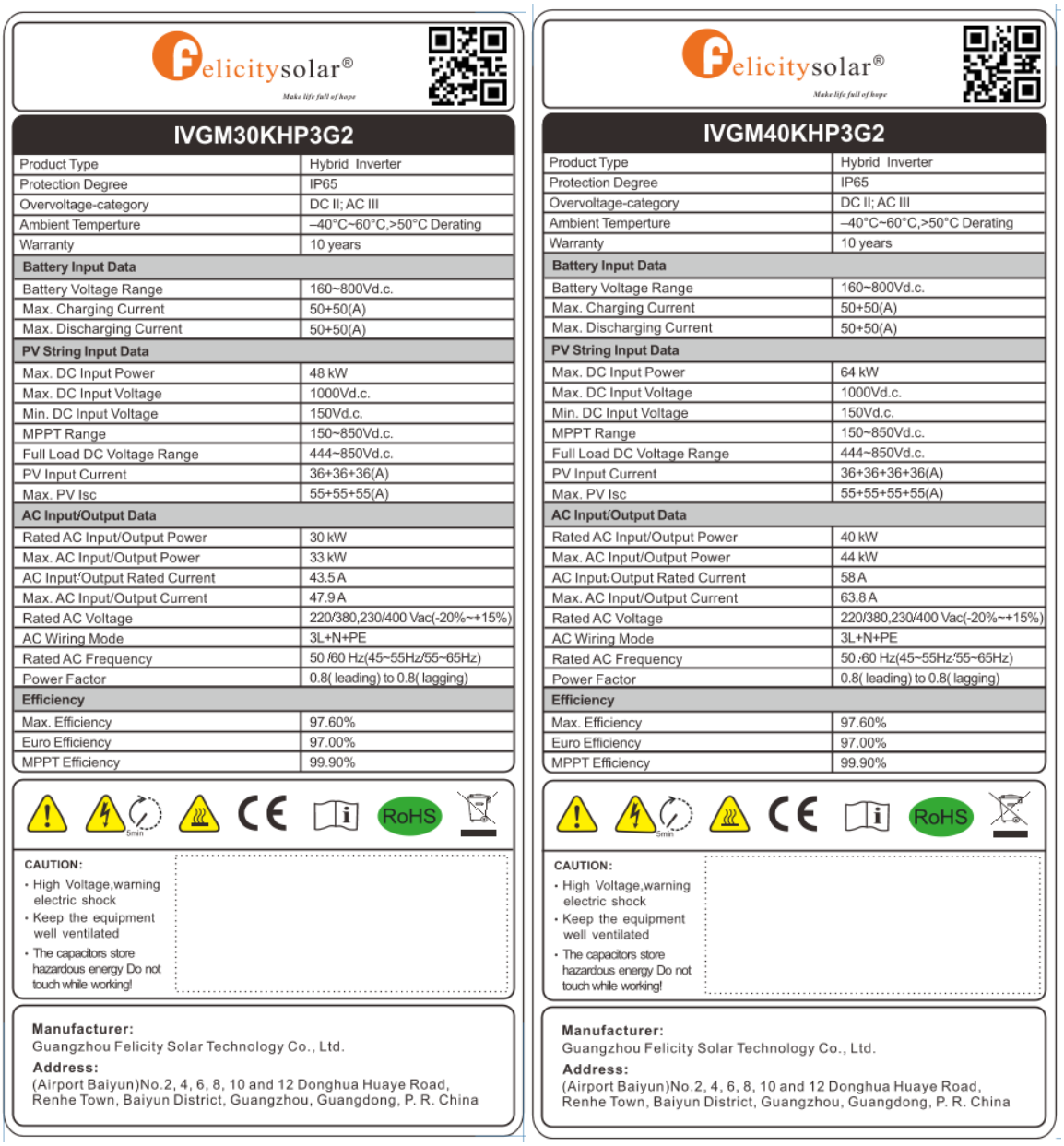
IVGM29K9HP3G2	
Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input 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%

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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%

RoHS

CAUTION:
- High Voltage,warning electric shock
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- The capacitors store hazardous energy Do not touch while working!

Manufacturer:
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Address:
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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%

RoHS

CAUTION:
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IVGM50KHP3G2

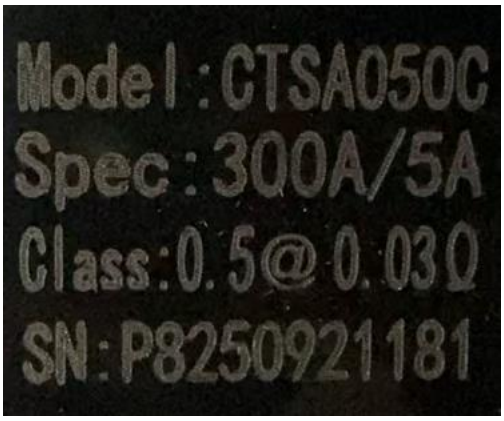
Product Type	Hybrid Inverter
Protection Degree	IP65
Overvoltage-category	DC II; AC III
Ambient Temperture	–40°C~60°C,>50°C Derating
Warranty	10 years
Battery Input Data	
Battery Voltage Range	160~800Vd.c.
Max. Charging Current	50+50(A)
Max. Discharging Current	50+50(A)
PV String Input Data	
Max. DC Input 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:
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Current Transducer



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General product information:

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USER GUIDE

IVGM50KHP3G2

IVGM40KHP3G2

IVGM30KHP3G2

IVGM29K9HP3G2

IVGM25KHP3G2



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General product information:

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				

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General product information:

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.					

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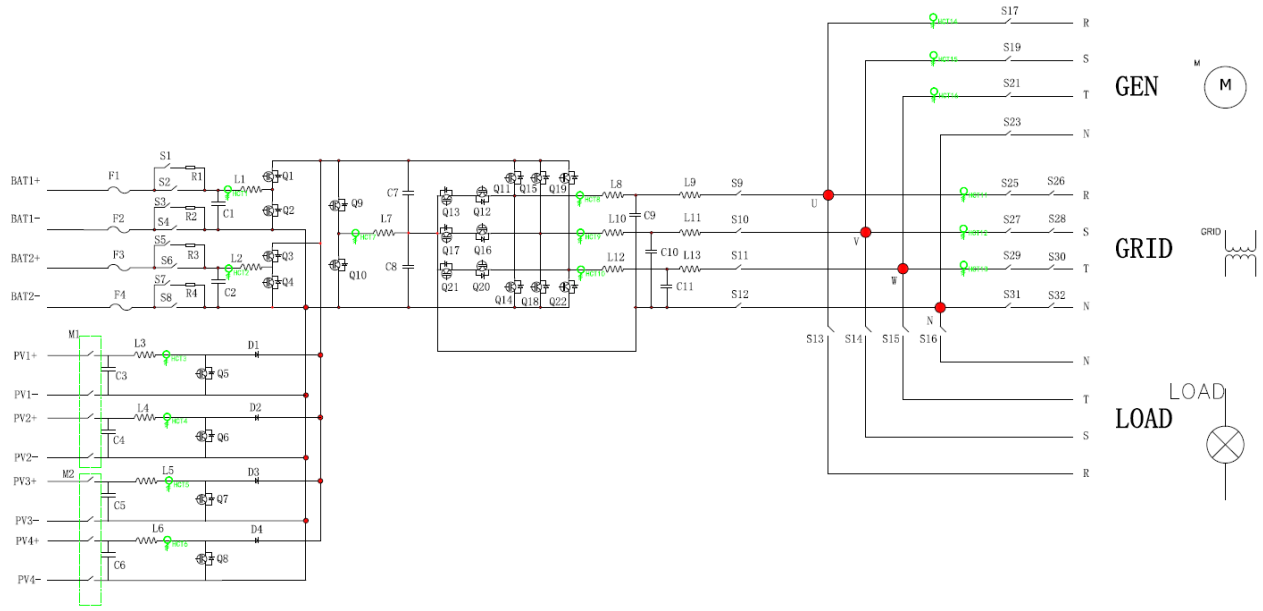


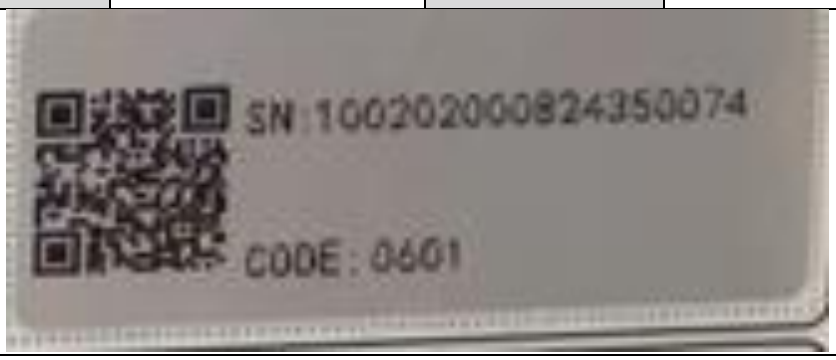
Figure 1 – Block diagram

Description of the differences of the models within a series:

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 photovoltaic (PV) and battery inverter IVGM50KHP3G2 with the current sensor CTSA050C-300A/5A. 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.

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1) Basic outline of the system	Informative

Application Scenarios

Scheme of Single machine photovoltaic power generation system: Photovoltaic (PV) and battery inverter + Current Transducer

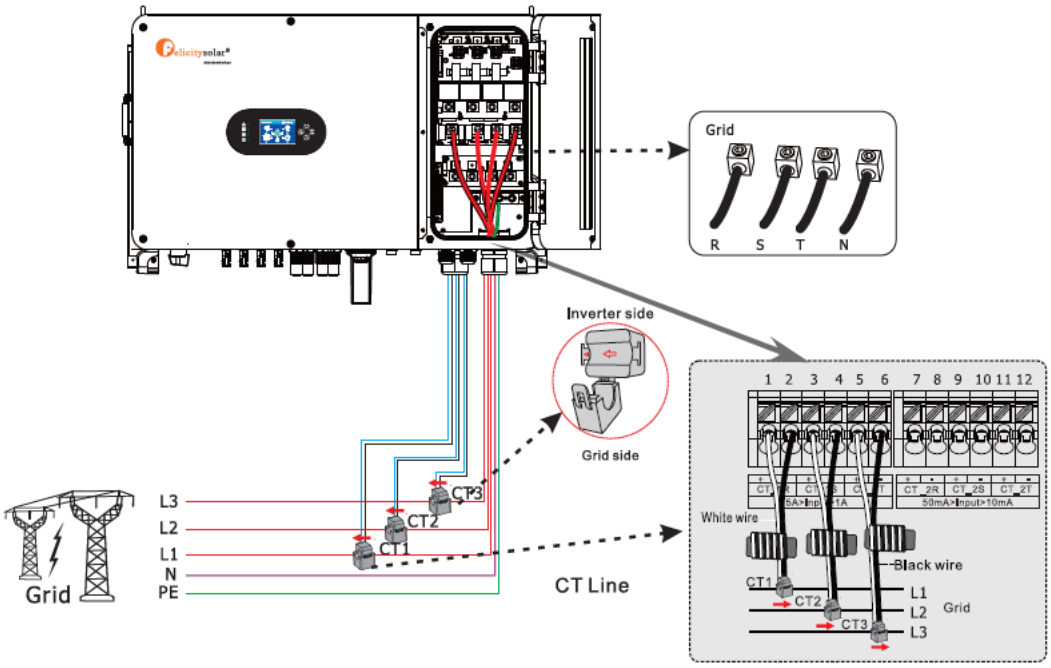


Figure 4.5-1 CT Connection

Note: CT Description
1. The default transformation ratio for CT is 6000:1;
2. The default range of CT is 300A;
The CT has a ratio of 300A:5A, and the internal circuit of terminals 1-6 provides an additional conversion ratio of 5A:50mA. Therefore, the total transformation ratio is 6000:1.

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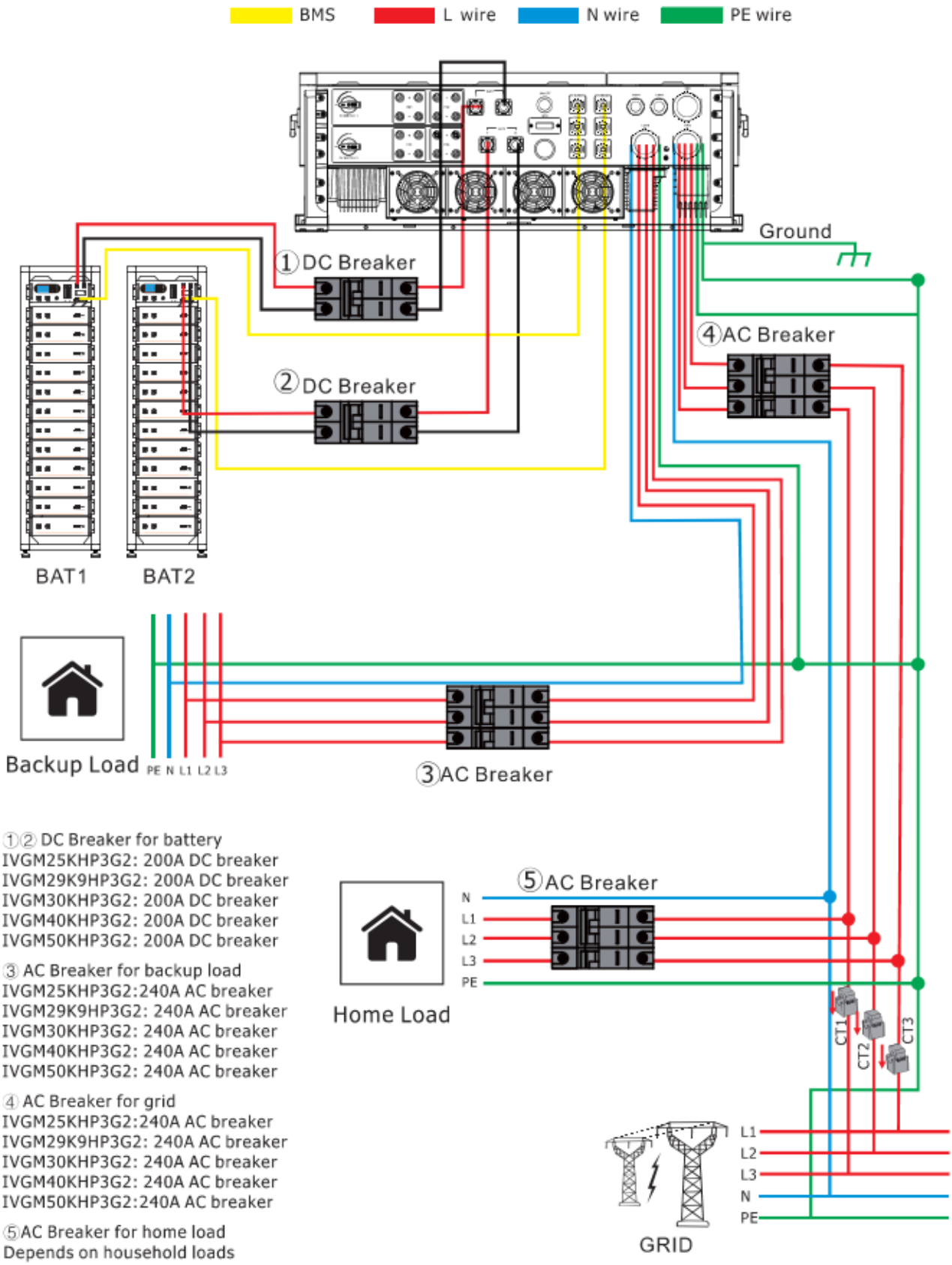


Figure 2 –Scheme of Single machine photovoltaic power generation system (CT Connection)

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Max. 12pcs parallel for on-grid and off-grid operation.
Note: In the parallel system, the power cables for the grid and the load must be identical in length.
Note: In the parallel system, the CTs or meter should be connect to the master.

