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TESTING LABORATORY

Name : Certification Entity for Renewable Energies, S.L.
(CERE Testing Laboratory)

Address..... : C/ Monturiol 15. 28906. Getafe - Madrid - Spain

Conducted (tested) by : Marcos Bragado

Test Date : 09/02/2021 – 11/02/2021
27/01/2022 – 31/01/2022

Issue Date..... : 14/02/2022

SITE TEST

Name : Gamesa Electric S.A.U

Address..... : Calle Mar Mediterráneo 14-16
28830.San Fernando de Henares, Madrid.Spain

LICENCE HOLDER

Name : Gamesa Electric S.A.U

Address..... : Calle Mar Mediterráneo 14-16
28830.San Fernando de Henares, Madrid.Spain

APPLICANT

Name : Certification Entity for Renewable Energies, S.L.
(CERE Certification Entity)

Address..... : C/ Monturiol 15. 28906. Getafe - Madrid - Spain

APPLIED SPECIFICATIONS

This protocol is based on the standard **Central Electricity Authority (CEA): 2007 + Amd 2013+ Amd 2019.**

SAMPLES CHARACTERISTICS

Apparatus type/ Installation..... : Three-Phase Bidirectional Solar Inverter

Manufacturer/ Supplier/ Installer : Gamesa Electric

Trademark..... : Gamesa Electric

Models : PV 3750 STD

Serial Number : 2031957

Firmware version..... : FIP1027_R1.1_011 Inverter
FIP1049_R1.2_0 Storage

Rated Characteristics : Pn: 3750,00 kVA, 660VAC, 50Hz
See point 2 of this test report, "General Information"

Performed by:



Marcos Bragado
(Testing Engineer)

Approved by:



Alberto Martín
(Technical Manager)

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1. SCOPE

Certification Entity for Renewable Energies, S.L (CERE Testing Laboratory) has been contracted by Certification Entity for Renewable Energies, S.L (CERE Certification Entity) in order to perform the testing according to the network connection standards specified in page 1 "Applied specifications".

2. GENERAL INFORMATION

2.1. Tested item: Particular characteristics

Input.....: 915-1500 Vdc, Id_{Cmax} 2x2100 A

Output.....: 3750 kVA, 660 Vac_{L-L}, I_{ac}_{max} 3280 A, 50 Hz

Class of protection against electric shock.....: Class I

Degree of protection against moisture.....: IP55

Type of connection to the main supply.....: 3 Phases + PE

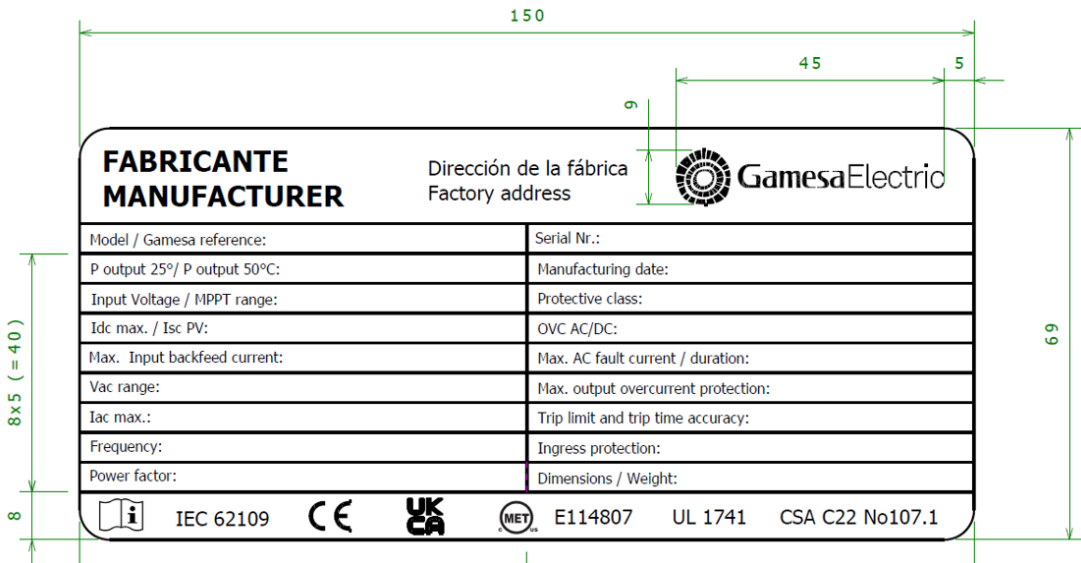
Cooling group.....: Liquid Cooling

Modular.....: Yes

Internal Transformer.....: No

Climatic Condition.....: -20°C to +60°C

2.2. Rating plate:



150

45

5

9

69

8x5 (= 40)

8

FABRICANTE		Dirección de la fábrica			GamesaElectric
MANUFACTURER		Factory address			
Model / Gamesa reference:			Serial Nr.:		
P output 25° / P output 50°C:			Manufacturing date:		
Input Voltage / MPPT range:			Protective class:		
Idc max. / Isc PV:			OVC AC/DC:		
Max. Input backfeed current:			Max. AC fault current / duration:		
Vac range:			Max. output overcurrent protection:		
Iac max.:			Trip limit and trip time accuracy:		
Frequency:			Ingress protection:		
Power factor:			Dimensions / Weight:		
	IEC 62109				E114807 UL 1741 CSA C22 No107.1

2.3. Summary of inspection and test results:

All the tests and checks have been performed in accordance with the reference Standard as specified previously.

The results obtained apply only to the particular sample tested that is the subject of the present test report. The most unfavourable result values of the verifications and tests performed are contained herein.

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

Version	Modifications
0	Initial report
1	New edition to include IEC TS 62910:2015 as test procedure for low voltage ride-through measurements.
2	Storage tests 5.3, 5.5, 5.7, 5.8, 5.9 and 5.11 included by client request.

Note: Accredited activities can be found into the accreditation scope.

Note 2: Tests performed over one module of the inverter (1875kVA at 25°C) because is representative of the full inverter which is a modular system with two modules (3750kVA at 25°C).

Note 3: The IEC TS 62910:2015, Utility-interconnected photovoltaic inverters - Test procedure for low voltage ride-through measurements, has been used.

Note 4: The EUT tested corresponds to a model of 3750 kVA working on bidirectional mode.

The present test report cannot be copied partially without the express written consent of the Testing Laboratory.

This test report cancels and supersedes the test report number 20764-1-TR-E1 issued on 03/11/2021.

WEATHER CONDITIONS

Temperature: 21,2 – 23,4 °C

Humidity: 33 –42 %HR

3. TEST EQUIPMENT LIST / MEASUREMENT UNCERTAINTY & TEST SETUP

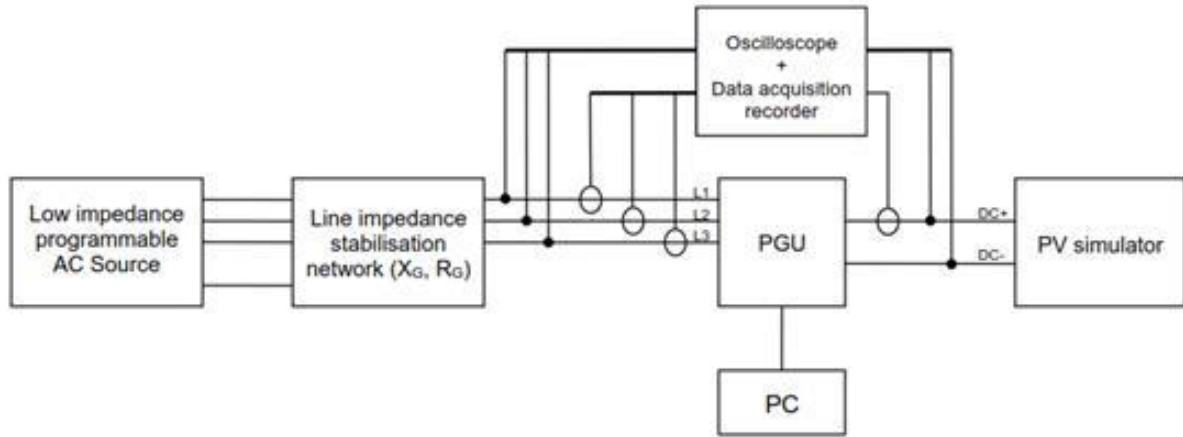
3.1. Test Equipment List

CERE'S EQUIPMENT LIST					
No.	TEST EQUIPMENT	MANUFACTURER / MODEL	CODE N°	CALIBRATION DATE	
				LAST	DUE
1	Power Analyzer	DEWESOFT / Sirius	CERE_128	27/07/2020	27/07/2022
2	AC Current Sensor x3	CIRCUTOR / TP816	CERE_143	24/09/2020	24/09/2022
			CERE_144	24/09/2020	24/09/2022
			CERE_145	24/09/2020	24/09/2022
3	Multimeter	FLUKE / 179	CERE_008	26/10/2020 02/11/2021	26/10/2021 02/11/2022
4	Weather station	VELLEMAN / WS8472	CERE_012	22/10/2020 22/10/2021	22/10/2021 22/10/2022

3.2. Measure uncertainties

Voltage.....	V ± 0,16%
Current.....	I ± 0,61%
Power.....	P ± 0,62%
Frequency.....	F ± 0,12%
Harmonics.....	I ± 0,61%
Flickers.....	V ± 0,16%

3.3. Test set up:



Current sensors and voltage probes have been connected to the output of equipment under test (EUT) according each test requirement.

All the tests described in the following pages have been performed using this specified test setup.

4. RESUME OF TEST RESULTS

4.1. Interpretation Keys

Test object does meet the requirement:	P	Pass
Test object does not meet the requirement:	F	Fail
Test case does not apply to the test object:	N/A	Not applicable
To make a reference to a table or an annex.:	See additional sheet	
To indicate that the test has not been performed:	N/T	Not tested

4.2. Chapter of the Standard

Test N°	Test Description:	Standard Reference	Result
5.1	LVRT	4 (c) (3) amd 2019	P
5.2	HVRT	4 (7) amd 2019	P
5.3	Operation field (V&F)	4 (c) (2) amd 2019	P
5.4	Active power injection in case of over frequency	4 (c) (4) (ii) amd 2019	P
5.5	Switching operations	5 (3) (v) amd 2019	P
5.6	Flicker	5 (3) (v) amd 2019	P
5.7	Harmonics	5 (3) amd 2019	P
5.8	Capability of the EUT	5 (2) amd 2019	P
5.9	Active power control	4 (i) amd 2019	P
5.10	DC Current Injection	Part II (B1) ((2) amd 2013	N/A*
5.11	Current unbalances	Part IV (4) CEA 2007	P
5.12	Q vs V	5 (2) amd 2019	P

*The converter always is connected with a external medium voltage insulated transformer.



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5. TEST RESULTS

5.1. LVRT:

LVRT: Priority P with previous active current									
Fault type	Load (%Pn)	Voltage Level desired (%Un)	Voltage Level measured (%Un)	Time minimum (ms)	Time measured (ms)	Active current measured pre-fault (%In)	Active current measured fault (%In)	Reactive current measured pre-fault (%In)	Reactive current measured fault (%In)
3P	NO LOAD	< 15 %	13,40%	> 300	420	--	--	--	--
1P	NO LOAD		13,70%		400	--	--	--	--
3P	70%		10,33%		420	70,07%	92,88%	-2,60%	37,05%
3P	20%		9,17%		420	20,00%	30,65%	-0,73%	95,05%
1P	70%		14,63%		380	70,07%	72,05%	-2,60%	69,34%
1P	20%		14,75%		380	20,00%	22,77%	-0,73%	97,42%
3P	NO LOAD	< 50 %	45,13%	> 1650	1740	--	--	--	--
1P	NO LOAD		45,13%		1720	--	--	--	--
3P	70%		37,26%		1760	70,07%	73,95%	-2,60%	67,36%
3P	20%		37,59%		1760	20,00%	23,30%	-0,73%	97,27%
1P	70%		45,08%		1720	70,07%	72,32%	-2,60%	69,09%
1P	20%		45,01%		1720	20,00%	22,62%	-0,73%	83,93%
3P	NO LOAD	< 85 %	80,03%	> 3000	3120	--	--	--	--
1P	NO LOAD		80,07%		3080	--	--	--	--
3P	70%		79,73%		3120	70,06%	72,82%	-2,60%	68,56%
3P	20%		79,75%		3120	20,00%	22,93%	-0,73%	78,77%
1P	70%		80,04%		3060	70,06%	71,22%	-2,59%	25,64%



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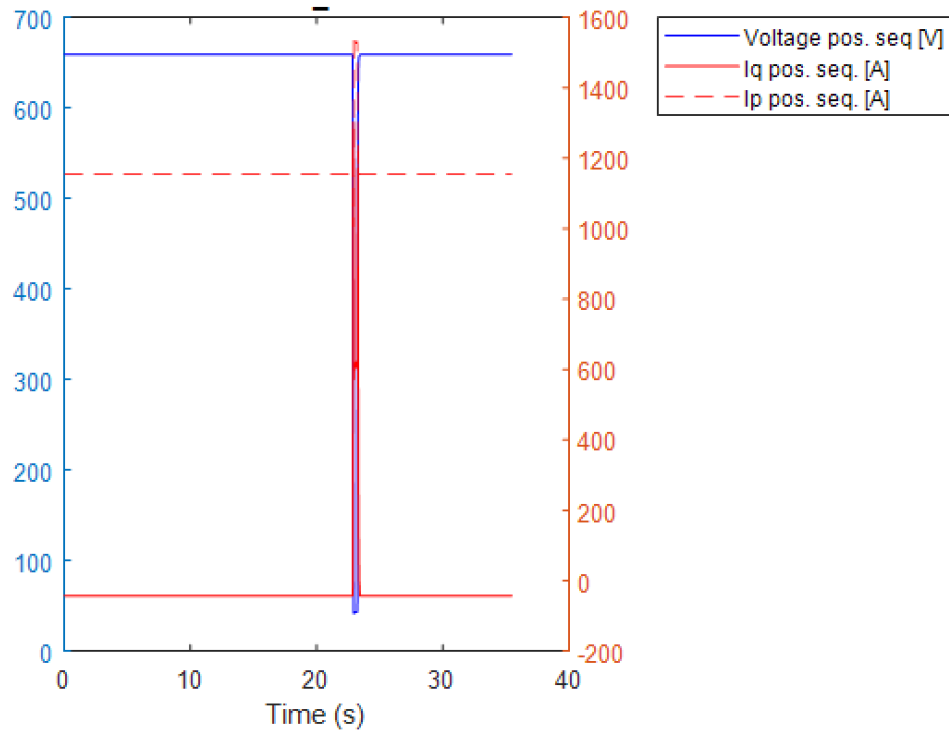
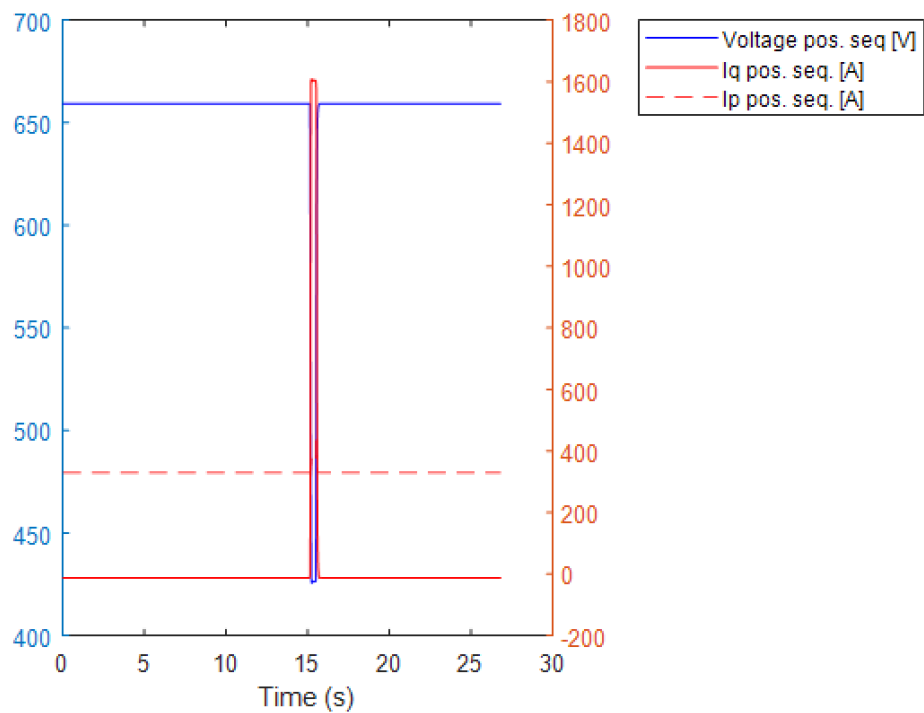


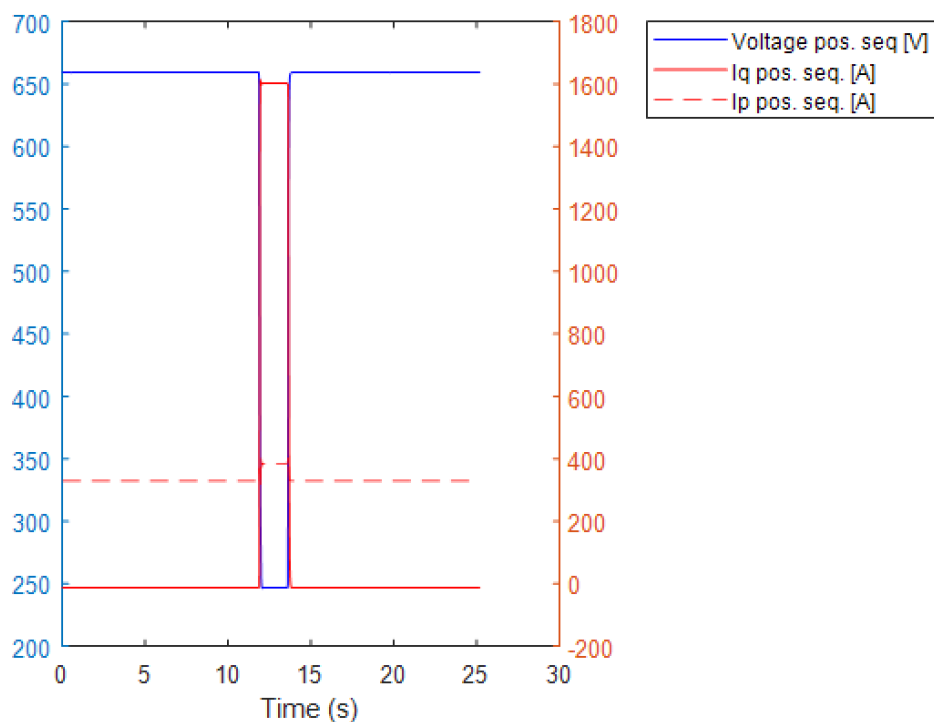
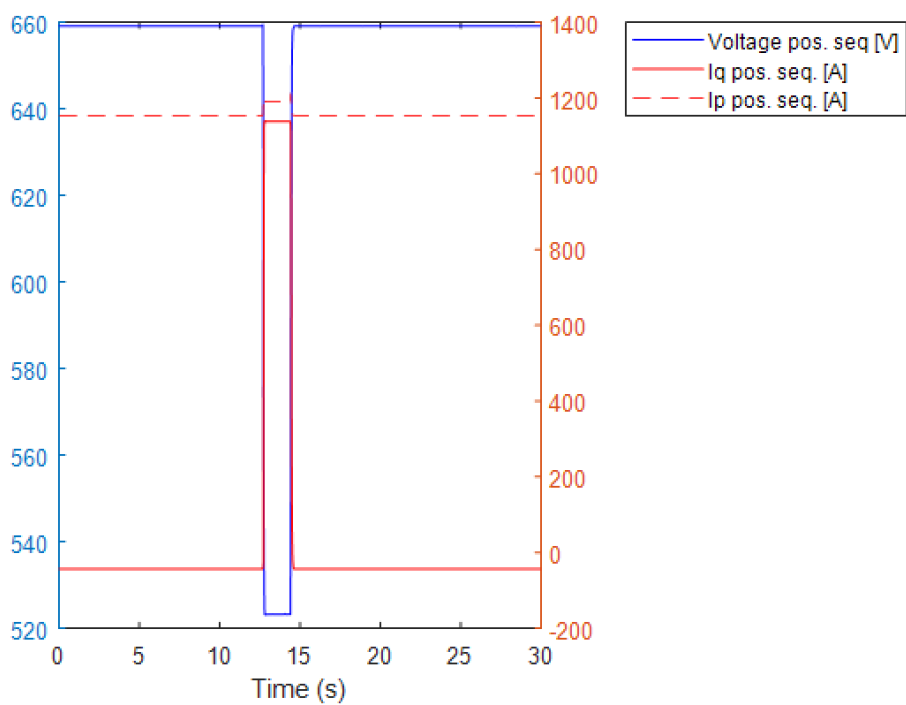
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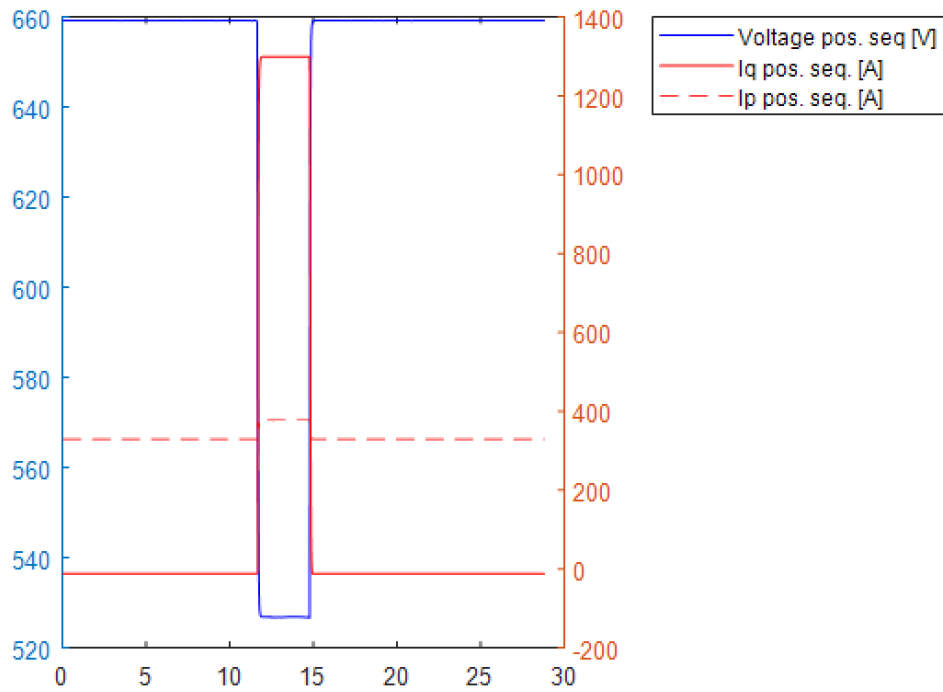
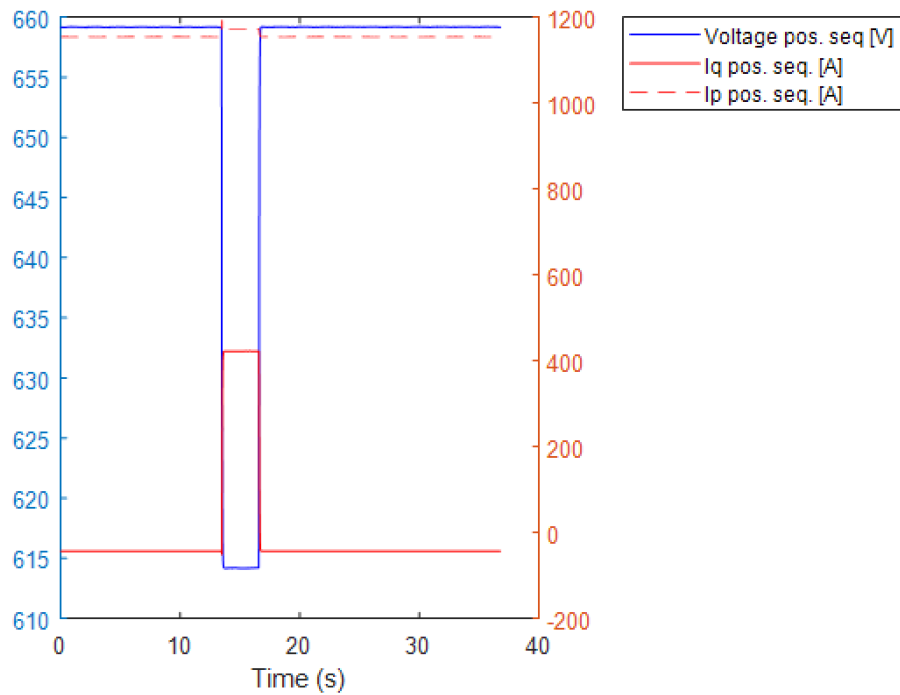
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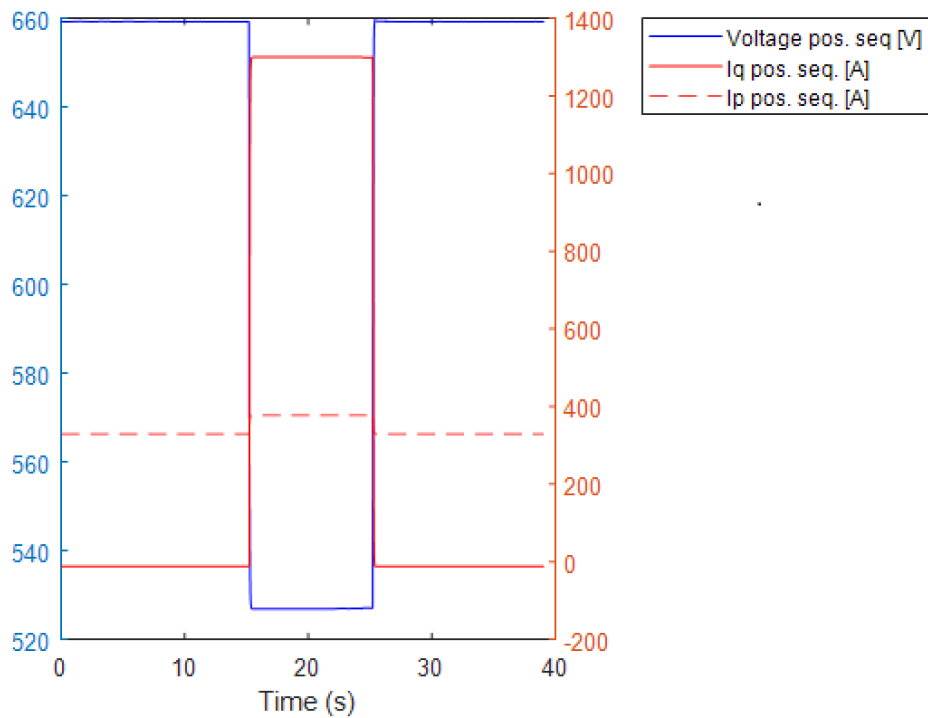
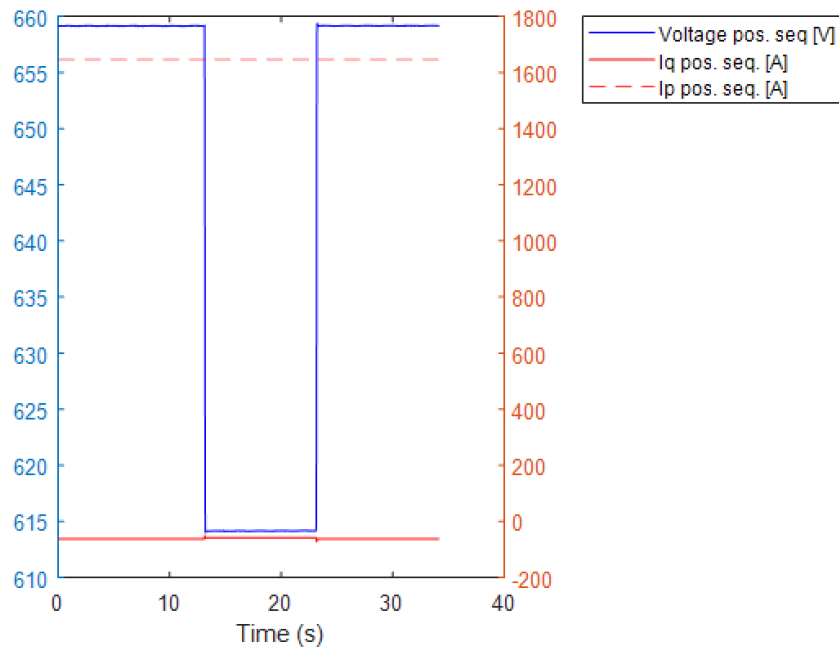
LVRT: Priority P with previous active current