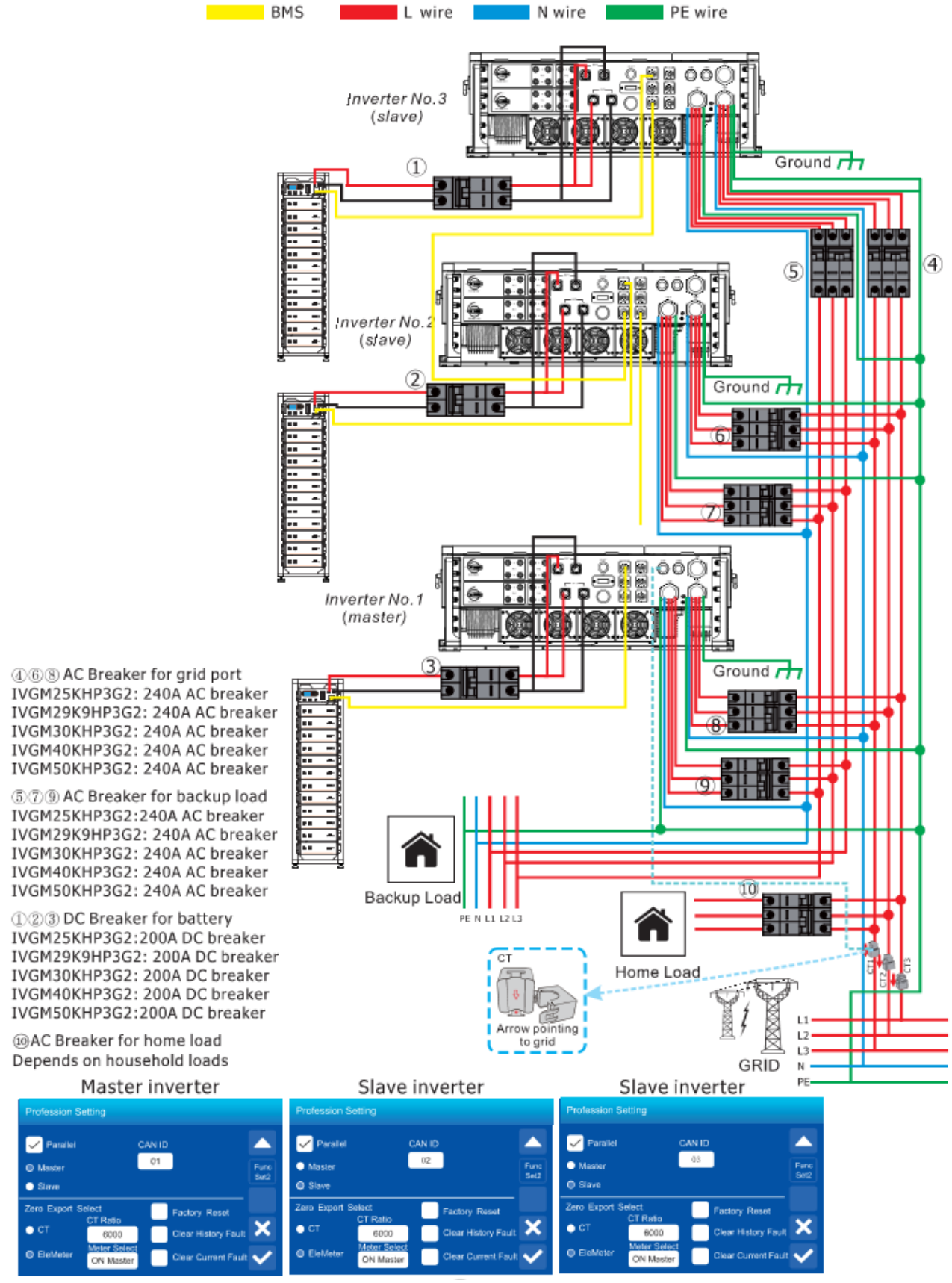


Figure 3 -Scheme of parallel photovoltaic power generation system

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2) Power analyzer and class of measurement transformers for power measurement.		**Informative**
Current Transducer		
Model:		CTSA050C-300A/5A
Primary nominal rms current	:	300A
Output current @Ipn	:	5A
Accuracy level	:	0,5
AC withstand voltage	:	4000V/10s,1mA, 50Hz
Insulation Resistance	:	⩾100 MΩ / 500 VDC
Connecting wires of secondary winding	:	White and black wire, 2*16AWG
Working altitude	:	≤3000m
Working temperature	:	-25°C ~+80°C
Relative Humidity	:	⩽95%

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3) Control element.	Informative

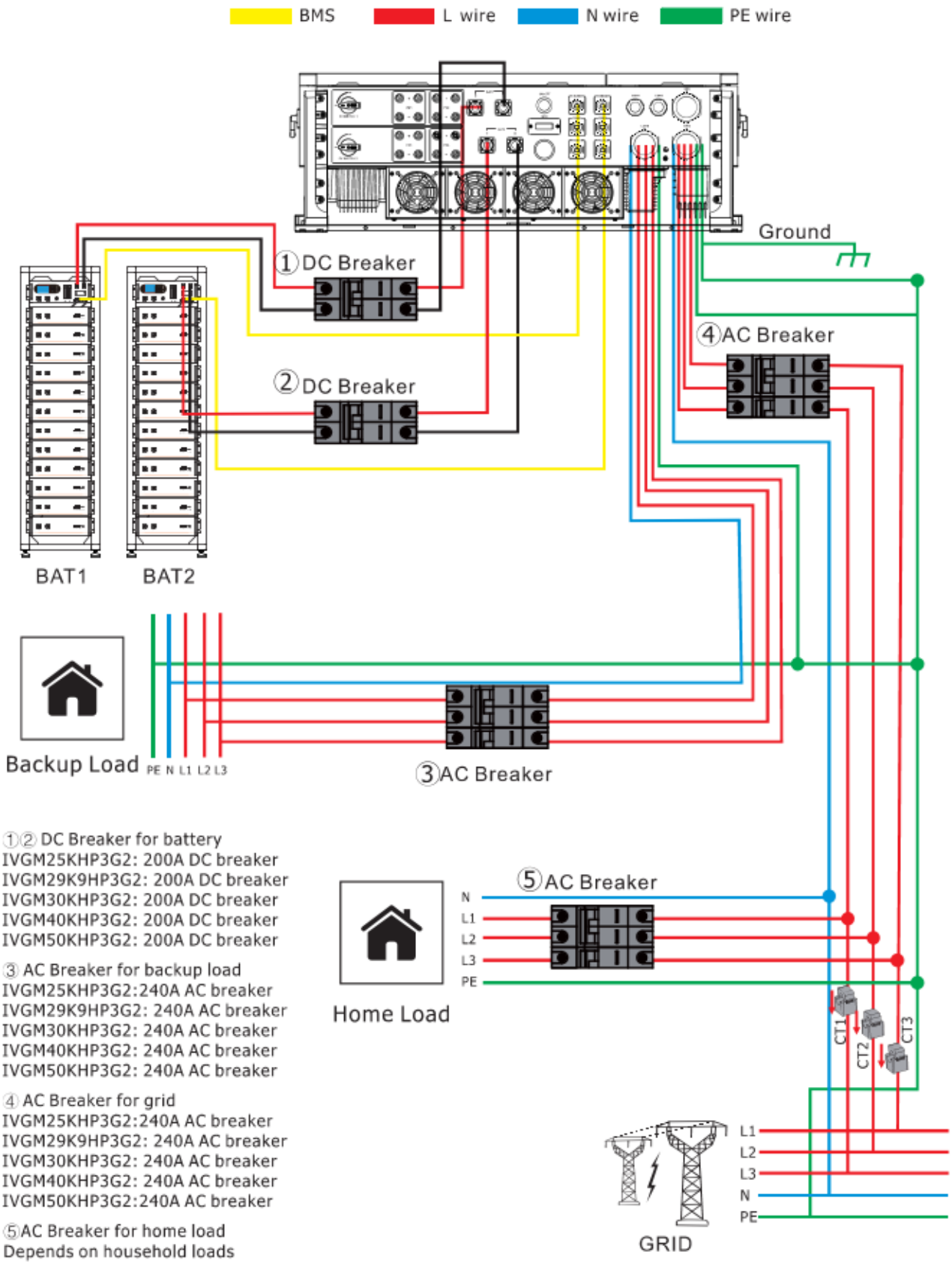


Figure 4 – Scheme of typical installation

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4) Type of communications used between the different elements.	**Informative**
Inverter and Current Transducer	
Inverter:	IVGM50KHP3G2
Current sensor:	CTSA050C-300A/5A
5) Type generators for which the system is valid.	**Informative**
Following Generators are Valid for the System:	
Inverter: IVGM25KHP3G2, IVGM29K9HP3G2, IVGM30KHP3G2, IVGM40KHP3G2 , IVGM50KHP3G2	
Comment: The test has been Performed on the IVGM50KHP3G2.	
6) Power of the type generator tested and generators / analyser's assimilated.	**Informative**
Note: The power rating of the generators can be found on page 2. The technical data of the current transducer can be found on page 14.	
7) Control algorithm	**Informative**
The inverter provides following operation modes: • Unlimited operation No power supply limitation. The inverter products power depending on available primary energy. • Limited power operation Output power of the inverter is controlled: power injection to the grid lower ≤ defined power set point at the interconnection point • Zero power injection Output power of the inverter is controlled. Energy generation and consumption balance at the interconnection point can be achieved. No power injection into grid.	
8) Electric characteristics of the generator	**Informative**
Note: The electric characteristics of the generators can be found on page 2.	
9) Maximum number of generators to be connected	**Informative**
Note: The maximum number of generators is based on the test result tr and local installation requirements.	

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4. Test	P
4.1 Tolerance in permanent mode	**P**

a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 3)

Connection scheme:	Phase 1	Phase 2	Phase 3	Test 1	Test 2	Test 3	Result
Three Phase	P_{inv}%	P_{inv}%	P_{inv}%	P_{Grid} [kW]	P_{Grid} [kW]	P_{Grid} [kW]	
	90-100	90-100	90-100	-0,056	-0,141	-0,112	P
	10-20	10-20	10-20	-0,112	-0,114	-0,112	P
	0	0	0	-0,123	-0,124	-0,123	P
	90-100	60-70	60-70	-5,019	-4,922	-5,047	P
	60-70	60-70	60-70	-0,080	-0,111	-0,102	P
	30-40	60-70	60-70	-10,020	-10,035	-10,028	P
	0	60-70	60-70	-21,674	-21,680	-21,679	P

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of them being able to be tested separately.

To verify this condition, the following test is carried out, following the scheme shown in the different figures:

1 Connect the generator to an energy source capable of supplying a power equal to or greater than the power of the generator to be tested.

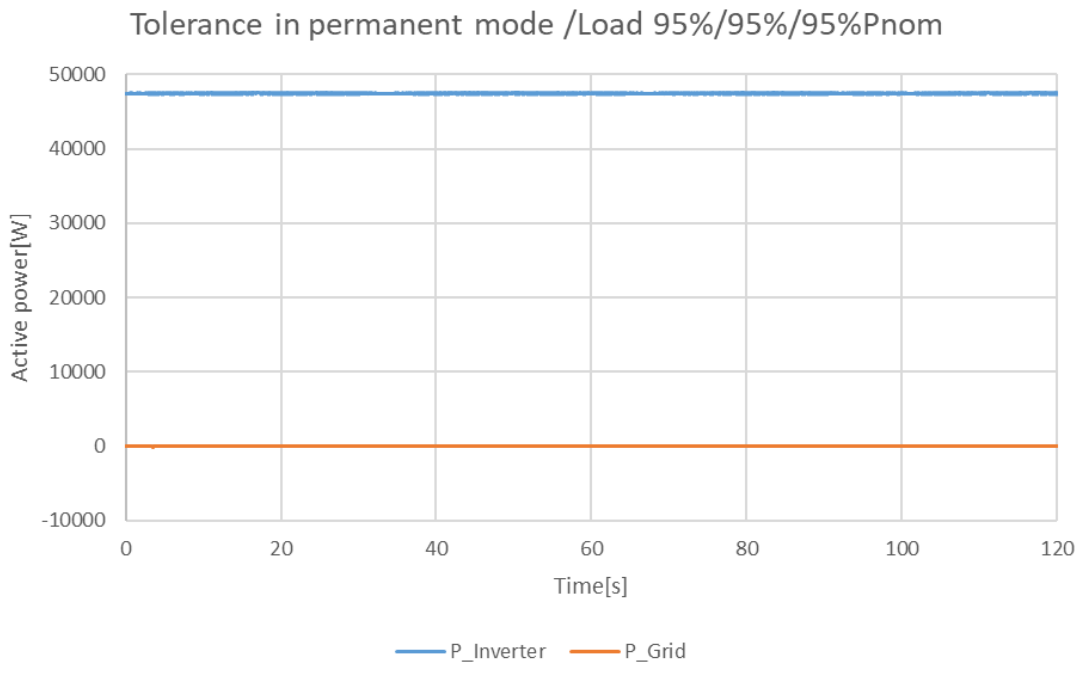
2 Connect the generator to the grid to be tested.

3 Set the load value according to the values indicated in Table 1.

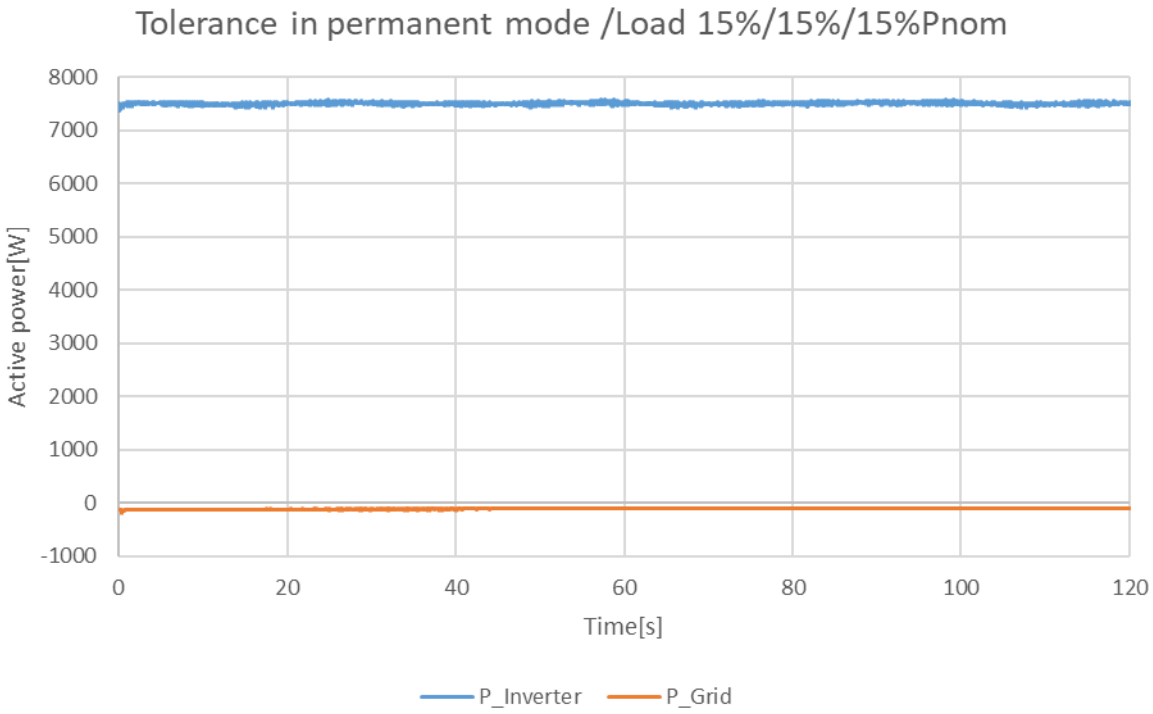
4 Wait a time of at least two seconds before starting the measurement.