Fault type	Load (%Pn)	Voltage Level desired (%Vn)	Time minimum (s)	Time measured (s)	Voltage Level pre (%Vn)	Voltage Level fault (%Vn)	Active current measured pre (%In)	Active current measured fault (%In)	Reactive current measured pre (%In)	Reactive current measured fault (%In)
3P	100%	< 90 %	10 s	10,02	99,93%	79,75%	99,94%	99,95%	-3,74%	-3,57%
	70%			10,02	99,94%	79,71%	70,06%	72,82%	-2,61%	68,56%
	20%			10,02	99,96%	79,70%	20,00%	22,91%	-0,73%	78,92%
1P	100%	< 90 %	10 s	9,98	99,79%	80,08%	99,94%	99,95%	-3,75%	-3,49%
	70%			9,96	99,82%	80,04%	70,05%	71,17%	-2,61%	25,47%
	20%			10,00	99,97%	80,00%	19,99%	21,03%	-0,73%	27,43%

Graphic-Fault type LVRT 3ph-<15%Vn (Time 300ms)-70%Pn

Graphic-Fault type LVRT 1ph-<15%Vn (Time 300ms)-20%Pn


Graphic-Fault type LVRT 3ph-<50%Vn (Time 1650ms)-20%Pn

Graphic-Fault type LVRT 1ph-<50%Vn (Time 1650ms)-70%Pn


Graphic-Fault type LVRT 3ph-85%Vn (Time 3000ms)-20%Pn

Graphic-Fault type LVRT 1ph-85%Vn (Time 3000ms)-70%Pn


Graphic-Fault type UVRT 3ph-85%Vn (Time 10000ms) -20%Pn

Graphic-Fault type UVRT 1ph-85%Vn (Time 10000ms) -100%Pn


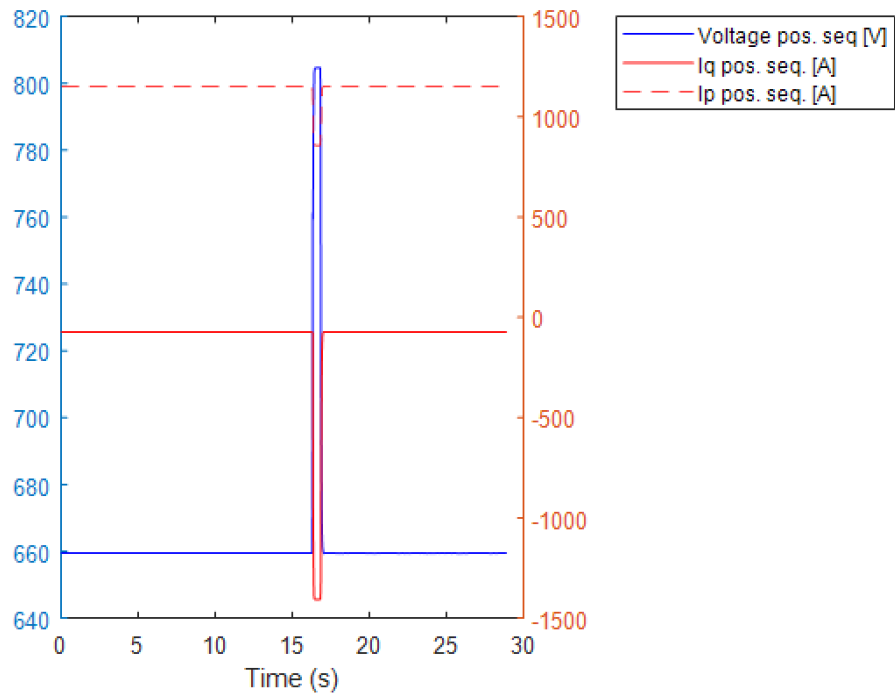
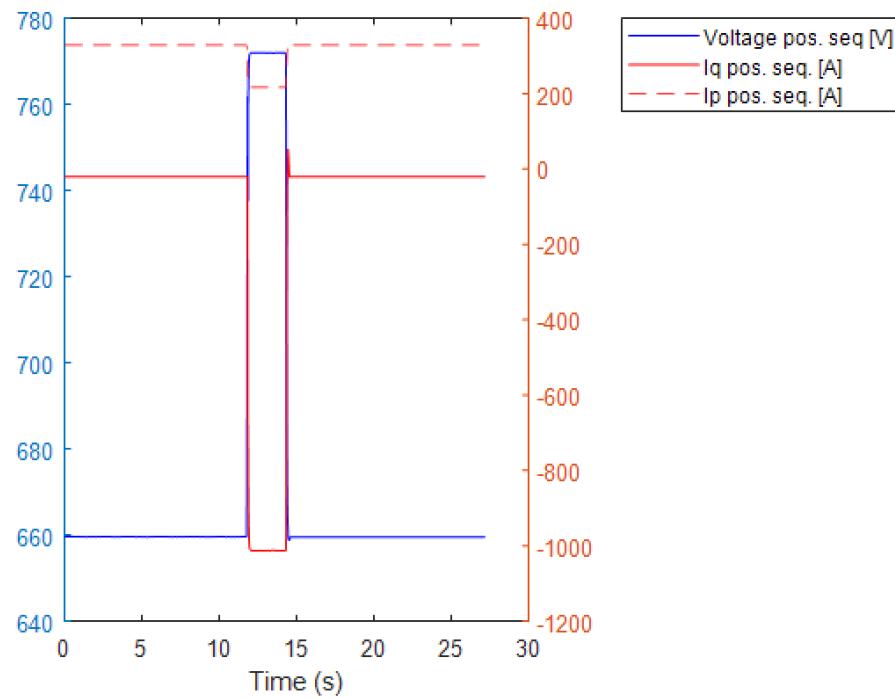
LVRT: Priority Q													
Fault type	Load	Voltage Level desired (%)	Voltage Level measured (%)	Time minimum (ms)	Time measured (ms)	Load measured (%)	Iq pre-fault positive sequence (% In)	Iq fault positive sequence (% In)	ΔU (positive sequence)	ΔI_q (positive sequence)	Reactive current error (%)	K performed	K measured
3P	100%	< 5%	9,60%	≥ 150	240,00	98,02%	0,29%	100,08%	93,72%	99,79%	0,08%	3,50	1,06
3P	20%	< 5%	9,35%	≥ 150	240,00	19,60%	-0,27%	100,25%	93,33%	100,52%	0,25%	3,50	1,08
2P	100%	< 5%	9,56%	≥ 150	220,00	97,98%	0,29%	49,98%	41,22%	49,68%	-0,32%	3,50	1,21
2P	20%	< 5%	11,67%	≥ 150	240,00	19,59%	-0,26%	50,01%	39,65%	50,27%	0,27%	3,50	1,27
3P	100%	35%-45%	45,92%	≥ 850	900,12	97,71%	0,30%	100,35%	55,64%	100,05%	0,35%	3,50	1,80
3P	20%	35%-45%	47,01%	≥ 850	900,12	19,53%	-0,27%	100,42%	54,46%	100,69%	0,42%	3,50	1,85
2P	100%	35%-45%	46,55%	≥ 850	880,11	97,74%	0,32%	49,84%	23,32%	49,52%	-0,48%	3,50	2,12
2P	20%	35%-45%	46,68%	≥ 850	880,11	19,54%	-0,26%	49,85%	22,61%	50,11%	0,11%	3,50	2,22
3P	100%	70%-80%	81,49%	≥ 1340	1420,18	97,74%	0,32%	72,44%	20,09%	72,13%	1,80%	3,50	3,59
3P	20%	70%-80%	79,86%	≥ 1340	1420,18	19,55%	-0,26%	71,74%	21,25%	72,00%	-2,39%	3,50	3,39
2P	100%	70%-80%	78,17%	≥ 1340	1400,18	97,78%	0,29%	33,95%	9,36%	33,66%	0,90%	3,50	3,60
2P	20%	70%-80%	77,13%	≥ 1340	1420,18	19,55%	-0,27%	32,97%	10,08%	33,24%	-2,04%	3,50	3,30
3PQmax	20%	70%-80%	82,17%	≥ 1340	1400,18	94,36%	92,69%	100,20%	24,77%	7,52%	0,20%	3,50	0,30
3PQmin	20%	70%-80%	74,18%	≥ 1340	1420,18	100,93%	-98,52%	-23,07%	20,47%	75,45%	3,81%	3,50	3,69
3P	10%	70%-80%	81,47%	≥ 1340	1420,18	9,78%	-0,35%	100,24%	19,65%	100,58%	0,24%	6,00	5,12
2P	10%	70%-80%	77,86%	≥ 1340	1400,18	9,77%	-0,35%	49,79%	9,43%	50,14%	0,14%	6,00	5,32

Note: Low K values are due to the EUT saturating by apparent power during LVRT.

5.2. HVRT

HVRT						
Fault type	Over Voltage (p.u.)	Minimum time to remain connected (seconds)	Load (%Pn)	Time Measured (seconds)	Load Measured Pre-Fault (%Pn)	Voltage Measured (%Un)
3P	1,30≥V>1,20	0,2 Sec	20%	0,52	20,04%	121,94%
			70%	0,52	70,20%	122,28%
3P	1,20≥V>1,10	2 sec	20%	2,50	20,04%	117,03%
			70%	2,50	70,21%	117,21%
1P	1,30≥V>1,20	0,2 Sec	100%	12,02	98,60%	118,99%
			20%	12,01	19,80%	118,91%
1P	1,20≥V>1,10	2 sec	100%	12,00	97,66%	119,00%
			20%	12,00	19,80%	112,04%

Note: The EUT remains connected during HVRT.

Graphic-Fault type HVRT 3ph-1.20<V<1.30-70%Pn

Graphic-Fault type HVRT 3ph-1.20<V<1.10-20%Pn


5.3. Operation field (V&F)

Inverter mode:

Test num	Voltage (%Un)	Frequency	Minimum time	Voltage measured (%Un)	Frequency measured (Hz)	Active Power Measured	Time measured (min)	Disconnection (YES/NO)
Test 1	116%	47 Hz	5 min	116,76%	47,00	100,59%	5,00	NO
Test 2	84%	47 Hz	5 min	84,45%	47,00	83,39%	5,00	NO
Test 3	116%	52 Hz	5 min	116,38%	52,00	100,79%	5,00	NO
Test 4	84%	52 Hz	5 min	84,22%	52,00	84,55%	5,00	NO
Test 5	100%	49,40Hz	--	100,01%	49,40	100,35%	2,00	NO
Test 6	100%	50,40 Hz	--	100,00%	50,40	99,87%	2,00	NO

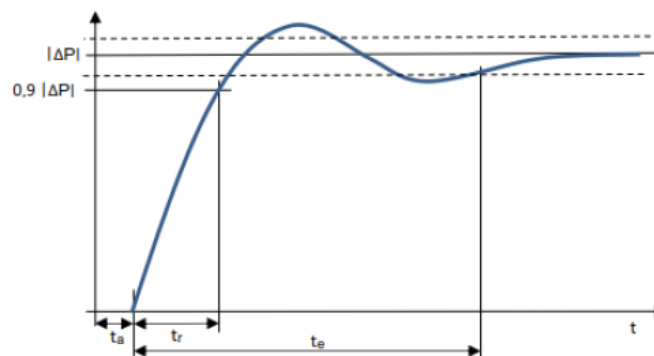
Storage mode:

Test num	Voltage (%Un)	Frequency	Minimum time	Voltage measured (%Un)	Frequency measured (Hz)	Active Power Measured	Time measured (min)	Disconnection (YES/NO)
Test 1	116%	47 Hz	5 min	116,86%	47,04	-100,04%	5,00	NO
Test 2	84%	47 Hz	5 min	84,21%	47,04	-83,81%	5,00	NO
Test 3	116%	52 Hz	5 min	116,68%	52,05	-99,96%	5,00	NO
Test 4	84%	52 Hz	5 min	84,06%	52,05	-83,77%	5,00	NO
Test 5	100%	49,40Hz	--	100,23%	49,44	-100,05%	2,00	NO
Test 6	100%	50,40 Hz	--	100,25%	50,44	-100,02%	2,00	NO

Note: it has been disabled the V/f protections and L-HVRT / PvsF functions in order to obtain the maximum power of the EUT within the V/f operation ranges.

5.4. Active power injection in case of over frequency

NOTE: $P_{ini}=P_{max}$



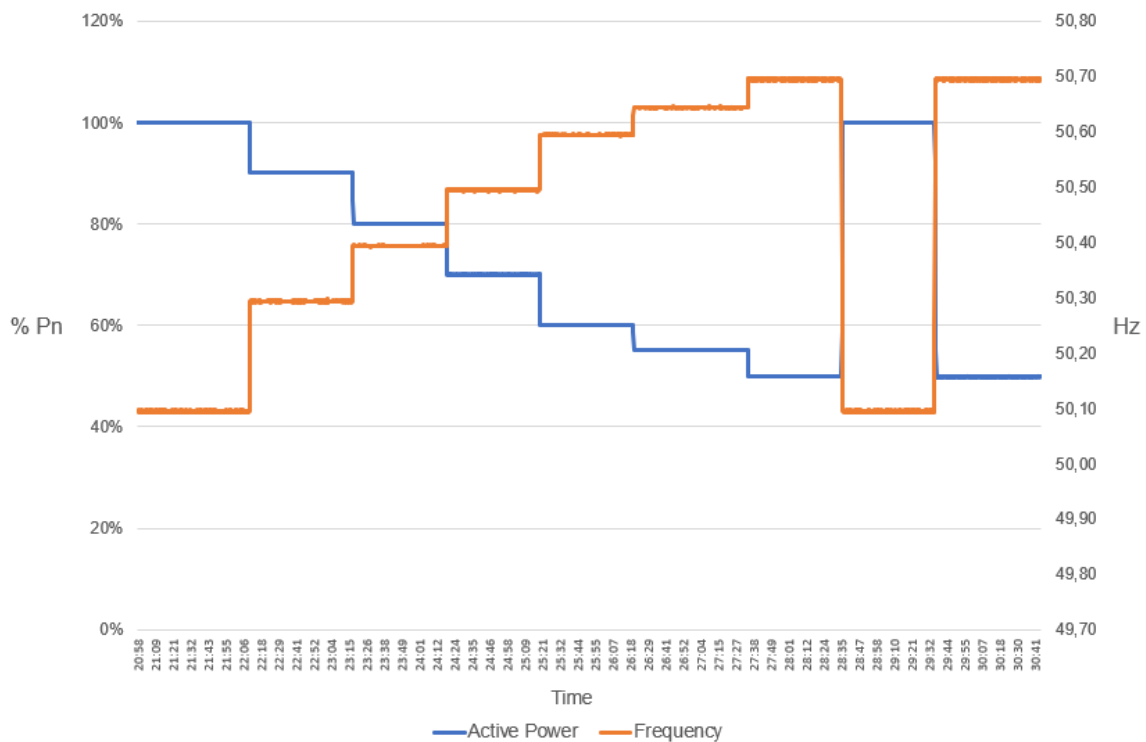
t_a	Time since frequency changes until power initiates automatic response
t_r	Time since the beginning of automatic response until power reaches 90% $ \Delta P $
t_e	Time until power stabilizes within a band of $\pm 10\%$ $ \Delta P $ (expected power value)
$ \Delta P $	Absolute value: $P - P_{ini}$



P vs of: 50,2Hz-s=2%-Pini=Pmax

Test point N°	f (Hz)	$\Delta P/P_{max}$ (%) expected	P (%) Reg.	Dev. (%)	90% P (%) reg.	tr(s) (at 90% P (%) reg.)	ta (s)	te (s)	Dev Max. (%) (Error considered $\pm 5\%$)
1	50,10	0,00%	99,96%	0,04%	--	--	--	--	$\pm 5\%$
2	50,30	-10,00%	90,11%	-0,11%	91,10%	0,20	0,20	0,20	$\pm 5\%$
3	50,40	-20,00%	80,11%	-0,11%	81,11%	0,20	0,20	0,20	$\pm 5\%$
4	50,50	-30,00%	70,06%	-0,06%	71,06%	0,20	0,20	0,20	$\pm 5\%$
5	50,60	-40,00%	60,00%	0,00%	61,01%	0,20	0,20	0,20	$\pm 5\%$
6	50,65	-45,00%	55,10%	-0,10%	55,59%	0,20	0,20	0,20	$\pm 5\%$
7	50,70	-50,00%	50,00%	0,00%	50,51%	0,20	0,20	0,20	$\pm 5\%$
8	50,10	0,00%	99,96%	0,04%	94,97%	0,90	0,20	1,10	$\pm 5\%$
9	50,70	-50,00%	49,87%	0,13%	54,88%	0,60	0,20	1,00	$\pm 5\%$

P vs f: 50,2Hz-s=2%-Pini=Pmax

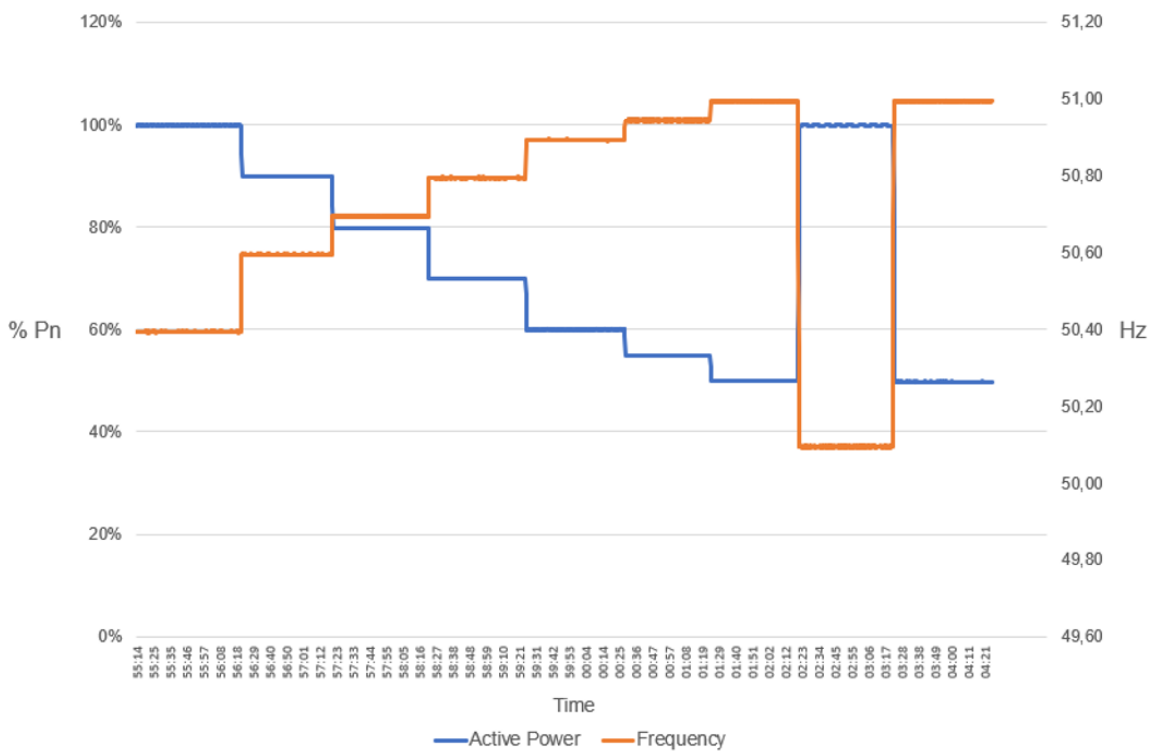




P vs of: 50,5Hz-s=2%-Pini=Pmax

Test point N°	f (Hz)	$\Delta P/P_{max}$ (%) expected	P (%) Reg.	Dev. (%)	90% P (%) reg.	tr(s) (at 90% P (%) reg.)	ta (s)	te (s)	Dev Max. (%) (Error considered $\pm 5\%$)
1	50,40	0,00%	99,87%	0,13%	--	--	--	--	$\pm 5\%$
2	50,60	-10,00%	89,87%	0,13%	90,87%	0,20	0,10	0,20	$\pm 5\%$
3	50,70	-20,00%	79,87%	0,13%	80,87%	0,20	0,20	0,40	$\pm 5\%$
4	50,80	-30,00%	69,84%	0,16%	70,84%	0,40	0,20	0,40	$\pm 5\%$
5	50,90	-40,00%	59,98%	0,02%	60,97%	0,10	0,20	0,10	$\pm 5\%$
6	50,95	-45,00%	54,87%	0,13%	55,38%	0,20	0,10	0,20	$\pm 5\%$
7	51,00	-50,00%	49,95%	0,05%	50,44%	0,20	0,20	0,20	$\pm 5\%$
8	50,10	0,00%	99,86%	0,14%	94,87%	0,90	0,20	1,00	$\pm 5\%$
9	51,00	-50,00%	49,83%	0,17%	54,83%	1,20	0,20	1,20	$\pm 5\%$