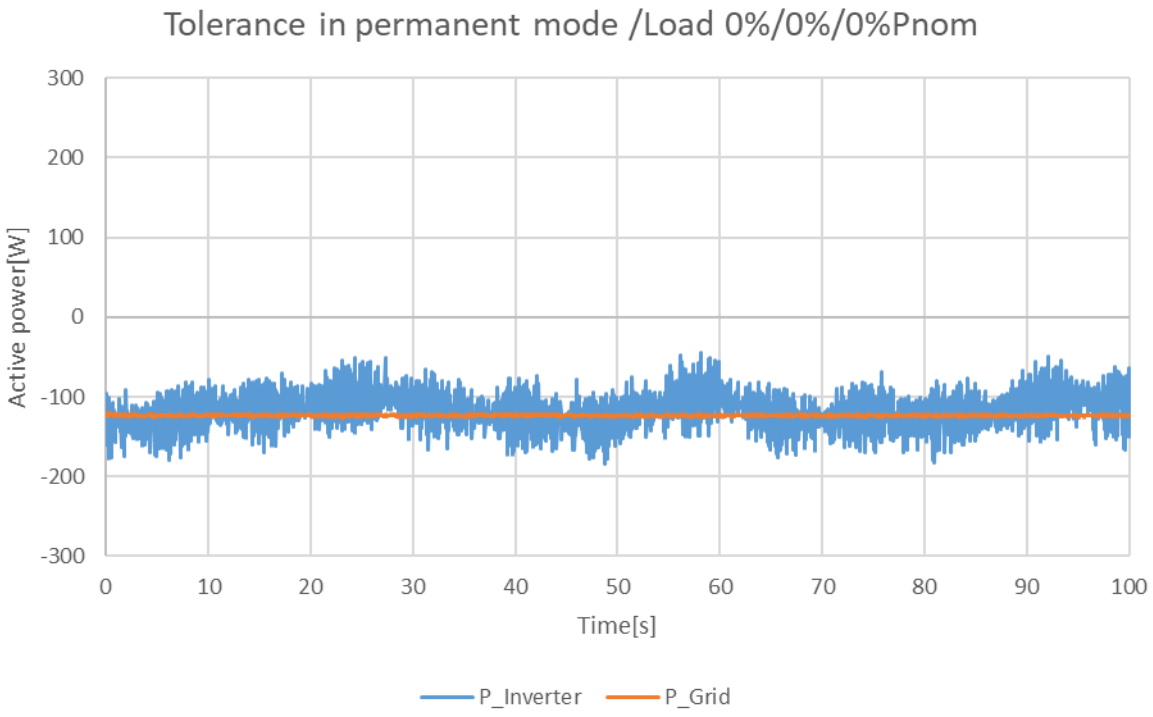
5 Measure the power exchanged at the test point, with an uncertainty better than or equal to 0.5% + 25 W, making measurements every 50 ms.

Graph of power gradient:

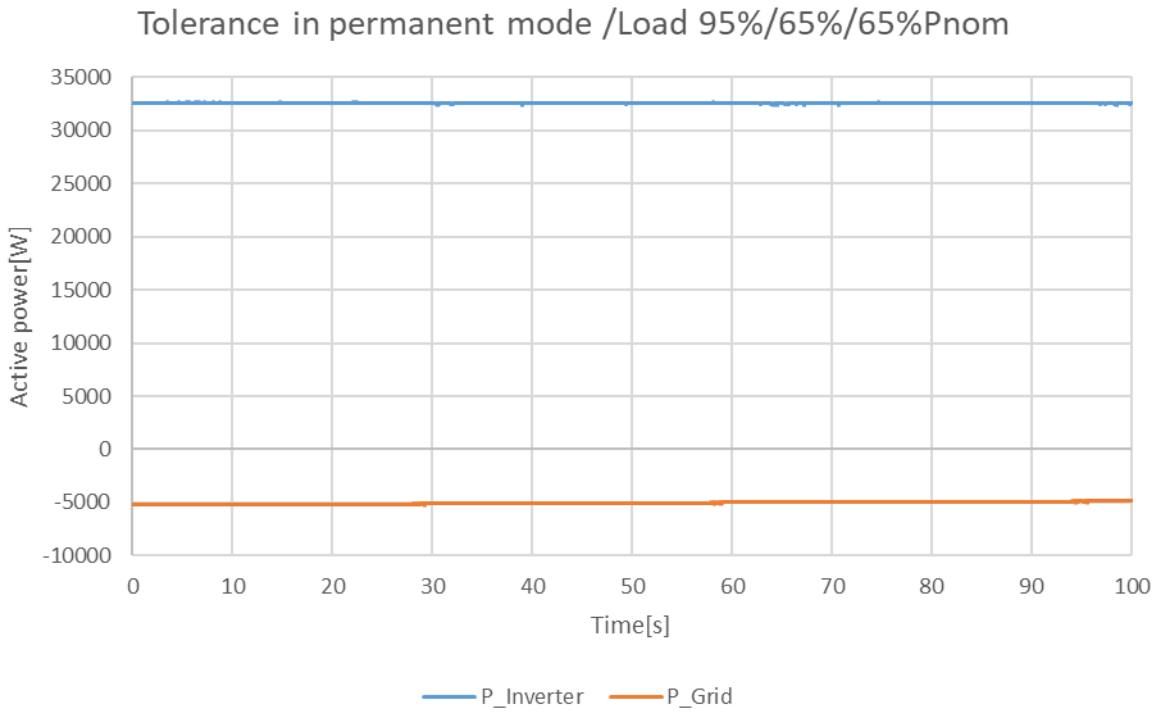


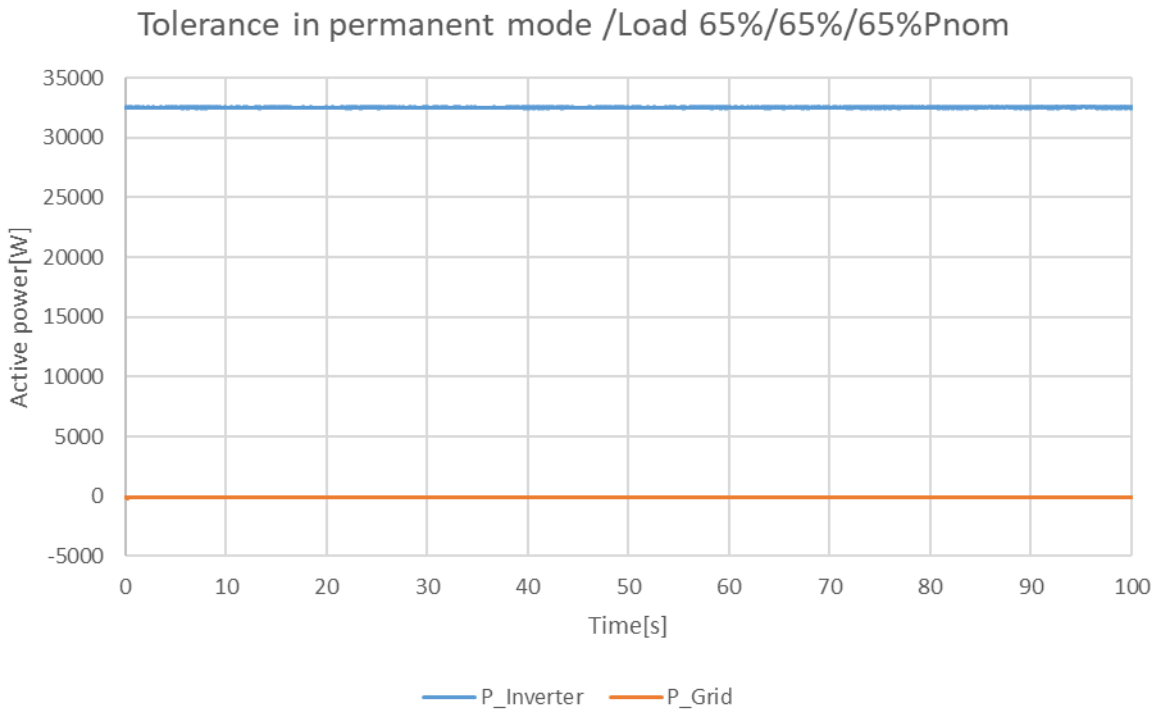
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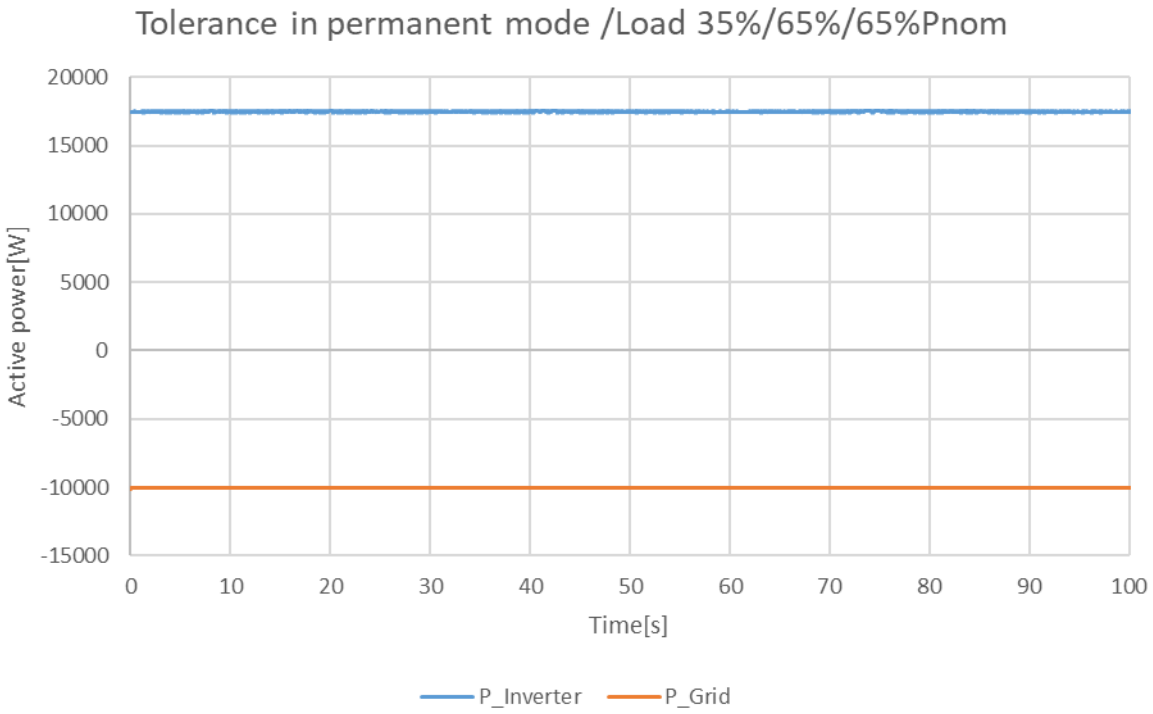


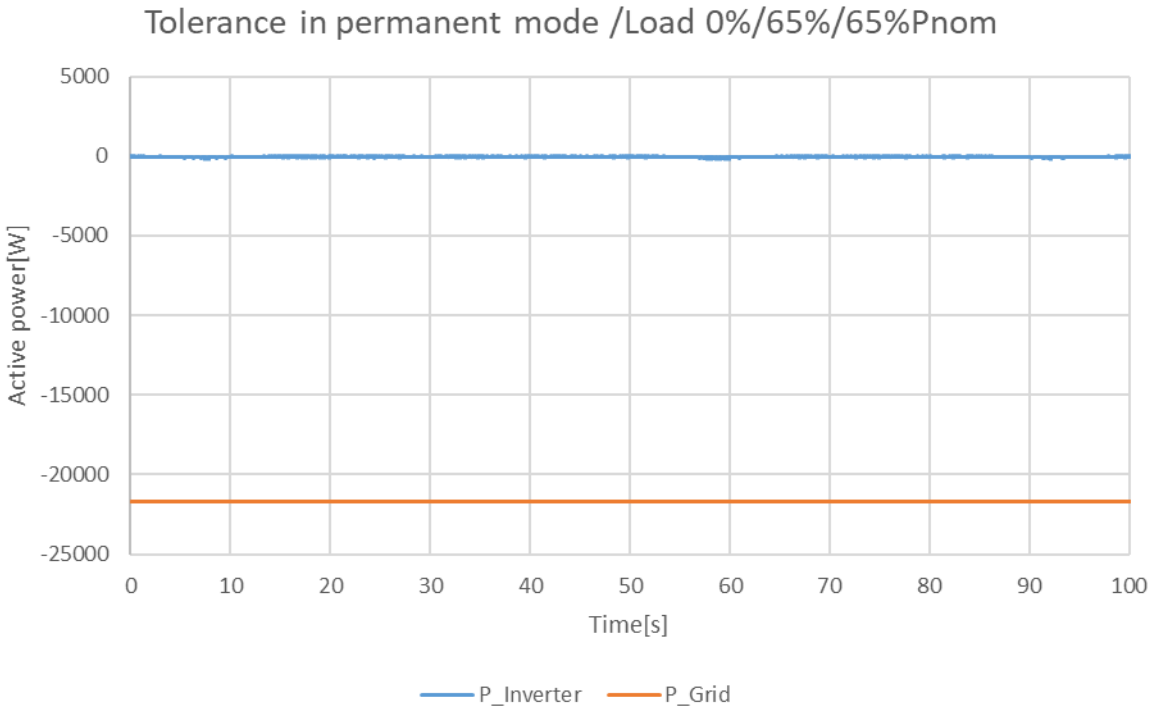
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b) Test 2 (Parallel operation with two inverters, see Figure 4)

Connection scheme:	Phase 1	Phase 2	Phase 3	Test 1	Test 2	Test 3	Result
Three Phase	P_{inv}%	P_{inv}%	P_{inv}%	P_{Grid} [kW]	P_{Grid} [kW]	P_{Grid} [kW]	
	90-100	90-100	90-100	-0,056	-0,084	-0,065	P
	10-20	10-20	10-20	-0,144	-0,131	-0,134	P
	0	0	0	-0,136	-0,135	-0,135	P

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	90-100	60-70	60-70	-5,098	-5,055	-4,933	P
	60-70	60-70	60-70	-0,134	-0,063	-0,205	P
	30-40	60-70	60-70	-10,012	-10,028	-9,728	P
	0	60-70	60-70	-21,743	-21,738	-21,730	P

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of them being able to be tested separately.

To verify this condition, the following test is carried out, following the scheme shown in the different figures:

1 Connect the generator to an energy source capable of supplying a power equal to or greater than the power of the generator to be tested.