P vs of: 50,5Hz-s=2%-Pini=Pmax

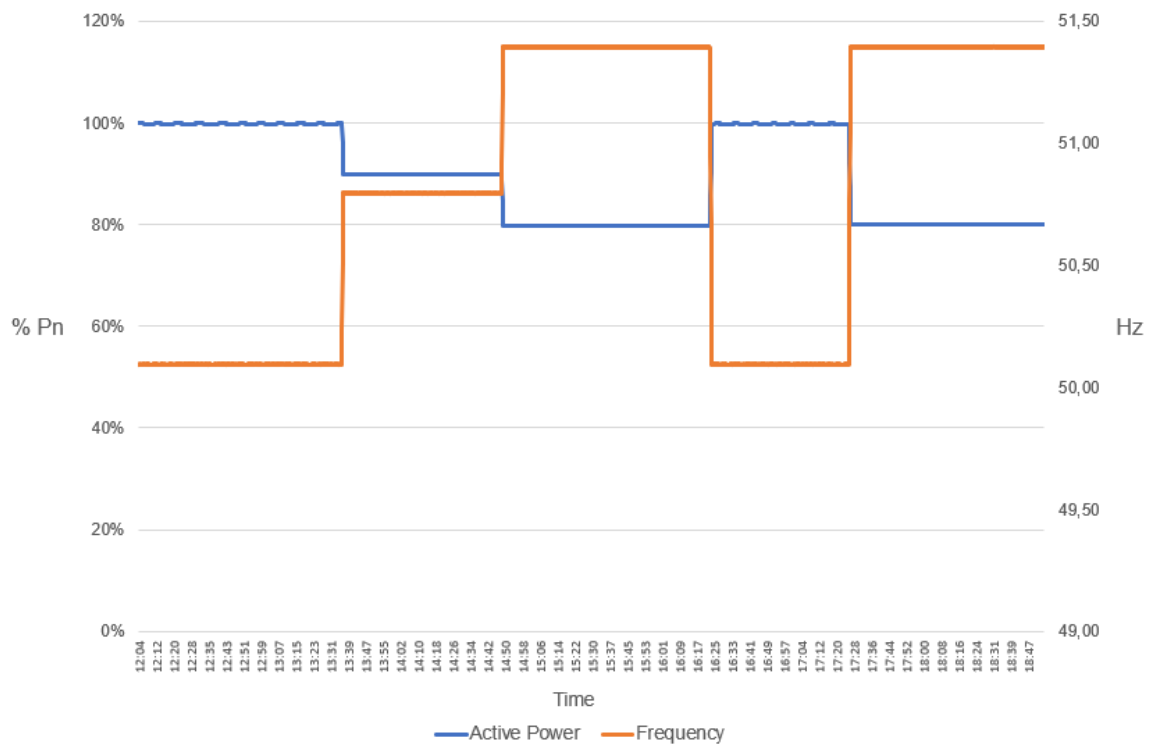




P vs of: 50,2Hz-s=12%-Pini=Pmax

Test point N°	f (Hz)	$\Delta P/P_{max}$ (%) expected	P (%) Reg.	Dev. (%)	90% P (%) reg.	tr(s) (at 90% P (%) reg.)	ta (s)	te (s)	Dev Max. (%) (Error considered $\pm 5\%$)
1	50,10	0,00%	99,89%	0,11%	--	--	--	--	$\pm 5\%$
2	50,80	-10,00%	89,85%	0,15%	90,85%	0,20	0,40	0,30	$\pm 5\%$
3	51,40	-20,00%	79,83%	0,17%	80,84%	0,30	0,20	0,30	$\pm 5\%$
4	50,10	0,00%	99,88%	0,12%	97,88%	0,70	0,20	0,90	$\pm 5\%$
5	51,40	-20,00%	80,07%	-0,07%	82,05%	0,50	0,30	0,70	$\pm 5\%$

P vs of: 50,2Hz-s=12%-Pini=Pmax

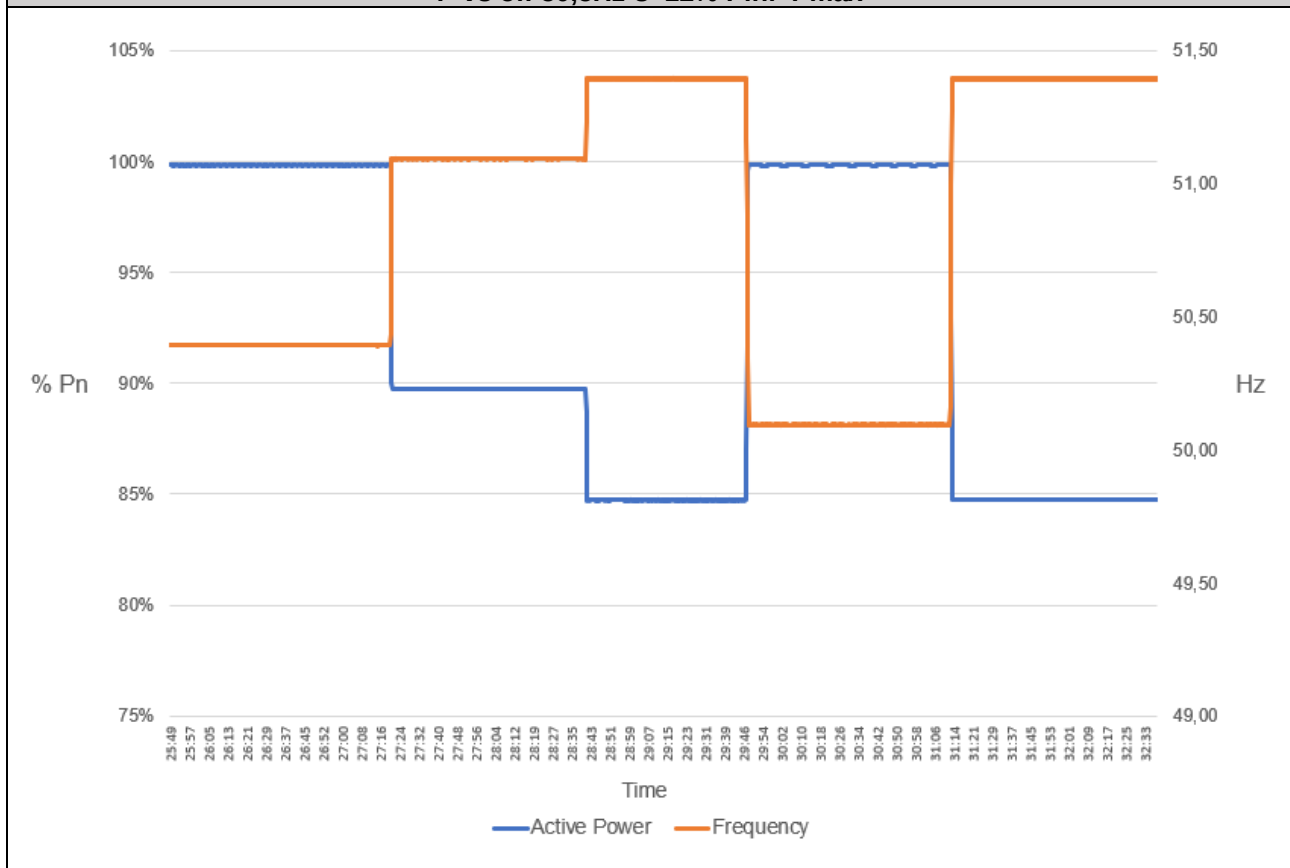




P vs of: 50,5Hz-s=12%-Pini=Pmax

Test point N°	f (Hz)	$\Delta P/P_{max}$ (%) expected	P (%) Reg.	Dev. (%)	90% P (%) reg.	tr(s) (at 90% P (%) reg.)	ta (s)	te (s)	Dev Max. (%) (Error considered $\pm 5\%$)
1	50,40	0,00%	99,87%	0,13%	--	--	--	--	$\pm 5\%$
2	51,10	-10,00%	89,76%	0,24%	90,77%	0,40	0,10	0,40	$\pm 5\%$
3	51,40	-15,00%	84,75%	0,25%	85,25%	0,20	0,10	0,20	$\pm 5\%$
4	50,10	0,00%	99,83%	0,17%	98,32%	0,50	0,20	0,60	$\pm 5\%$
5	51,40	-15,00%	84,75%	0,25%	86,26%	0,50	0,30	0,70	$\pm 5\%$

P vs of: 50,5Hz-s=12%-Pini=Pmax



5.5. Switching operations

Inverter Mode						
Switching Operations:	PST	Dmax	Dc	c(Ψk)	kf (Ψk)	ku (Ψk)
Start-up at cut-in power (10 %Pn)	0,19	0,07	0,01	0,04	0,00	0,00
Change of Power (100 %Pn – 10 %Pn)	0,15	--	--	0,03	0,00	0,00
Start-up at rated power (100 %Pn)	0,16	0,05	0,03	0,03	0,00	0,00
Cut off at rated power (100 %Pn)	0,13	0,18	-0,16	0,02	0,00	0,00
Storage Mode						
Switching Operations:	PST	Dmax	Dc	c(Ψk)	kf (Ψk)	ku (Ψk)
Start-up at cut-in power (-10 %Pn)	0,25	0,80	0,07	13,40	0,37	0,29
Change of Power (-100 %Pn – -10 %Pn)	0,37	0,98	0,40	19,82	0,54	0,29
Start-up at rated power (-100 %Pn)	0,85	1,38	0,45	45,22	1,24	0,29
Cut off at rated power (-100 %Pn)	0,33	0,86	0,43	17,53	0,48	0,29

5.6. Flicker

Continuous Operation				
Pbin(%)	Limit	33 %	66 %	100%
PST	<1,00	0,00	0,00	0,08
PLT	<0,65	0,00	0,00	0,04
dc	<3,30%	0,17	0,14	0,16
dmax	<6,00%	1,09	4,88	5,25

Note: Limits according IEC 61000-3-11.

5.7. Harmonics

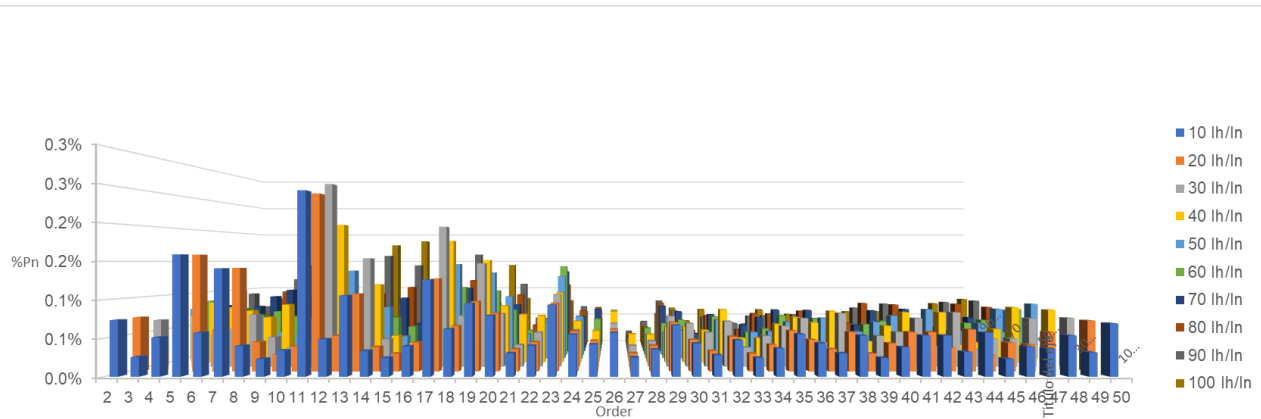
Currents Harmonics: Inverter mode

Pbin(%In)	10	20	30	40	50	60	70	80	90	100	Limits (%In)
Nr/Order	I _h (%In)										
2	0,07%	0,07%	0,07%	0,08%	0,08%	0,09%	0,08%	0,10%	0,09%	0,06%	1,75%
3	0,03%	0,03%	0,03%	0,07%	0,03%	0,06%	0,05%	0,06%	0,07%	0,07%	7,00%
4	0,05%	0,05%	0,06%	0,09%	0,08%	0,07%	0,07%	0,06%	0,08%	0,06%	1,75%
5	0,16%	0,16%	0,05%	0,08%	0,05%	0,06%	0,09%	0,10%	0,12%	0,14%	7,00%
6	0,06%	0,06%	0,05%	0,08%	0,06%	0,07%	0,10%	0,07%	0,08%	0,08%	1,75%
7	0,14%	0,14%	0,07%	0,07%	0,04%	0,06%	0,09%	0,09%	0,11%	0,13%	7,00%
8	0,04%	0,04%	0,04%	0,09%	0,04%	0,05%	0,07%	0,04%	0,08%	0,06%	1,75%
9	0,02%	0,02%	0,03%	0,06%	0,03%	0,02%	0,02%	0,03%	0,05%	0,05%	7,00%
10	0,03%	0,03%	0,04%	0,05%	0,04%	0,04%	0,04%	0,04%	0,05%	0,04%	1,75%
11	0,24%	0,24%	0,26%	0,20%	0,14%	0,07%	0,06%	0,09%	0,16%	0,18%	3,50%
12	0,05%	0,05%	0,04%	0,05%	0,05%	0,06%	0,07%	0,05%	0,07%	0,05%	0,88%
13	0,11%	0,11%	0,15%	0,12%	0,08%	0,06%	0,09%	0,11%	0,14%	0,19%	3,50%
14	0,03%	0,03%	0,04%	0,04%	0,03%	0,04%	0,05%	0,03%	0,07%	0,05%	0,88%
15	0,02%	0,02%	0,02%	0,03%	0,02%	0,02%	0,02%	0,02%	0,05%	0,04%	3,50%
16	0,04%	0,04%	0,04%	0,04%	0,03%	0,04%	0,04%	0,04%	0,05%	0,04%	0,88%
17	0,13%	0,13%	0,20%	0,18%	0,15%	0,11%	0,11%	0,12%	0,16%	0,14%	2,50%
18	0,06%	0,06%	0,07%	0,06%	0,08%	0,07%	0,08%	0,07%	0,09%	0,07%	0,63%
19	0,10%	0,10%	0,15%	0,15%	0,13%	0,10%	0,07%	0,04%	0,05%	0,14%	2,50%
20	0,08%	0,08%	0,08%	0,08%	0,10%	0,07%	0,08%	0,09%	0,11%	0,08%	0,63%
21	0,03%	0,03%	0,03%	0,07%	0,04%	0,04%	0,03%	0,04%	0,05%	0,04%	2,50%
22	0,04%	0,04%	0,05%	0,07%	0,06%	0,06%	0,05%	0,06%	0,04%	0,05%	0,63%
23	0,09%	0,09%	0,10%	0,10%	0,13%	0,14%	0,13%	0,11%	0,08%	0,08%	1,00%
24	0,05%	0,05%	0,05%	0,06%	0,07%	0,06%	0,06%	0,06%	0,07%	0,06%	0,25%
25	0,04%	0,04%	0,03%	0,05%	0,03%	0,06%	0,07%	0,07%	0,06%	0,04%	1,00%
26	0,06%	0,06%	0,06%	0,08%	0,06%	0,07%	0,06%	0,06%	0,06%	0,06%	0,25%
27	0,02%	0,02%	0,03%	0,04%	0,02%	0,02%	0,02%	0,02%	0,02%	0,01%	1,00%
28	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,25%
29	0,07%	0,07%	0,07%	0,05%	0,04%	0,05%	0,08%	0,08%	0,08%	0,05%	1,00%
30	0,04%	0,04%	0,06%	0,05%	0,04%	0,06%	0,07%	0,05%	0,06%	0,06%	0,25%
31	0,03%	0,03%	0,05%	0,05%	0,03%	0,02%	0,03%	0,03%	0,03%	0,04%	1,00%
32	0,05%	0,05%	0,06%	0,08%	0,06%	0,06%	0,06%	0,06%	0,05%	0,06%	0,25%
33	0,02%	0,02%	0,03%	0,04%	0,03%	0,03%	0,03%	0,02%	0,03%	0,02%	1,00%
34	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,03%	0,04%	0,04%	0,25%
35	0,06%	0,06%	0,06%	0,06%	0,04%	0,04%	0,06%	0,06%	0,05%	0,03%	0,50%
36	0,04%	0,04%	0,07%	0,07%	0,06%	0,06%	0,07%	0,06%	0,05%	0,06%	0,13%
37	0,03%	0,03%	0,03%	0,06%	0,02%	0,04%	0,04%	0,03%	0,03%	0,02%	0,50%
38	0,05%	0,05%	0,08%	0,08%	0,06%	0,06%	0,07%	0,06%	0,05%	0,05%	0,13%
39	0,02%	0,02%	0,02%	0,03%	0,03%	0,03%	0,03%	0,02%	0,03%	0,02%	0,50%
40	0,04%	0,04%	0,04%	0,03%	0,04%	0,04%	0,04%	0,04%	0,03%	0,04%	0,13%
41	0,05%	0,05%	0,05%	0,05%	0,06%	0,05%	0,04%	0,04%	0,04%	0,04%	0,50%
42	0,05%	0,05%	0,07%	0,07%	0,07%	0,05%	0,07%	0,08%	0,07%	0,06%	0,13%
43	0,03%	0,03%	0,03%	0,04%	0,03%	0,04%	0,05%	0,05%	0,04%	0,02%	0,50%
44	0,06%	0,06%	0,08%	0,07%	0,08%	0,06%	0,07%	0,07%	0,07%	0,06%	0,13%
45	0,02%	0,02%	0,02%	0,03%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,50%
46	0,04%	0,04%	0,04%	0,03%	0,04%	0,04%	0,04%	0,04%	0,04%	0,03%	0,13%
47	0,04%	0,04%	0,04%	0,05%	0,05%	0,05%	0,03%	0,04%	0,06%	0,04%	0,50%
48	0,05%	0,05%	0,07%	0,08%	0,08%	0,06%	0,06%	0,08%	0,08%	0,07%	0,13%
49	0,03%	0,03%	0,03%	0,03%	0,03%	0,04%	0,04%	0,04%	0,03%	0,03%	0,50%
50	0,07%	0,07%	0,07%	0,08%	0,08%	0,07%	0,07%	0,07%	0,08%	0,08%	0,13%
THD	0,49%	0,49%	0,53%	0,53%	0,44%	0,41%	0,44%	0,43%	0,51%	0,51%	8,00%

Note: Limits showed corresponds to IEEE519.



Graphics of Current Harmonics



NOTE: The results of harmonics shown in percentage are expressed with respect to the nominal current.