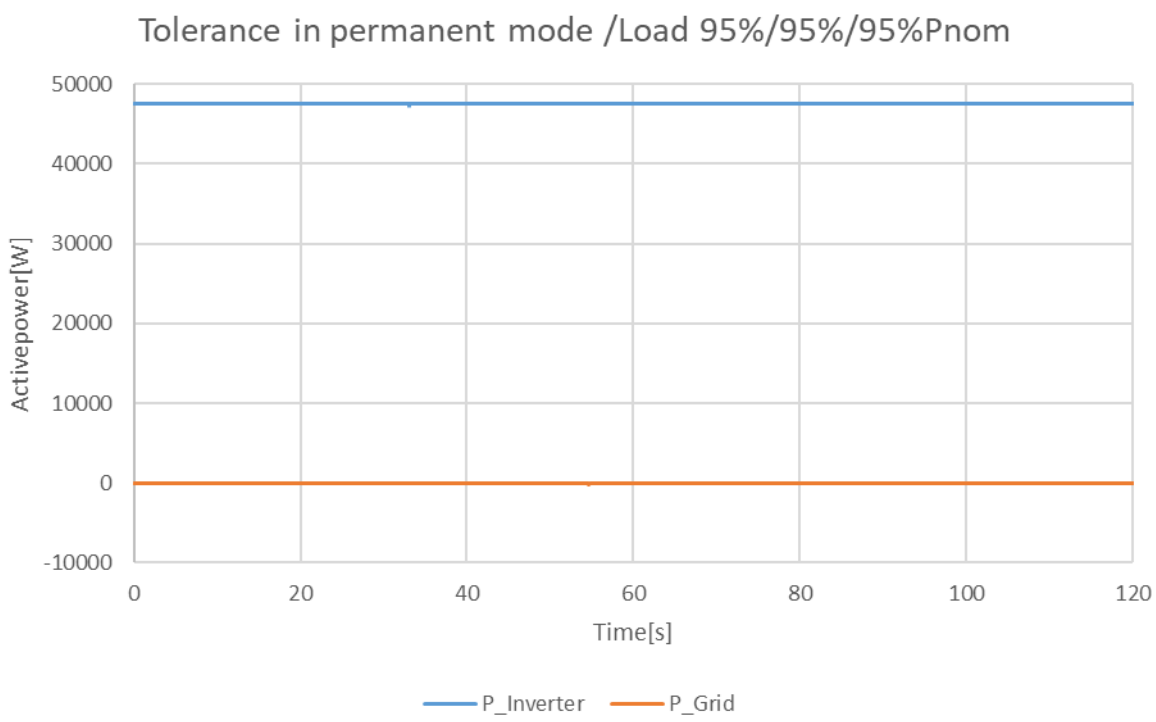
2 Connect the generator to the grid to be tested.

3 Set the load value according to the values indicated in Table 1.

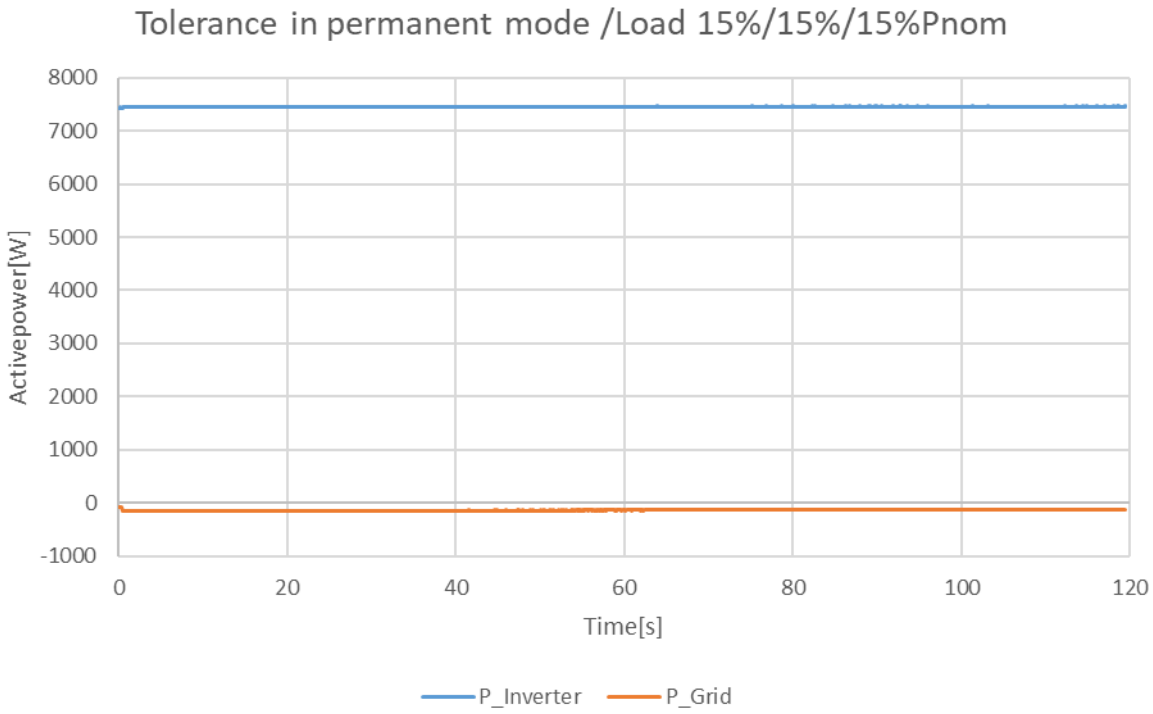
4 Wait a time of at least two seconds before starting the measurement.

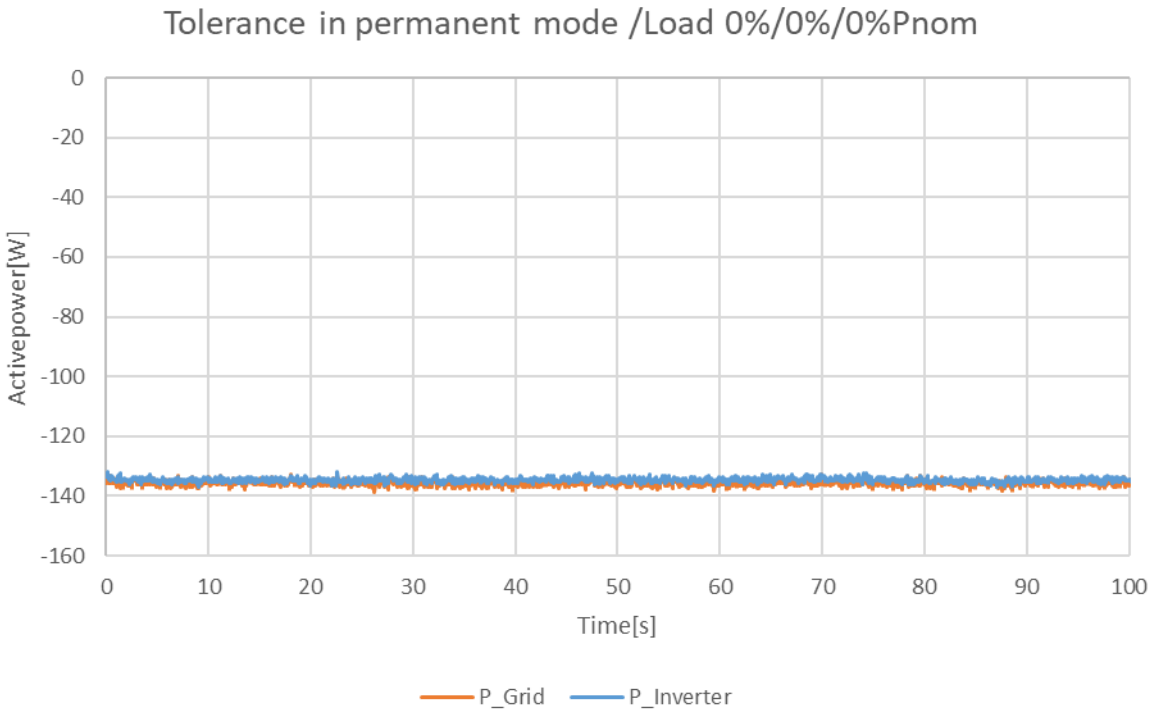
5 Measure the power exchanged at the test point, with an uncertainty better than or equal to 0.5% + 25 W, making measurements every 50 ms.

Graph of power gradient:

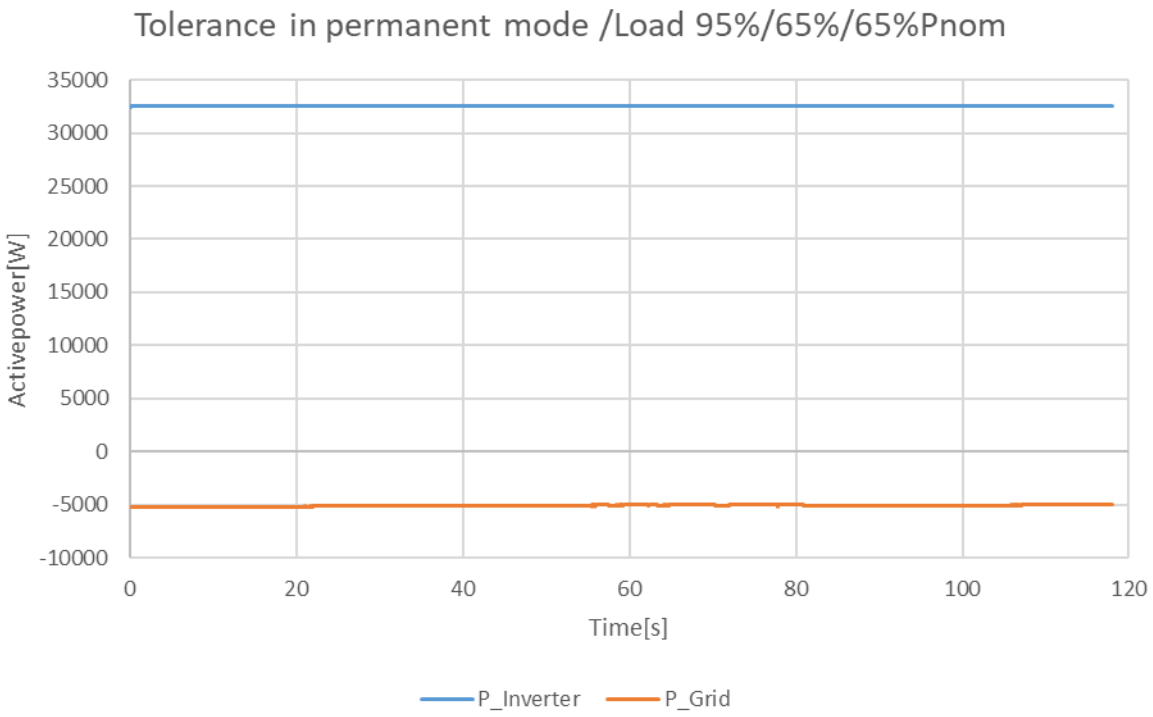


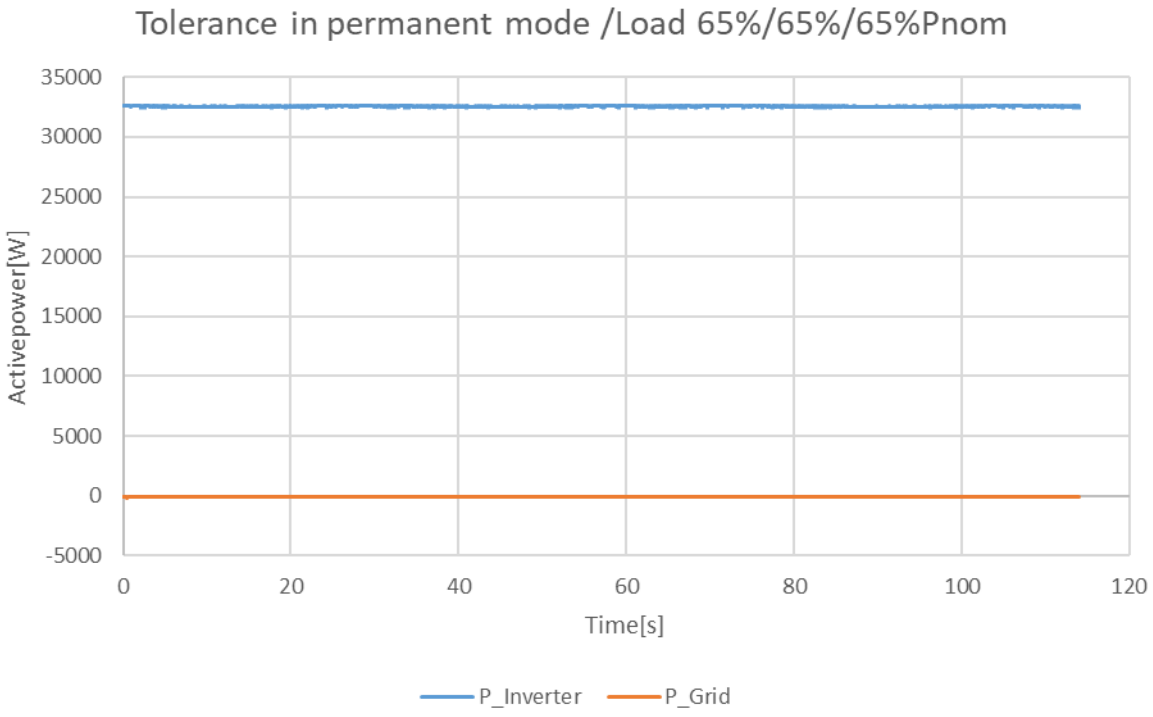
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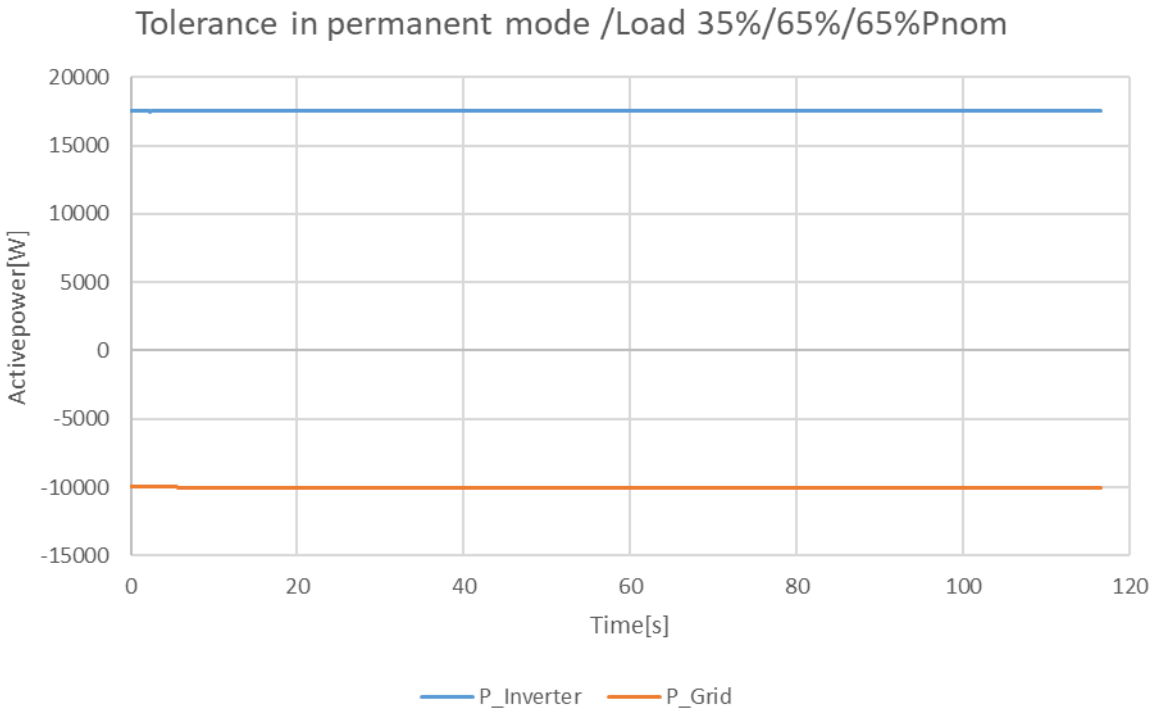


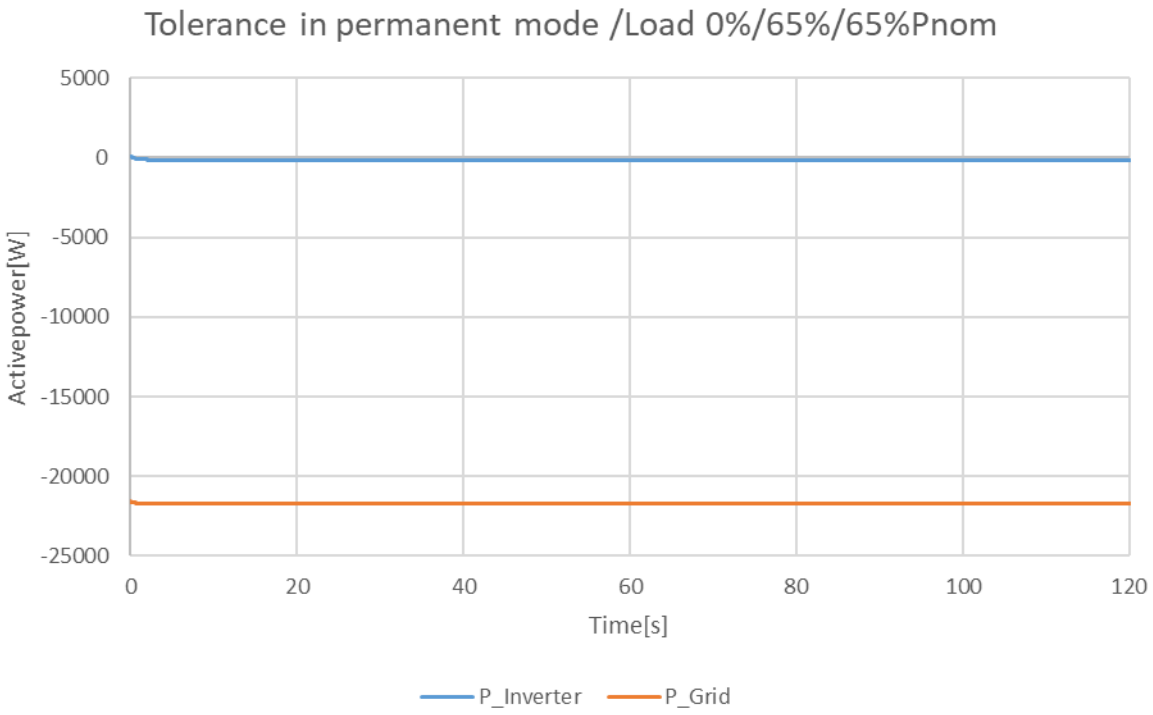
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Assessment criterion:

For adjustable PGUs:

The power limitation system must guarantee that before a load disconnection, the generator readjusts its production, reaching the permanent regime again in less than t_a(the required time of action).

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.

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4.2 Response to load disconnections						P
a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 3)						
TEST	Initial load	Final load	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	90-100%	60-70%	0,95	0,95	1,00	P
2	90-100%	30-40%	1,50	1,35	1,45	P
3	90-100%	0-5%	1,55	1,60	1,50	P
4	60-70%	30-40%	1,20	1,05	1,05	P
5	60-70%	0-5%	1,45	1,55	1,60	P
6	30-40%	0-5%	1,45	1,15	1,25	P

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of them being able to be tested separately.

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

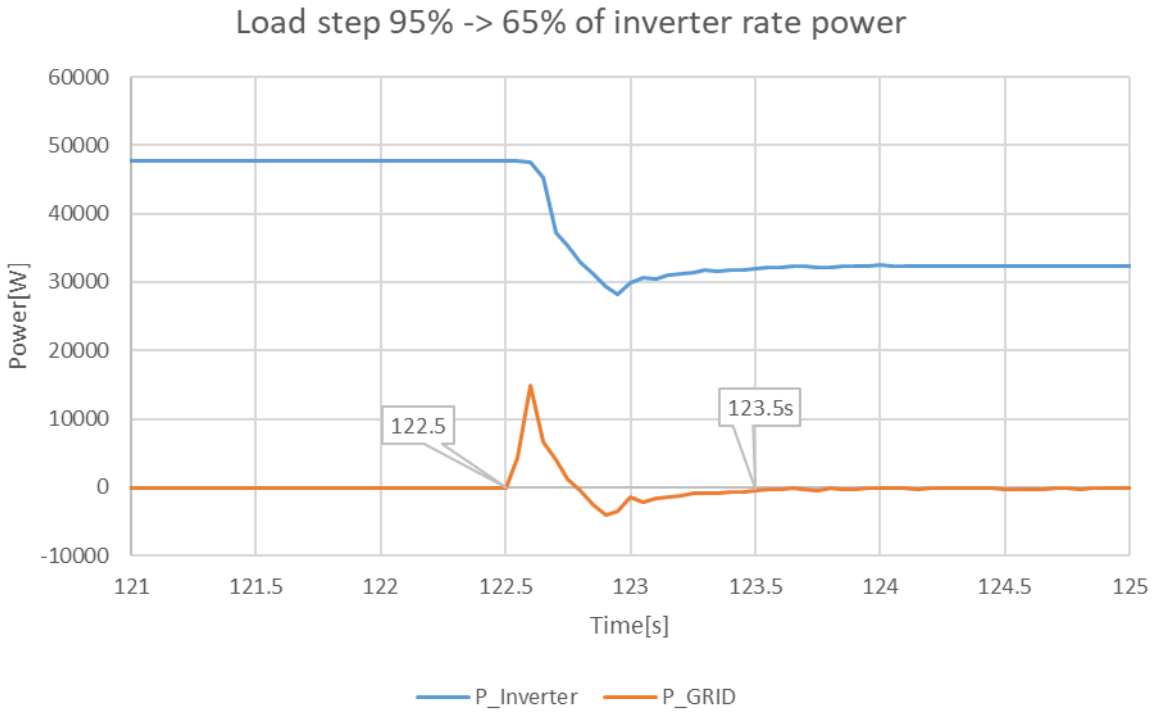
1 Connect the generator to a power source that feeds the generator and that is capable of supplying a power equal to or greater than the power of the generator to be tested.

2 Connect the generator to the grid to be tested.

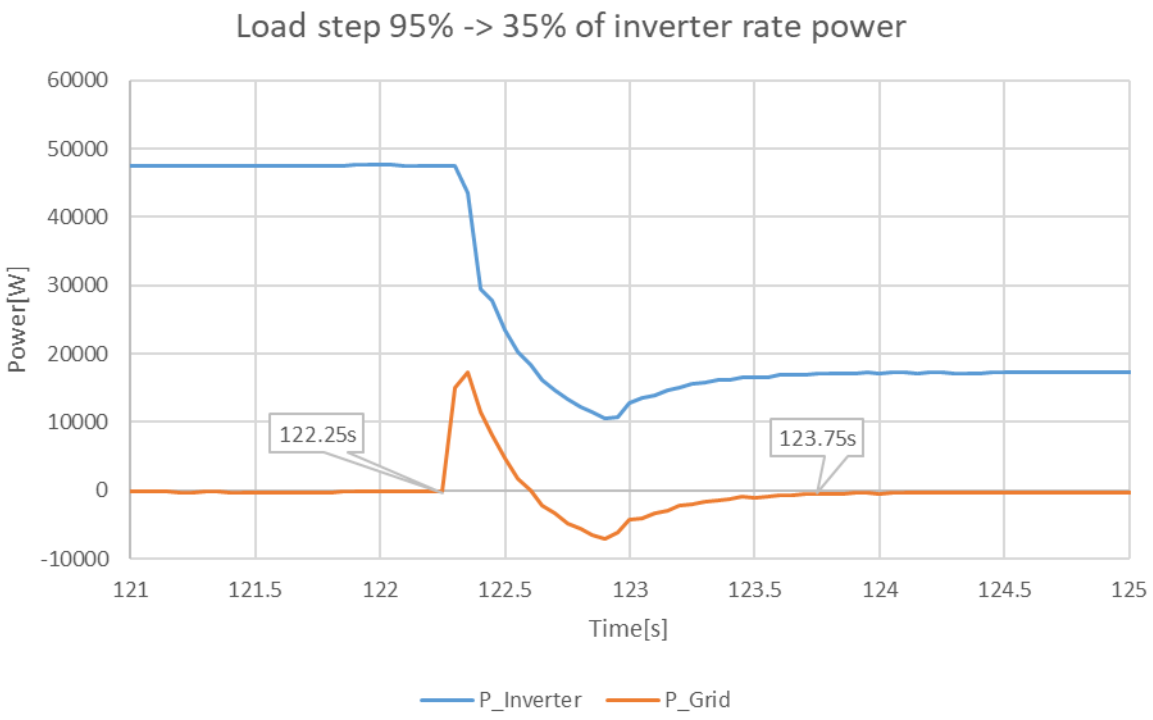
3 Perform the load disconnections proposed in Table 2.

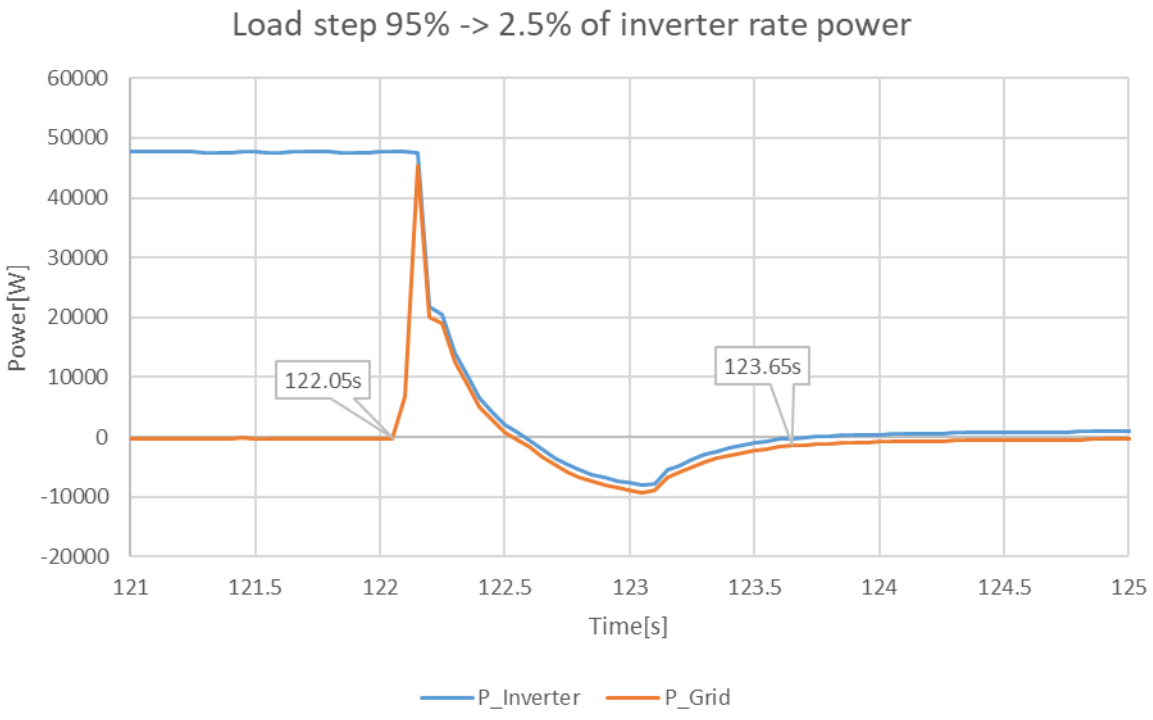
4 Measure the power exchanged with the network, with an uncertainty better than or equal to 0.5% + 25 W, making measurements of 50 ms in a time window of 2 min comprising at least one minute before and after the load disconnection.

Graph of power gradient:

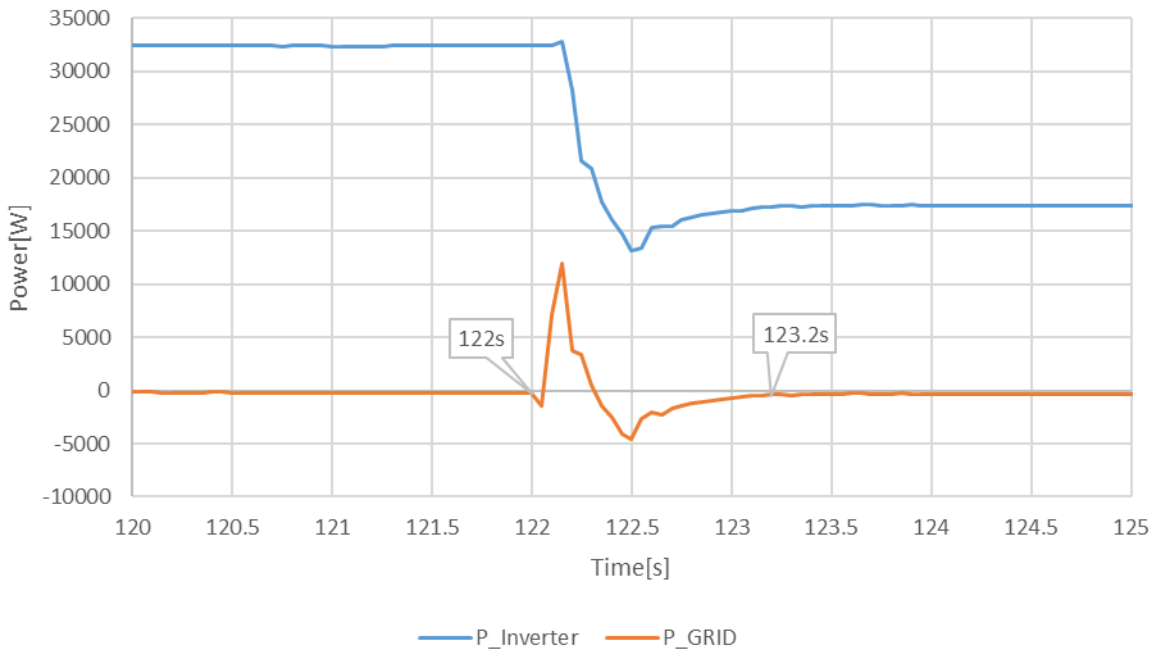


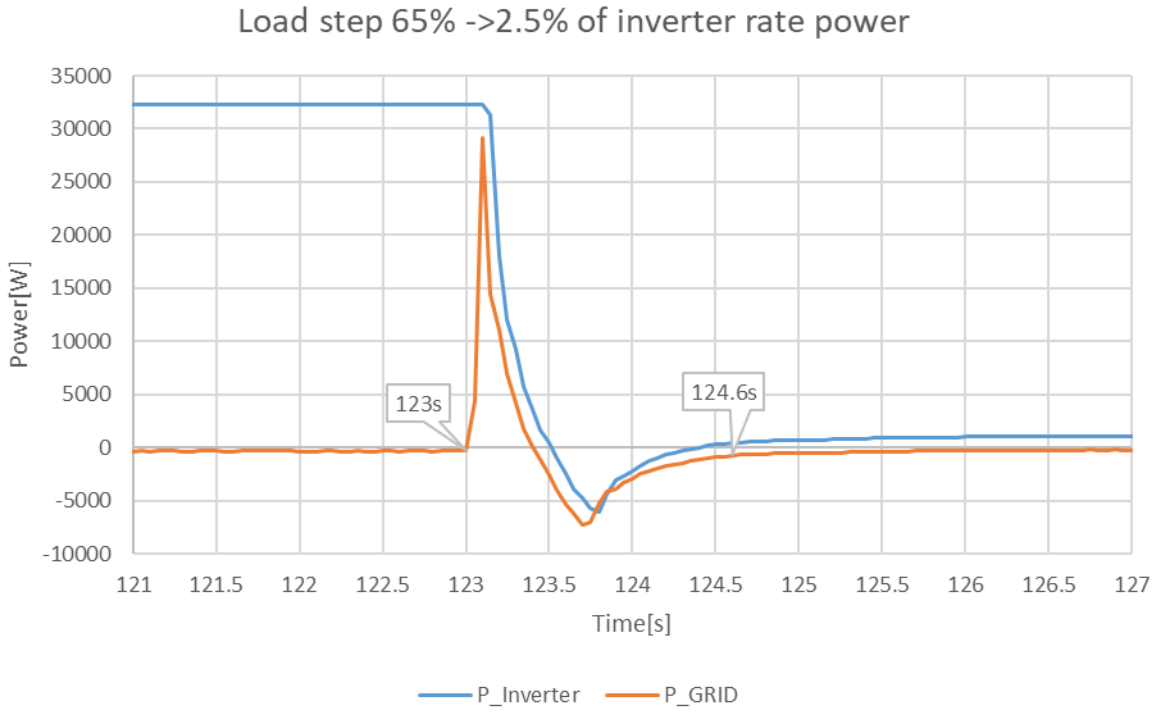
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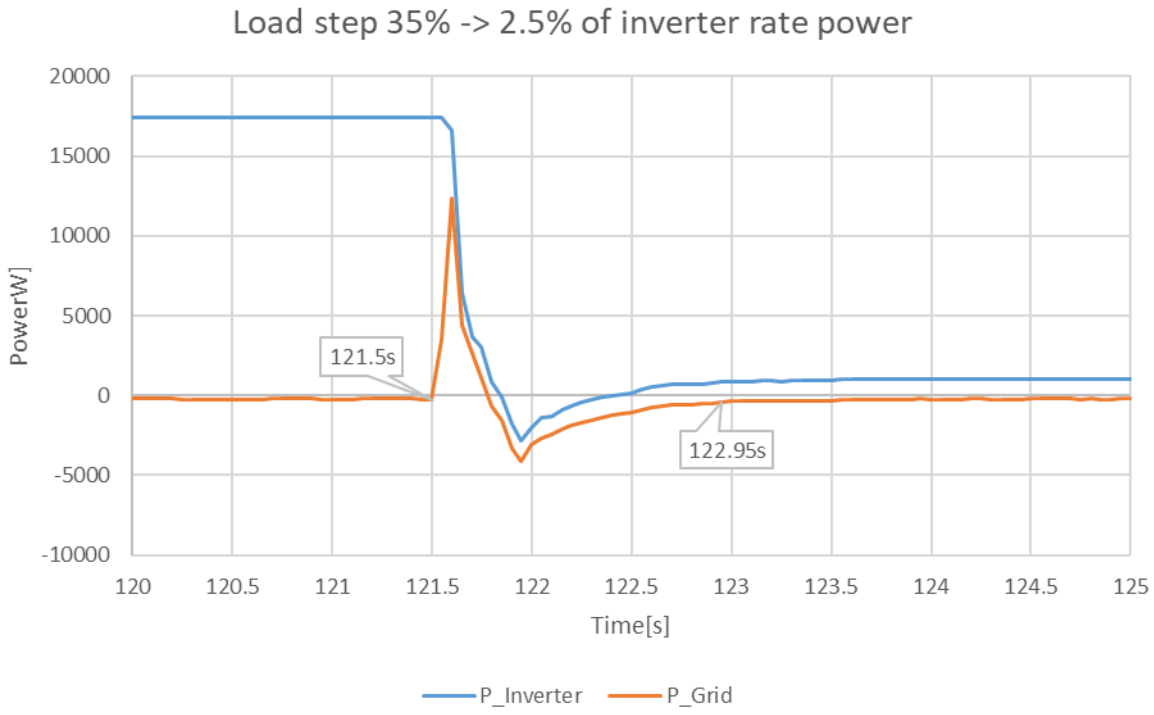


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b) Test 2 (Parallel operation with two inverters, see Figure 4)

TEST	Initial load	Final load	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	90-100%	60-70%	0,70	1,00	0,95	P
2	90-100%	30-40%	1,35	1,20	1,15	P
3	90-100%	0-5%	1,65	1,55	1,50	P
4	60-70%	30-40%	1,10	0,75	0,75	P
5	60-70%	0-5%	1,75	1,30	1,20	P
6	30-40%	0-5%	1,45	1,15	1,30	P

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of them being able to be tested separately.

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.

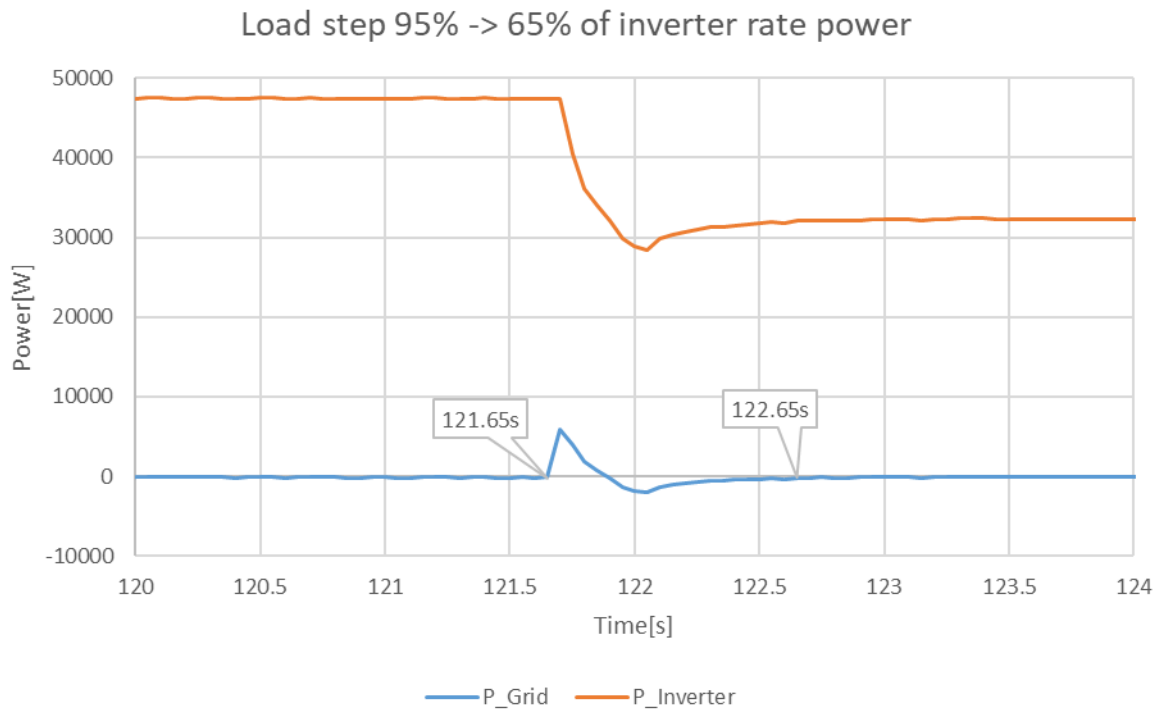
2 Connect the generator to the grid to be tested.

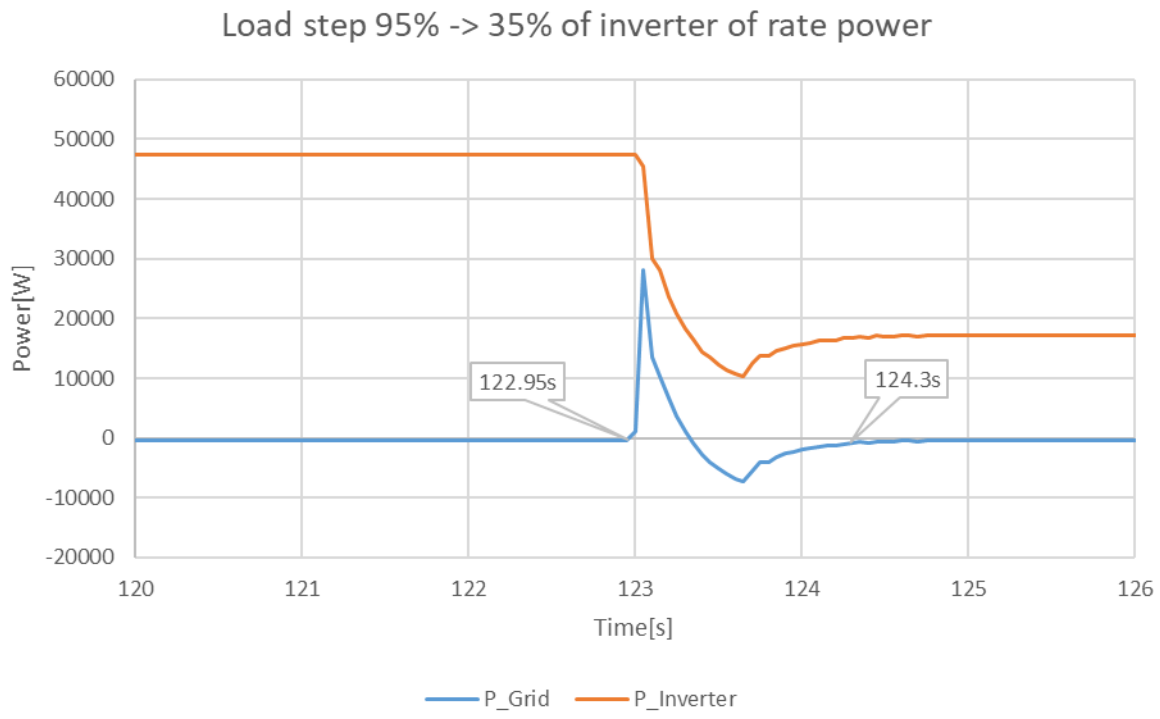
3 Perform the load disconnections proposed in Table 2.

4 Measure the power exchanged with the network, with an uncertainty better than or equal to 0.5% + 25 W, making measurements of 50 ms in a time window of 2 min comprising at least one minute before and after the load disconnection.

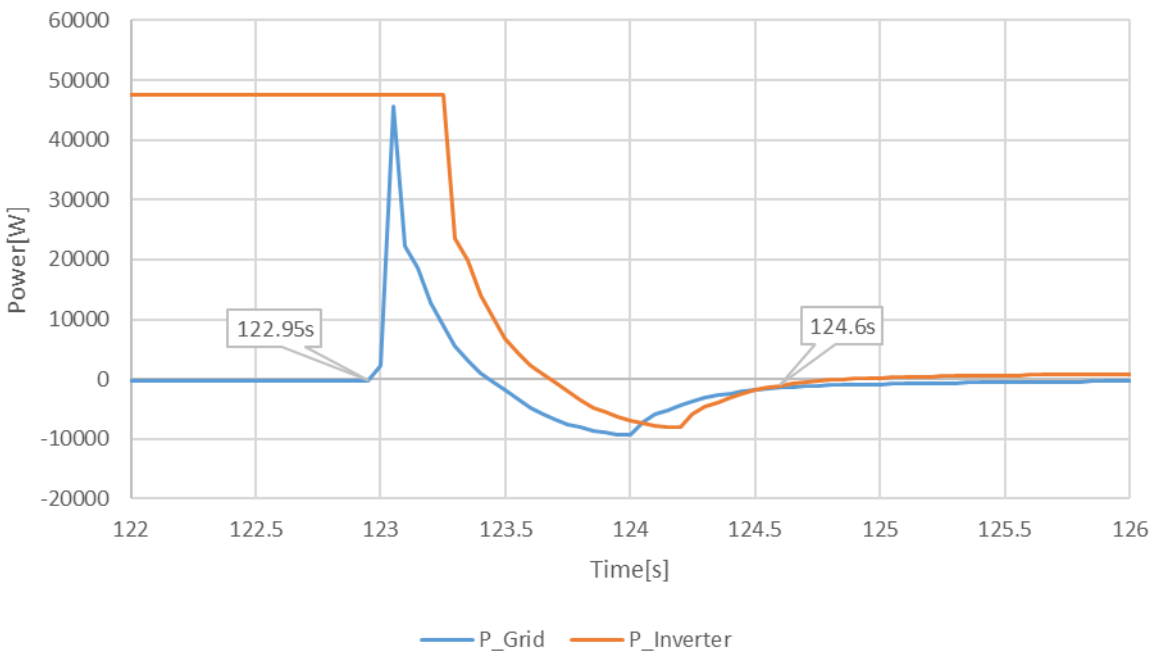
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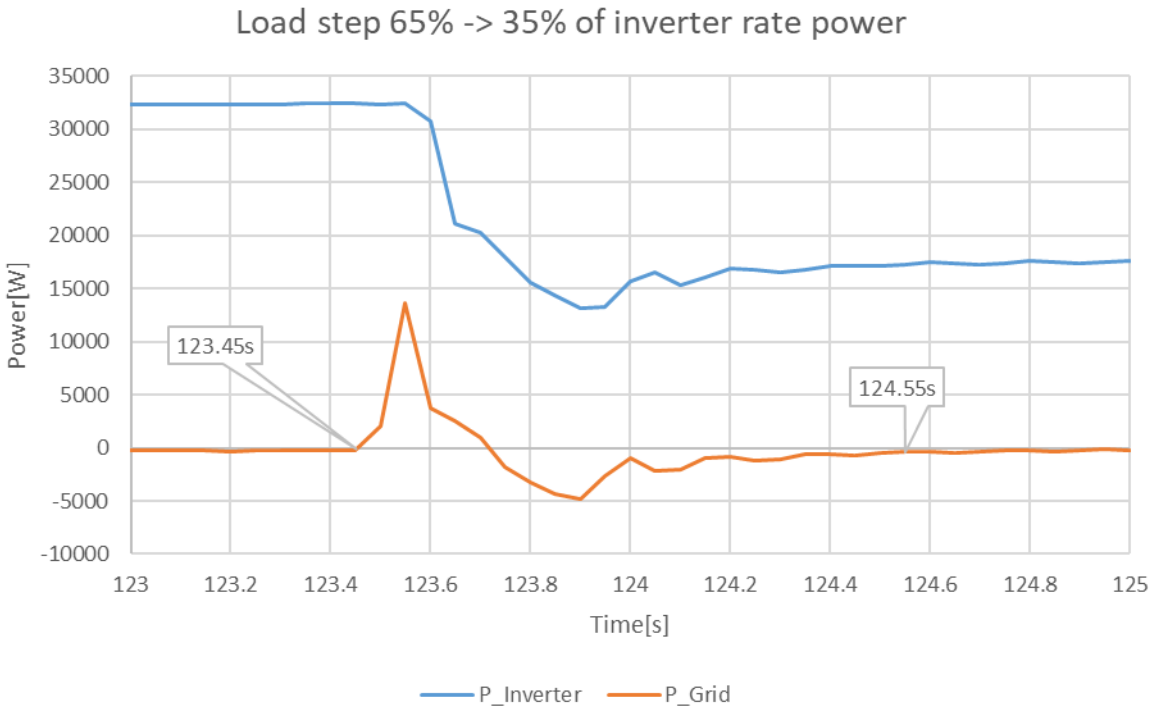
Graph of power gradient:



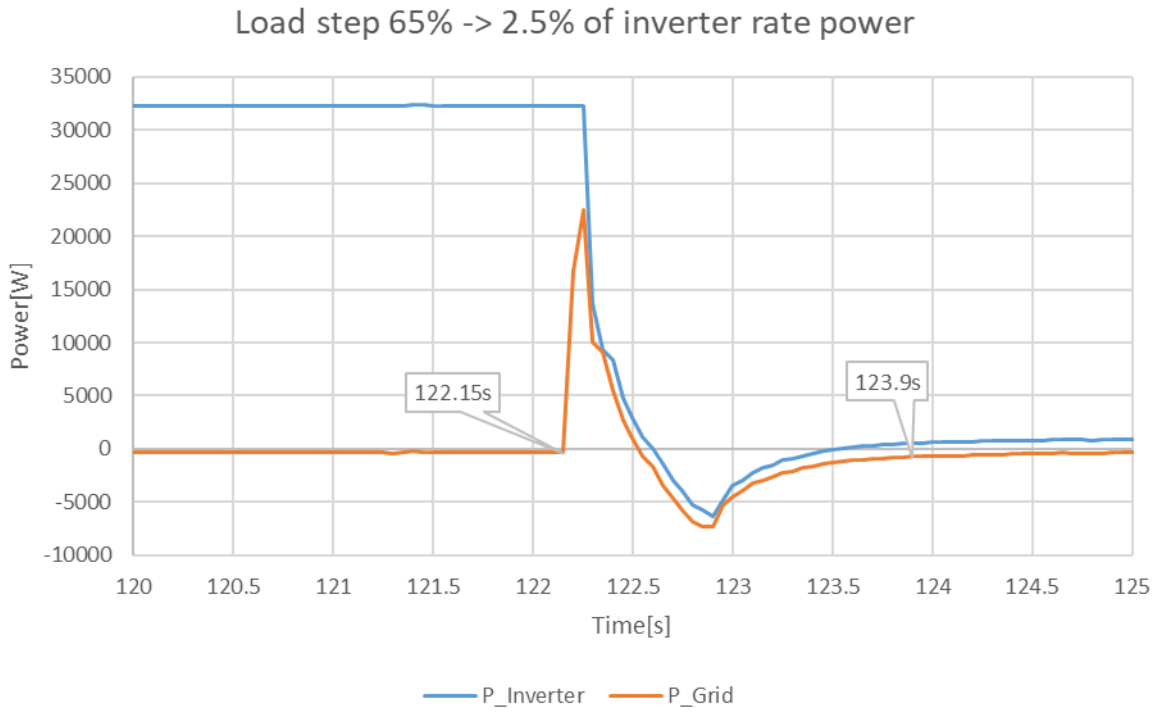


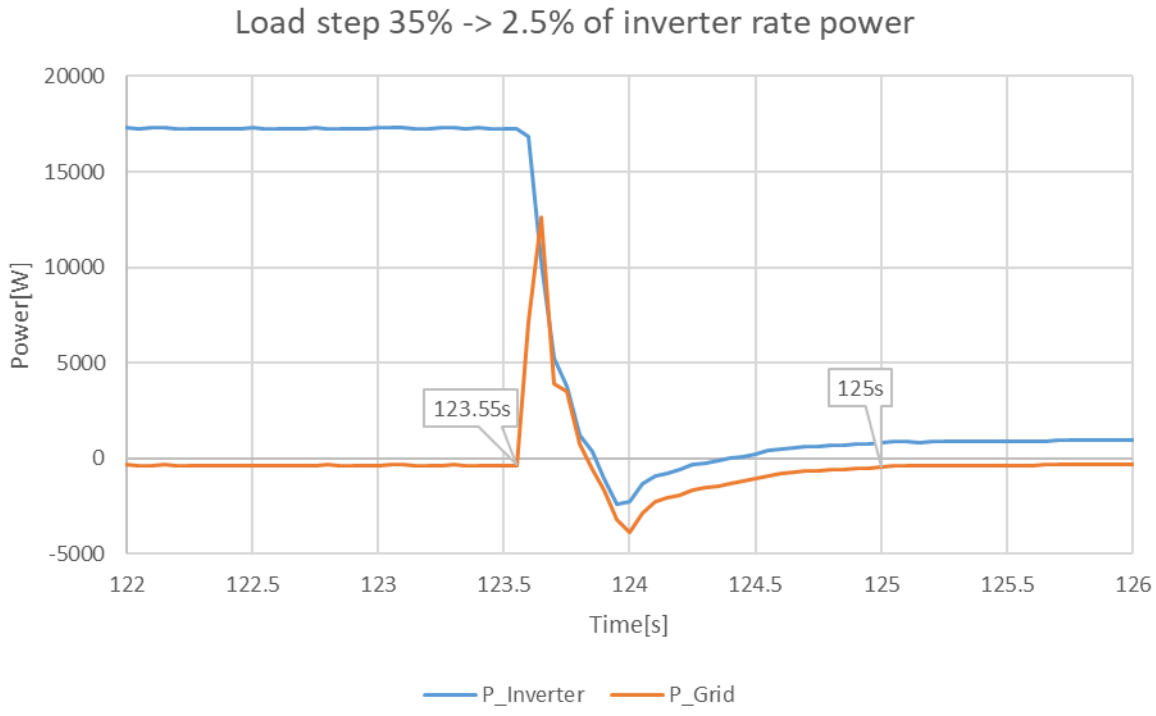
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Assessment criterion:

For adjustable PGUs:

The power limitation system must guarantee that before a load disconnection, the generator readjusts its production, reaching the permanent regime again in less than t_a(the required time of action).

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.

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4.3 Response to power increases in the primary energy source						P
a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 3)						
Step	AC load	Power DC source	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	60-70%	40-50%	0,75	0,25	0,15	P
2	60-70%	90-100%				

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of them being able to be tested separately.

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

1 Connect the generator to a power source that feeds the generator and is capable of supplying between 40% and 50% of the power of the generator to be tested.

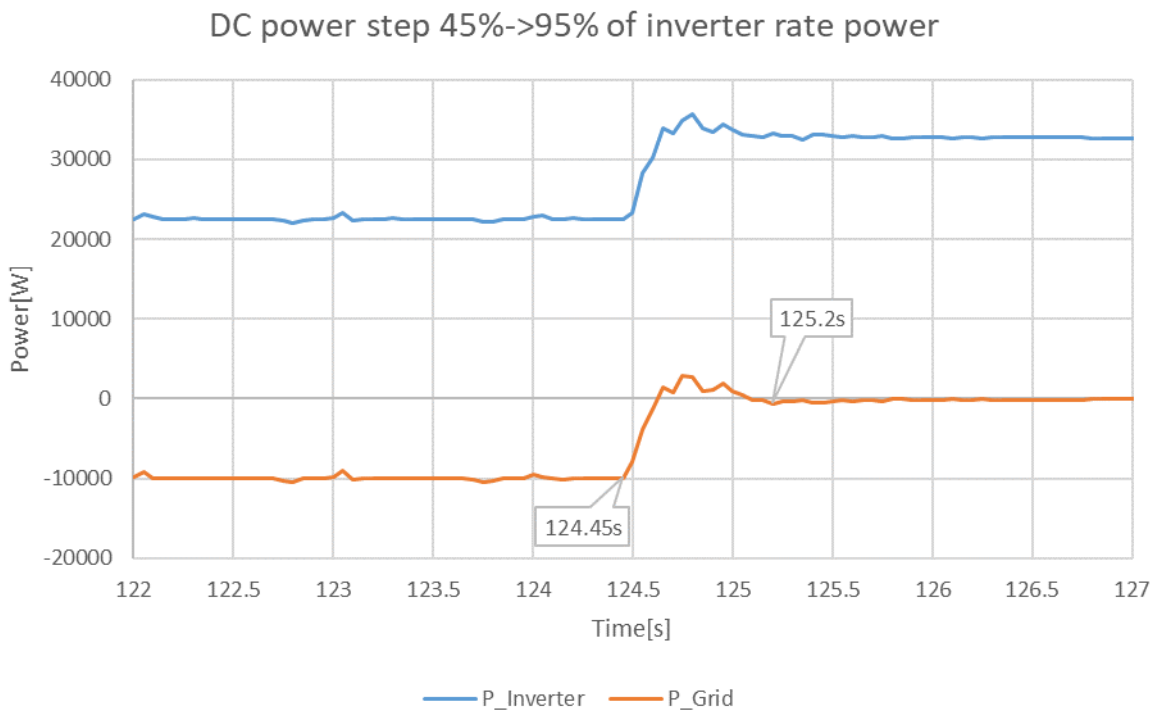
2 Connect the generator to the grid to be tested.

3 Connect a load that consumes between 60% and 70% of the power of the generator to be tested.

4 Increase by a step the power available in the energy source above 90% of the nominal power of the generator to be tested.

5 Measure the power exchanged with the grid, with an uncertainty better than or equal to 0.5% + 25 W, making measurements every 50 ms in a time window of 2 min comprising at least one minute before and after the increase in the power of the generator.

Repeat each of the tests three times.



b) Test 2 (Parallel operation with two inverters, see Figure 4)						
Step	AC load	Power DC source	Test 1	Test 2	Test 3	Result

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	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	60-70%	40-50%	0,15	0,15	0,20	P
2	60-70%	90-100%				

Test procedure:

The test must be repeated with the different type generators that are going to be approved for the system, each of them being able to be tested separately.

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

1 Connect the generator to a power source that feeds the generator and is capable of supplying between 40% and 50% of the power of the generator to be tested.

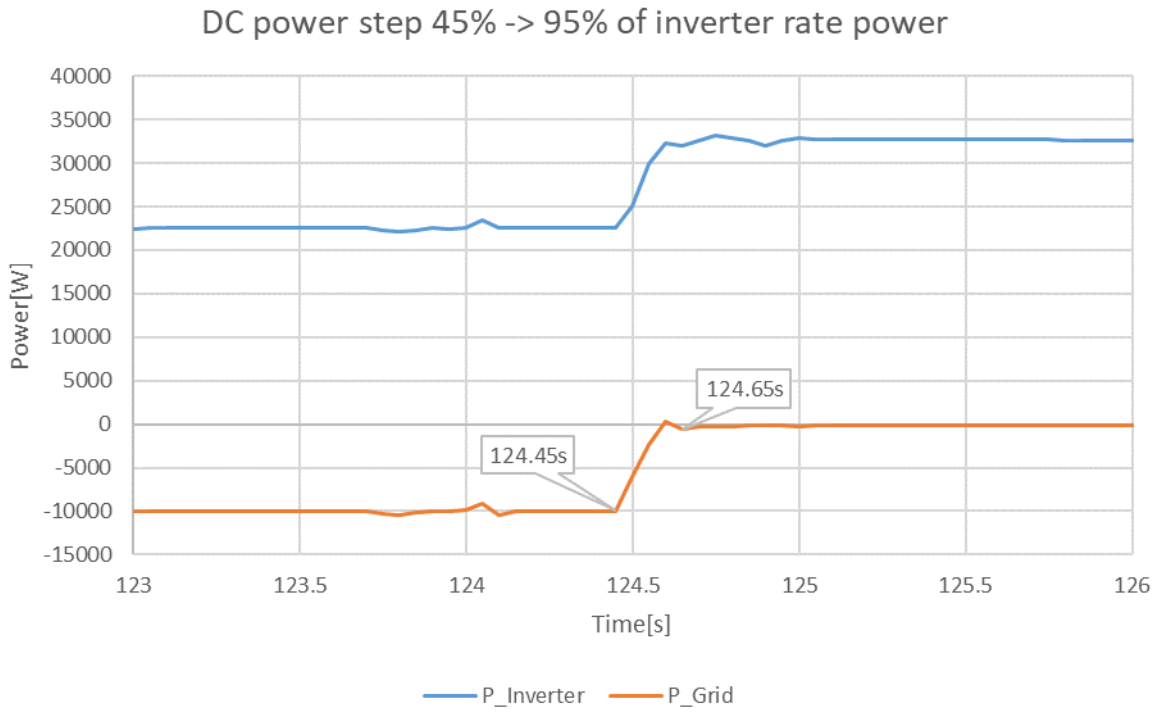
2 Connect the generator to the grid to be tested.

3 Connect a load that consumes between 60% and 70% of the power of the generator to be tested.

4 Increase by a step the power available in the energy source above 90% of the nominal power of the generator to be tested.

5 Measure the power exchanged with the grid, with an uncertainty better than or equal to 0.5% + 25 W, making measurements every 50 ms in a time window of 2 min comprising at least one minute before and after the increase in the power of the generator.

Repeat each of the tests three times.



Assessment criterion:

For adjustable PGUs:

The power limitation system must guarantee that before a load disconnection, the generator readjusts its production, reaching the permanent regime again in less than t_a(the required time of action).

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.

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4.4 Action in case of loss of communications							P
a) Test 1 (Scheme of Single machine photovoltaic power generation system, see Figure 3)							
Step	AC load	Power DC source	Communication between energy meter and generator	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%		Response time in sec.	Response time in sec.	Response time in sec.	
1	60-70%	90-100%	Yes	0,012	0,012	0,012	P
2	60-70%	90-100%	No				

Test procedure:

The generator must stop generating in case of loss of communication between the different elements of the system in a time less than the required action time. If the control element is integrated into one of the required devices (power measuring equipment or generator) it will not be necessary to check the communication between the elements integrated in the same device.

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

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 internal network to be tested.

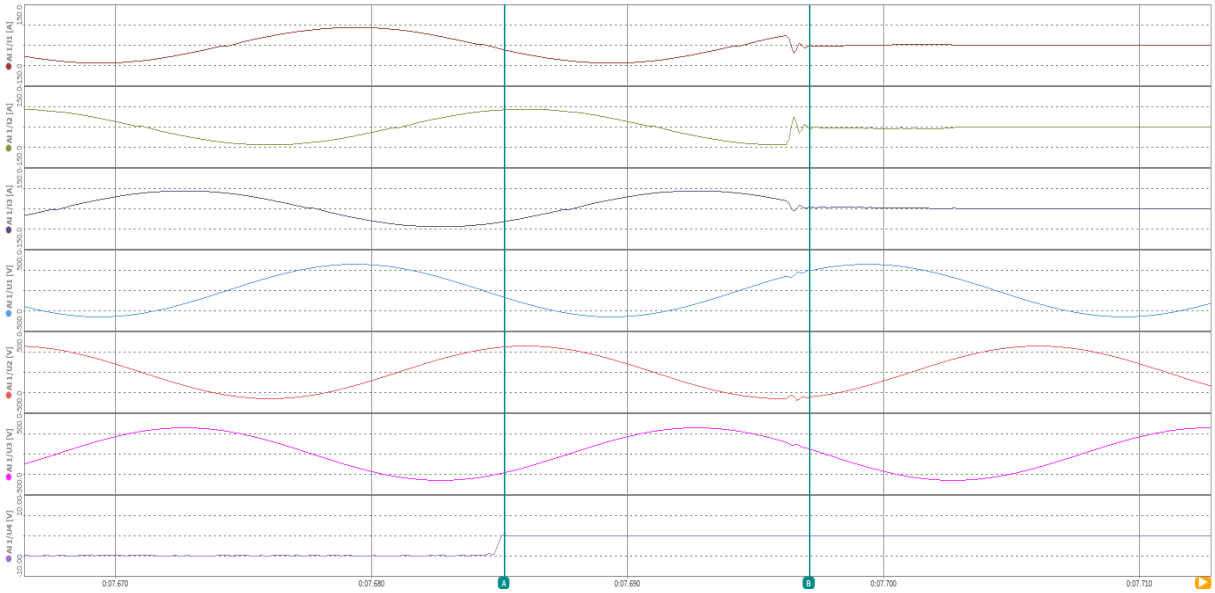
3 Set a load of 60% and 70% of the nominal power of the generator.

4 Cut off communication between the control element and the power measuring equipment.

5 Measure the time elapsed between the communication cut and the disconnection of the generator or total limitation of the generator power (0%).