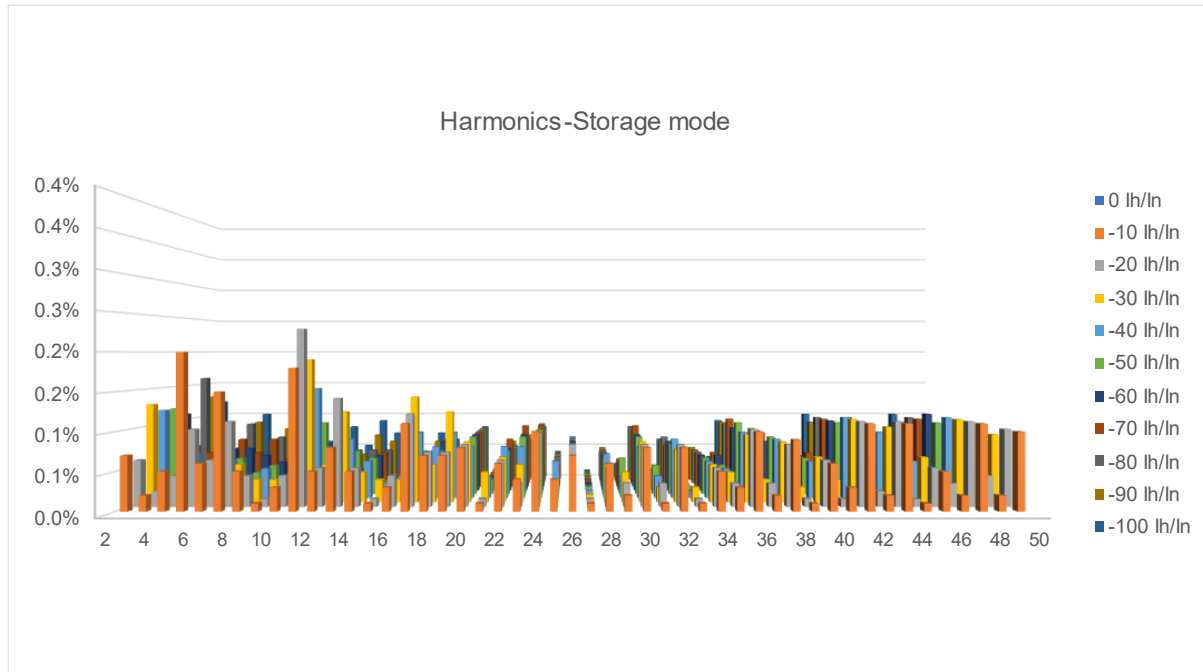
Storage mode

Pbin(%In)	10	20	30	40	50	60	70	80	90	100	Limits (%In)
Nr/Order	I _n (%In)										
2	0,07%	0,06%	0,13%	0,12%	0,12%	0,11%	0,06%	0,16%	0,13%	0,12%	1,75%
3	0,02%	0,02%	0,03%	0,03%	0,04%	0,03%	0,05%	0,07%	0,05%	0,04%	7,00%
4	0,05%	0,04%	0,04%	0,06%	0,04%	0,04%	0,04%	0,04%	0,04%	0,05%	1,75%
5	0,20%	0,10%	0,04%	0,03%	0,05%	0,06%	0,07%	0,09%	0,09%	0,10%	7,00%
6	0,06%	0,06%	0,05%	0,05%	0,05%	0,06%	0,05%	0,04%	0,05%	0,05%	1,75%
7	0,15%	0,11%	0,05%	0,02%	0,03%	0,05%	0,07%	0,07%	0,08%	0,10%	7,00%
8	0,05%	0,04%	0,03%	0,04%	0,04%	0,04%	0,04%	0,04%	0,04%	0,05%	1,75%
9	0,01%	0,01%	0,03%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	7,00%
10	0,03%	0,04%	0,03%	0,02%	0,03%	0,03%	0,03%	0,03%	0,03%	0,03%	1,75%
11	0,18%	0,23%	0,19%	0,15%	0,10%	0,07%	0,03%	0,04%	0,06%	0,08%	3,50%
12	0,05%	0,05%	0,05%	0,05%	0,06%	0,06%	0,05%	0,05%	0,04%	0,05%	0,88%
13	0,08%	0,14%	0,12%	0,08%	0,06%	0,03%	0,03%	0,05%	0,07%	0,09%	3,50%
14	0,05%	0,05%	0,04%	0,05%	0,05%	0,05%	0,05%	0,05%	0,06%	0,07%	0,88%
15	0,01%	0,01%	0,03%	0,02%	0,02%	0,02%	0,02%	0,02%	0,01%	0,02%	3,50%
16	0,03%	0,04%	0,03%	0,03%	0,03%	0,03%	0,03%	0,04%	0,04%	0,04%	0,88%
17	0,11%	0,12%	0,14%	0,09%	0,06%	0,05%	0,04%	0,05%	0,06%	0,07%	2,50%
18	0,07%	0,07%	0,05%	0,07%	0,06%	0,07%	0,07%	0,06%	0,06%	0,06%	0,63%
19	0,07%	0,07%	0,12%	0,09%	0,05%	0,04%	0,04%	0,04%	0,05%	0,05%	2,50%
20	0,08%	0,08%	0,08%	0,07%	0,08%	0,08%	0,08%	0,08%	0,08%	0,08%	0,63%
21	0,01%	0,01%	0,04%	0,03%	0,02%	0,02%	0,02%	0,02%	0,02%	0,02%	2,50%
22	0,06%	0,06%	0,06%	0,07%	0,06%	0,06%	0,07%	0,06%	0,06%	0,05%	0,63%
23	0,04%	0,03%	0,05%	0,07%	0,08%	0,08%	0,09%	0,07%	0,07%	0,06%	1,00%
24	0,10%	0,09%	0,09%	0,09%	0,09%	0,08%	0,09%	0,09%	0,08%	0,08%	0,25%
25	0,04%	0,02%	0,03%	0,05%	0,03%	0,01%	0,03%	0,04%	0,04%	0,04%	1,00%
26	0,07%	0,08%	0,07%	0,06%	0,07%	0,07%	0,06%	0,07%	0,06%	0,06%	0,25%
27	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	1,00%
28	0,06%	0,05%	0,05%	0,06%	0,05%	0,05%	0,05%	0,05%	0,05%	0,04%	0,25%
29	0,02%	0,03%	0,04%	0,03%	0,05%	0,04%	0,04%	0,03%	0,02%	0,02%	1,00%
30	0,08%	0,08%	0,08%	0,07%	0,08%	0,08%	0,09%	0,08%	0,08%	0,08%	0,25%
31	0,01%	0,03%	0,02%	0,03%	0,04%	0,03%	0,02%	0,02%	0,03%	0,03%	1,00%
32	0,08%	0,08%	0,07%	0,08%	0,07%	0,07%	0,06%	0,07%	0,06%	0,06%	0,25%
33	0,01%	0,01%	0,02%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	1,00%
34	0,05%	0,05%	0,05%	0,05%	0,05%	0,05%	0,05%	0,05%	0,05%	0,04%	0,25%
35	0,03%	0,03%	0,04%	0,04%	0,04%	0,05%	0,05%	0,04%	0,03%	0,02%	0,50%
36	0,10%	0,10%	0,09%	0,09%	0,10%	0,09%	0,10%	0,09%	0,09%	0,09%	0,13%
37	0,02%	0,03%	0,03%	0,02%	0,02%	0,02%	0,02%	0,01%	0,02%	0,02%	0,50%
38	0,09%	0,08%	0,08%	0,08%	0,08%	0,07%	0,08%	0,08%	0,08%	0,07%	0,13%
39	0,01%	0,01%	0,02%	0,02%	0,01%	0,01%	0,01%	0,01%	0,01%	0,01%	0,50%
40	0,06%	0,06%	0,06%	0,05%	0,05%	0,05%	0,05%	0,05%	0,05%	0,05%	0,13%
41	0,03%	0,01%	0,03%	0,04%	0,04%	0,04%	0,05%	0,04%	0,03%	0,02%	0,50%
42	0,11%	0,11%	0,11%	0,11%	0,10%	0,10%	0,10%	0,10%	0,09%	0,10%	0,13%
43	0,02%	0,02%	0,04%	0,03%	0,03%	0,02%	0,02%	0,03%	0,03%	0,03%	0,50%
44	0,11%	0,11%	0,10%	0,09%	0,09%	0,09%	0,09%	0,10%	0,08%	0,08%	0,13%
45	0,01%	0,01%	0,02%	0,02%	0,02%	0,02%	0,01%	0,02%	0,01%	0,01%	0,50%
46	0,05%	0,05%	0,06%	0,05%	0,05%	0,05%	0,05%	0,05%	0,04%	0,05%	0,13%
47	0,02%	0,03%	0,04%	0,02%	0,03%	0,03%	0,02%	0,03%	0,02%	0,02%	0,50%
48	0,11%	0,11%	0,11%	0,11%	0,10%	0,11%	0,10%	0,10%	0,09%	0,10%	0,13%
49	0,02%	0,04%	0,03%	0,03%	0,03%	0,04%	0,03%	0,04%	0,04%	0,04%	0,50%
50	0,10%	0,10%	0,09%	0,09%	0,09%	0,08%	0,09%	0,09%	0,08%	0,08%	0,13%
THD	0,51%	0,51%	0,49%	0,44%	0,42%	0,40%	0,39%	0,42%	0,41%	0,42%	8,00%

Note: Limits showed corresponds to IEEE519.



Graphics of Current Harmonics



NOTE: The results of harmonics shown in percentage are expressed with respect to the nominal current.

5.8. Capability of the EUT

Inverter mode:

PF fixed = 0,80 Inductive	P measured	P deviation	PF Measured	PF deviation Max ±2%
0,00± 5,00%	0,01%	-0,01%	-0,01	-
10,00± 5,00%	10,17%	-0,17%	-0,80	0,00
20,00± 5,00%	20,36%	-0,36%	-0,80	0,00
30,00± 5,00%	30,56%	-0,56%	-0,80	0,00
40,00± 5,00%	40,75%	-0,75%	-0,80	0,00
50,00± 5,00%	50,96%	-0,96%	-0,80	0,00
60,00± 5,00%	61,16%	-1,16%	-0,80	0,00
70,00± 5,00%	71,36%	-1,36%	-0,80	0,00
80,00± 5,00%	81,53%	-1,53%	-0,81	-0,01
90,00± 5,00%	91,26%	-1,26%	-0,91	-0,11(*)
100,00± 5,00%	100,42%	-0,42%	-1,00	-0,20(*)
PF fixed = 0,80 Capacitive	P measured	P deviation	PF Measured	PF deviation Max ±2%
0,00± 5,00%	0,01%	-0,01%	0,01	-
10,00± 5,00%	9,91%	0,09%	0,80	0,00
20,00± 5,00%	19,84%	0,16%	0,80	0,00
30,00± 5,00%	29,76%	0,24%	0,80	0,00
40,00± 5,00%	39,69%	0,31%	0,80	0,00
50,00± 5,00%	49,63%	0,37%	0,80	0,00
60,00± 5,00%	59,56%	0,44%	0,80	0,00
70,00± 5,00%	69,50%	0,50%	0,80	0,00
80,00± 5,00%	79,44%	0,56%	0,80	0,00
90,00± 5,00%	89,74%	0,26%	0,89	0,09(*)
100,00± 5,00%	100,42%	-0,42%	1,00	0,20(*)

(*) The EUT saturates by current.

Storage mode:

PF fixed = -0,80 Inductive	P measured	P deviation	PF Measured	PF deviation Max ±2%
0,00± 5,00%	-0,01%	0,01%	0,00	-
-10,00± 5,00%	-9,92%	-0,08%	-0,79	0,01
-20,00± 5,00%	-19,79%	-0,21%	-0,79	0,01
-30,00± 5,00%	-29,72%	-0,28%	-0,79	0,01
-40,00± 5,00%	-39,60%	-0,40%	-0,79	0,01
-50,00± 5,00%	-49,54%	-0,46%	-0,79	0,01
-60,00± 5,00%	-59,43%	-0,57%	-0,79	0,01
-70,00± 5,00%	-69,37%	-0,63%	-0,79	0,01
-80,00± 5,00%	-79,26%	-0,74%	-0,79	0,01
-90,00± 5,00%	-89,49%	-0,51%	-0,89	-0,09*
-100,00± 5,00%	-99,93%	-0,07%	-1,00	-0,20*
PF fixed = -0,80 Capacitive	P measured	P deviation	PF Measured	PF deviation Max ±2%
0,00± 5,00%	0,01%	-0,01%	--	-
-10,00± 5,00%	-9,92%	-0,08%	-0,79	0,01
-20,00± 5,00%	-20,16%	0,16%	-0,81	-0,01
-30,00± 5,00%	-30,29%	0,29%	-0,81	-0,01
-40,00± 5,00%	-40,36%	0,36%	-0,81	-0,01
-50,00± 5,00%	-50,50%	0,50%	-0,81	-0,01
-60,00± 5,00%	-60,58%	0,58%	-0,81	-0,01
-70,00± 5,00%	-70,70%	0,70%	-0,81	-0,01
-80,00± 5,00%	-80,79%	0,79%	-0,81	-0,01
-90,00± 5,00%	-90,61%	0,61%	-0,90	-0,10*
-100,00± 5,00%	-100,06%	0,06%	-1,00	-0,20*

(*) The EUT saturates by current.



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P-Q Capability

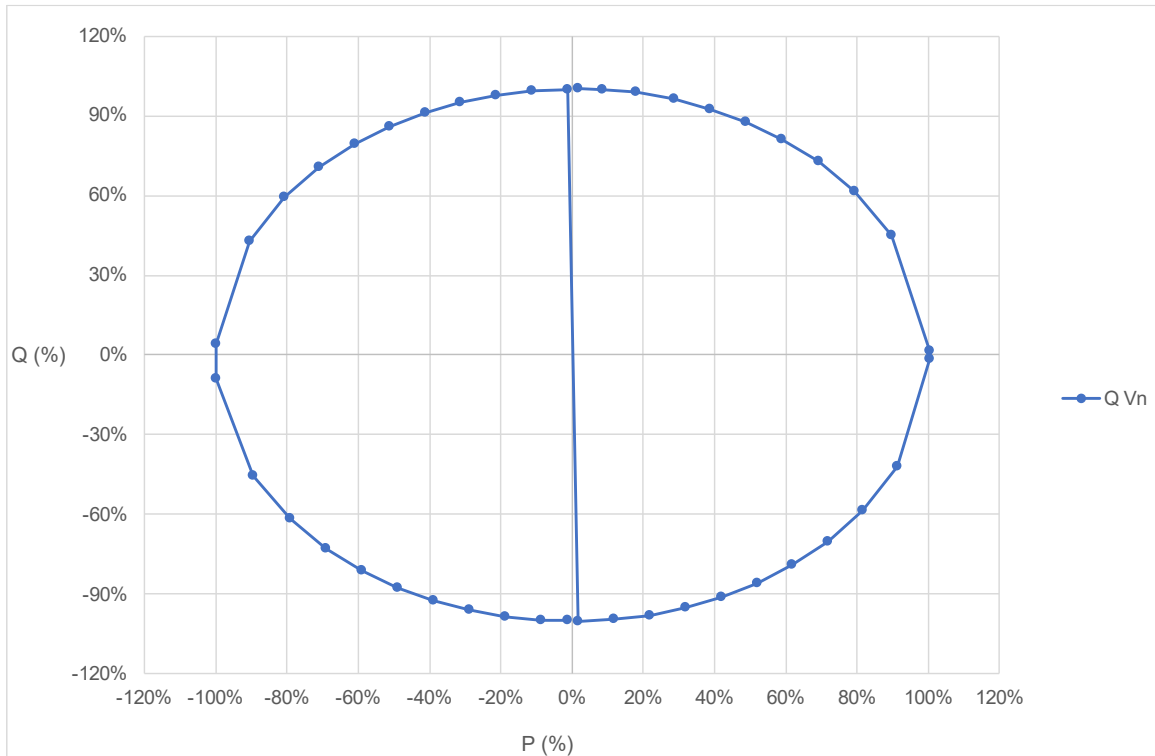
%Pn	P (kW)	Q (kVAr)	S (%Pn)	P (%Pn)	Q (%Pn)
0,00± 5,00%	31,50	1882,73	100,43%	1,68%	100,41%
10,00± 5,00%	157,33	1876,60	100,44%	8,39%	100,09%
20,00± 5,00%	334,92	1853,22	100,44%	17,86%	98,84%
30,00± 5,00%	535,76	1805,32	100,43%	28,57%	96,28%
40,00± 5,00%	725,43	1737,73	100,43%	38,69%	92,68%
50,00± 5,00%	912,33	1647,16	100,42%	48,66%	87,85%
60,00± 5,00%	1106,00	1523,83	100,42%	58,99%	81,27%
70,00± 5,00%	1297,06	1364,66	100,41%	69,18%	72,78%
80,00± 5,00%	1488,87	1152,01	100,40%	79,41%	61,44%
90,00± 5,00%	1682,65	843,87	100,39%	89,74%	45,01%
100,00± 5,00%	1882,33	31,58	100,40%	100,39%	1,68%
100,00± 5,00%	1882,56	-30,83	100,42%	100,40%	-1,64%
90,00± 5,00%	1710,86	-785,15	100,40%	91,25%	-41,87%
80,00± 5,00%	1528,46	-1099,72	100,42%	81,52%	-58,65%
70,00± 5,00%	1343,93	-1319,27	100,44%	71,68%	-70,36%
60,00± 5,00%	1158,45	-1485,18	100,46%	61,78%	-79,21%
50,00± 5,00%	972,43	-1613,02	100,45%	51,86%	-86,03%
40,00± 5,00%	785,60	-1711,76	100,45%	41,90%	-91,29%
30,00± 5,00%	598,51	-1785,72	100,45%	31,92%	-95,24%
20,00± 5,00%	410,87	-1838,22	100,46%	21,91%	-98,04%
10,00± 5,00%	223,02	-1870,19	100,45%	11,89%	-99,74%
0,00± 5,00%	34,57	-1883,40	100,47%	1,84%	-100,45%