6 Measure the power generated by the generator, with an uncertainty better than or equal to 0.5% + 25 W, making measurements every 50 ms.

The test will be repeated 3 times.



时间 [s]	A 7.68518969	B 7.69710156	间隔 0.01191187
AI 1/I1 [A]	-15.16281	-0.549772	14.61303
AI 1/I2 [A]	63.58783	-7.221413	-70.80925
AI 1/I3 [A]	-48.93437	6.802720	55.73709
AI 1/U1 [V]	-74.74900	248.1842	322.9332
AI 1/U2 [V]	310.6971	-313.2065	-623.9036
AI 1/U3 [V]	-236.2664	64.93569	301.2021
AI 1/U4 [V]	0.099421	0.012875	-0.086546

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b) Test 2 (Parallel operation with two inverters, see Figure 4)

Step	AC load	Power DC source	Communication between energy meter and generator	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%		Response time in sec.	Response time in sec.	Response time in sec.	
1	60-70%	90-100%	Yes	0,012	0,013	0,012	P
2	60-70%	90-100%	No				

Test procedure:

The generator must stop generating in case of loss of communication between the different elements of the system in a time less than the required action time. If the control element is integrated into one of the required devices (power measuring equipment or generator) it will not be necessary to check the communication between the elements integrated in the same device.

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

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 internal network to be tested.

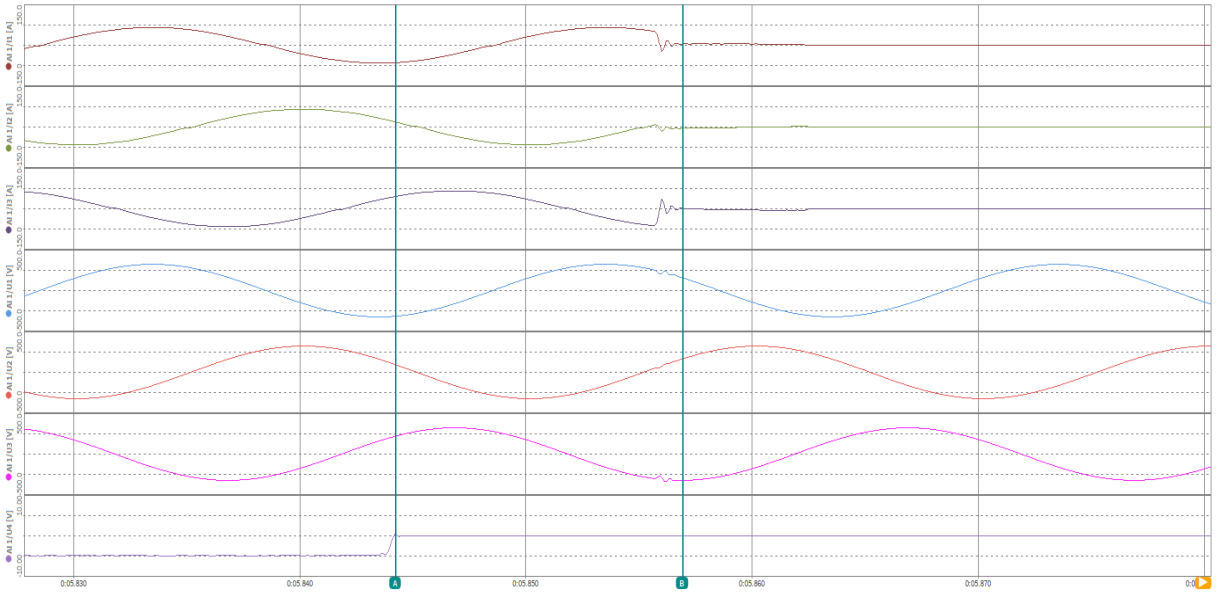
3 Set a load of 60% and 70% of the nominal power of the generator.

4 Cut off communication between the control element and the power measuring equipment.

5 Measure the time elapsed between the communication cut and the disconnection of the generator or total limitation of the generator power (0%).

6 Measure the power generated by the generator, with an uncertainty better than or equal to 0.5% + 25 W, making measurements every 50 ms.

The test will be repeated 3 times.



时间 [s]	A 5.84424681	B 5.85692520	间隔 0.01267839
AI 1/I1 [A]	-64.80898	3.437293	68.24627
AI 1/I2 [A]	19.63537	-4.473084	-24.10845
AI 1/I3 [A]	45.11418	1.801866	-43.31231
AI 1/U1 [V]	-317.6027	160.3594	477.9620
AI 1/U2 [V]	98.55056	165.4697	66.91909
AI 1/U3 [V]	219.0476	-325.5074	-544.5550
AI 1/U4 [V]	0.397921	0.014544	-0.383377

Assessment criterion:

For adjustable PGUs:

The power limitation system must guarantee that before a load disconnection, the generator readjusts its production, reaching the permanent regime again in less than t_a(the required time of action).

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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.

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4.5 Determination of the maximum number of generators

Test: Response to load disconnections

TEST	Initial load	Final load	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	90-100%	60-70%	0,95	0,95	1,00	P
2	90-100%	30-40%	1,50	1,35	1,45	P
3	90-100%	0%	1,55	1,60	1,50	P
4	60-70%	30-40%	1,20	1,05	1,05	P
5	60-70%	0%	1,45	1,55	1,60	P
6	30-40%	0%	1,45	1,15	1,25	P

Note: (Stand-alone operation)

In case the power limitation system can be used with more than one generator, the following tests will be repeated with one generator, giving it 100% of the total power of the loads。

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.

Test: Response to load disconnections

TEST	Initial load	Final load	Test 1	Test 2	Test 3	Result
	P_{inv}%	P_{inv}%	Response time in sec.	Response time in sec.	Response time in sec.	
1	90-100%	60-70%	0,70	1,00	0,95	P
2	90-100%	30-40%	1,35	1,20	1,15	P
3	90-100%	0%	1,65	1,55	1,50	P
4	60-70%	30-40%	1,10	0,75	0,75	P
5	60-70%	0%	1,75	1,30	1,20	P
6	30-40%	0%	1,45	1,15	1,30	P

Note: (Parallel operation with two inverters)

In case the power limitation system can be used with more than one generator, the following tests will be repeated with two generators working in parallel, giving each of them between 40% and 60% of the total power of the loads, such that both together satisfy 100% of the consumption.

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.

Maximum time measured for one generator, t1= 1,60 s;

Maximum time measured for two generator, t2= 1,75 s;

Difference between the maximum time obtained for one generator and for two generators: tr=t2-t1=0,15s

Maximum number of generators: $N \leq (ta-t1)/tr+1$

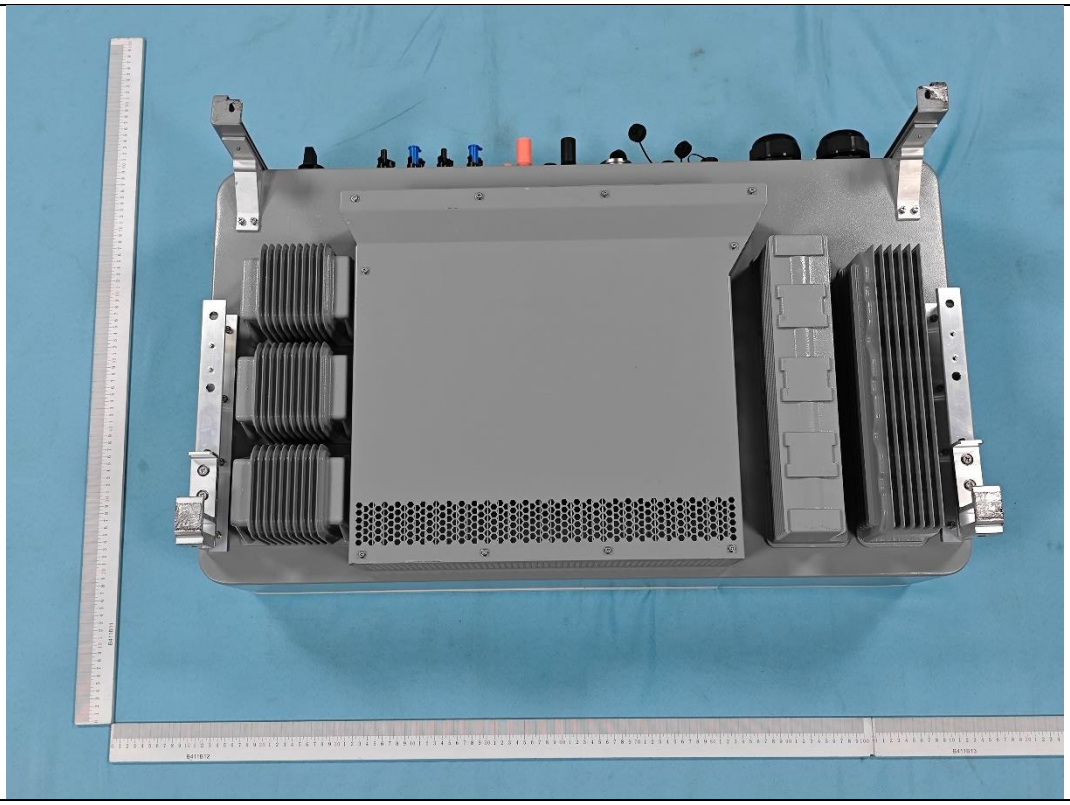
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Annex No. 1

Pictures of the unit

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Photo of EUT
Enclosure front view

Enclosure rear view


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Photo of EUT

Enclosure left view



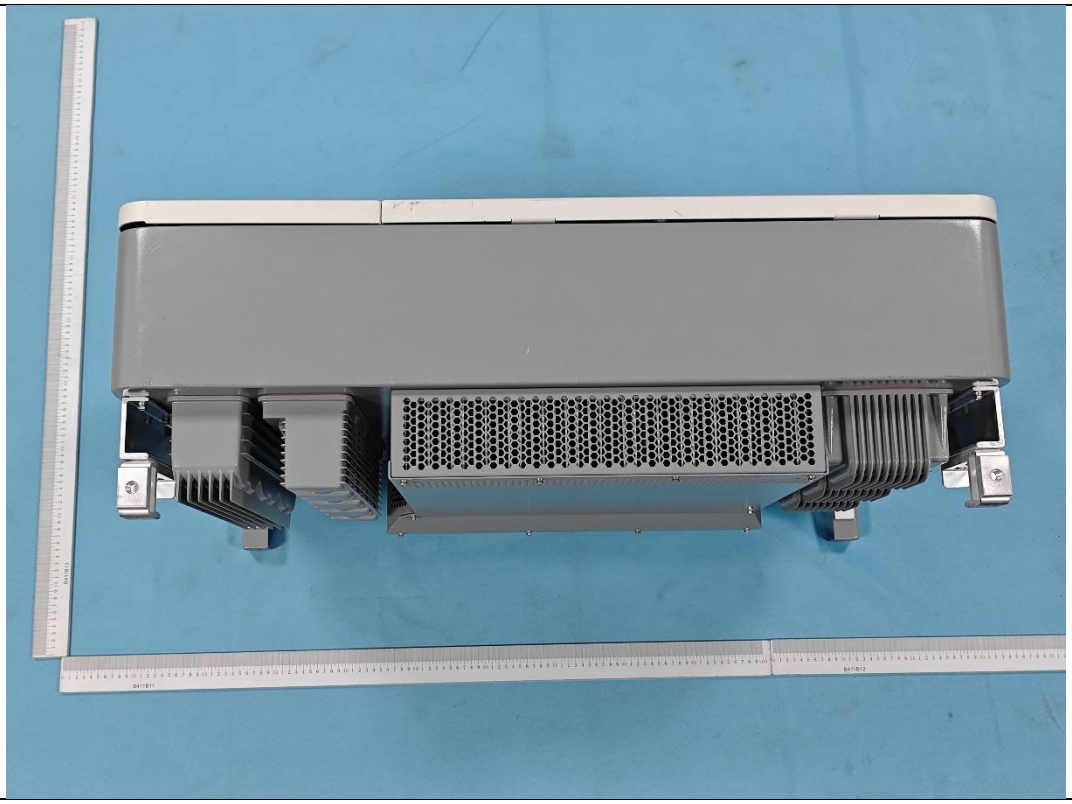
Enclosure right view



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Photo of EUT

Enclosure top view



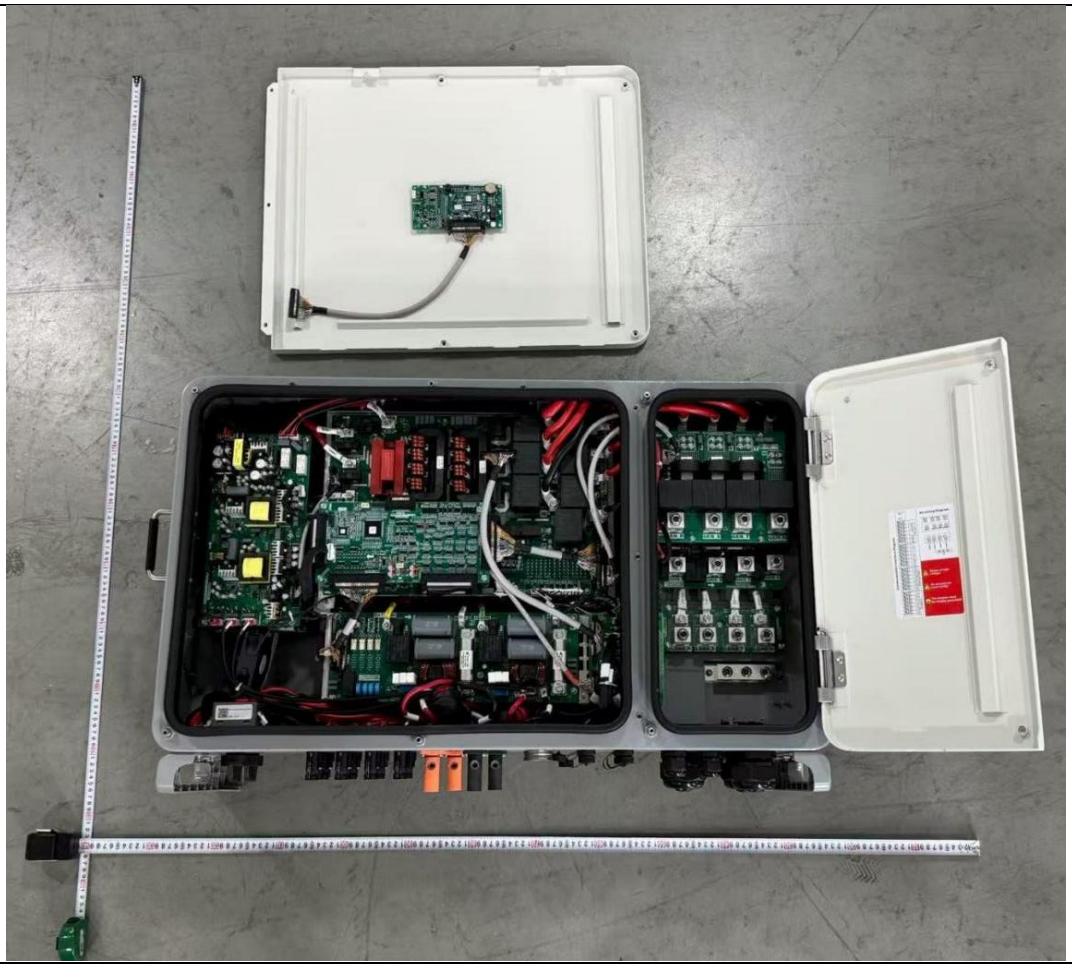
Enclosure bottom view



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Photo of EUT

Internal view



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Annex No. 2

Test Equipment list

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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

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END OF TEST REPORT

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