Storage mode:

P-Q Capability					
%Pn	P (kW)	Q (kVAr)	S (%Pn)	P (%Pn)	Q (%Pn)
0,00± 5,00%	-24,89	1872,24	99,86%	-1,33%	99,85%
-10,00± 5,00%	-212,65	1866,24	100,18%	-11,34%	99,53%
-20,00± 5,00%	-399,18	1835,50	100,18%	-21,29%	97,89%
-30,00± 5,00%	-586,57	1784,71	100,19%	-31,28%	95,18%
-40,00± 5,00%	-772,58	1712,54	100,20%	-41,20%	91,34%
-50,00± 5,00%	-959,20	1615,58	100,21%	-51,16%	86,16%
-60,00± 5,00%	-1144,53	1490,26	100,22%	-61,04%	79,48%
-70,00± 5,00%	-1330,40	1327,33	100,23%	-70,95%	70,79%
-80,00± 5,00%	-1514,80	1113,05	100,25%	-80,79%	59,36%
-90,00± 5,00%	-1698,73	805,51	100,27%	-90,60%	42,96%
-100,00± 5,00%	-1875,75	80,17	100,13%	-100,04%	4,28%
-100,00± 5,00%	-1873,69	-167,36	100,33%	-99,93%	-8,93%
-90,00± 5,00%	-1677,99	-851,82	100,36%	-89,49%	-45,43%
-80,00± 5,00%	-1486,03	-1154,80	100,37%	-79,25%	-61,59%
-70,00± 5,00%	-1296,53	-1364,37	100,38%	-69,15%	-72,77%
-60,00± 5,00%	-1106,50	-1522,67	100,39%	-59,01%	-81,21%
-50,00± 5,00%	-918,12	-1643,25	100,39%	-48,97%	-87,64%
-40,00± 5,00%	-728,89	-1735,43	100,39%	-38,87%	-92,56%
-30,00± 5,00%	-540,94	-1802,89	100,39%	-28,85%	-96,15%
-20,00± 5,00%	-352,22	-1849,01	100,39%	-18,79%	-98,61%
-10,00± 5,00%	-165,09	-1875,05	100,39%	-8,80%	-100,00%
0,00± 5,00%	-22,80	-1876,31	100,08%	-1,22%	-100,07%



Graphic Q Capability



5.9. Active Power Control

Active Power Set Point	P measured (kW)	P Measured (%)	P dev (%)
100,00± 5,00%	1883,27	100,44%	-0,44%
90,00± 5,00%	1694,82	90,39%	-0,39%
80,00± 5,00%	1506,35	80,34%	-0,34%
70,00± 5,00%	1317,88	70,29%	-0,29%
60,00± 5,00%	1129,41	60,24%	-0,24%
50,00± 5,00%	941,08	50,19%	-0,19%
40,00± 5,00%	752,67	40,14%	-0,14%
30,00± 5,00%	564,31	30,10%	-0,10%
20,00± 5,00%	375,99	20,05%	-0,05%
10,00± 5,00%	187,75	10,01%	-0,01%
0,00± 5,00%	0,188	0,01%	-0,01%
-10,00± 5,00%	-187,04	-9,98%	0,02%
-20,00± 5,00%	-374,45	-19,97%	0,03%
-30,00± 5,00%	-561,97	-29,97%	0,03%
-40,00± 5,00%	-749,54	-39,98%	0,02%
-50,00± 5,00%	-937,15	-49,98%	0,02%
-60,00± 5,00%	-1124,75	-59,99%	0,01%
-70,00± 5,00%	-1312,38	-69,99%	0,01%
-80,00± 5,00%	-1500,05	-80,00%	0,00%
-90,00± 5,00%	-1687,71	-90,01%	-0,01%
-100,00± 5,00%	-1875,39	-100,02%	-0,02%

Power recovery time-Inverter				
Power recovery delay time (s)	Measured time (s)	Power Ramp Set	Registered time (s)	Calculated ramp
		%Pn/min		%Pmax/min
5	5,16	10,00%	603,62	9,94%
Power recovery time-Storage				
Power recovery delay time (s)	Measured time (s)	Power Ramp Set	Registered time (s)	Calculated ramp
		%Pn/min		%Pmax/min
0,00	0,20	-10,00	605,50	-9,92%

5.10. DC Current Injection

Not applicable due to the EUT is connected to a Medium Voltage isolated transformer.

5.11. Current Unbalances

Active Power Set Point	I max (A)	I min (A)	Active Power measured (%Pn)	I average (A)	Unbalances (%I)	Limit (%Vn)
100,00± 5,00%	1646,90	1645,70	100,44%	1646,65	0,07%	3%
90,00± 5,00%	1482,10	1481,10	90,39%	1481,90	0,07%	3%
80,00± 5,00%	1317,30	1316,50	80,34%	1317,10	0,06%	3%
70,00± 5,00%	1152,5	1151,80	70,29%	1152,32	0,06%	3%
60,00± 5,00%	987,80	987,10	60,24%	987,55	0,07%	3%
50,00± 5,00%	823,20	822,50	50,19%	822,91	0,09%	3%
40,00± 5,00%	659,20	657,60	40,14%	658,55	0,24%	3%
30,00± 5,00%	493,80	493,30	30,10%	493,50	0,10%	3%
20,00± 5,00%	329,10	328,70	20,05%	328,85	0,12%	3%
10,00± 5,00%	164,60	164,20	10,01%	164,35	0,24%	3%
-10,00± 5,00%	164,08	163,21	-9,98%	163,39	0,17%	3%
-20,00± 5,00%	327,80	326,73	-19,97%	327,09	0,11%	3%
-30,00± 5,00%	491,43	490,54	-29,97%	490,88	0,10%	3%
-40,00± 5,00%	655,08	654,41	-39,98%	654,70	0,09%	3%
-50,00± 5,00%	818,95	818,20	-49,98%	818,54	0,09%	3%
-60,00± 5,00%	982,49	982,24	-59,99%	982,35	0,08%	3%
-70,00± 5,00%	1146,33	1146,09	-69,99%	1146,20	0,09%	3%
-80,00± 5,00%	1310,18	1309,93	-80,00%	1310,05	0,08%	3%
-90,00± 5,00%	1474,00	1473,80	-90,01%	1473,88	0,07%	3%
-100,00± 5,00%	1637,89	1637,63	-100,02%	1637,73	0,08%	3%

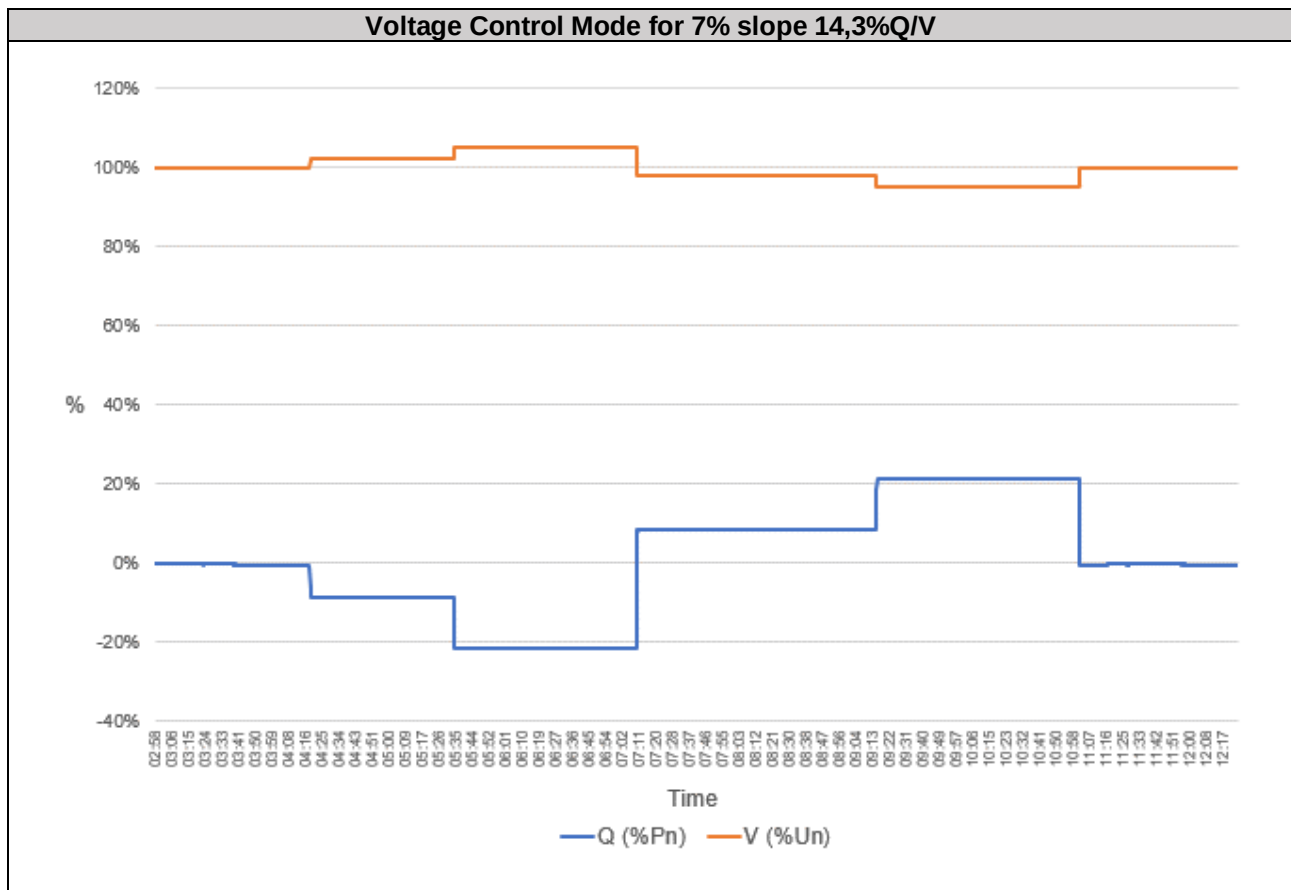
Note: I min and I max correspond to the minimum and maximum value measured of the three phases per each power level. I average corresponds to the average value of the three phases for every power level.

Note 2: The unbalance limit value showed in the table corresponds with the requirement expressed within the standard under study for power plants connected to 33kV or higher values. The table shows the current unbalance contribution of the equipment under study.



5.12. Q vs V

Voltage Control Mode for 7% slope 14,3%Q/V							
U in GCP [pu]	U Setpoint [pu]	Q (%Pmax)	Q min (Q/Pmax)	t1	t1 máx ≤	t2	t2 máx ≤
		measured		measured		measured	
1,00	1,00	-0,56%	0% ± 1,5%	-	-	-	-
1,02	1,00	-8,97%	-8,57% ± 1,5%	0,20	1,00 s	0,20	5,00 s
1,05	1,00	-21,77%	-21,43% ± 1,5%	0,20	1,00 s	0,50	5,00 s
0,98	1,00	8,33%	8,57% ± 1,5%	0,20	1,00 s	0,60	5,00 s
0,95	1,00	21,16%	21,43% ± 1,5%	0,70	1,00 s	0,70	5,00 s
1,00	1,00	0,74%	0% ± 1,5%	0,30	1,00 s	0,30	5,00 s

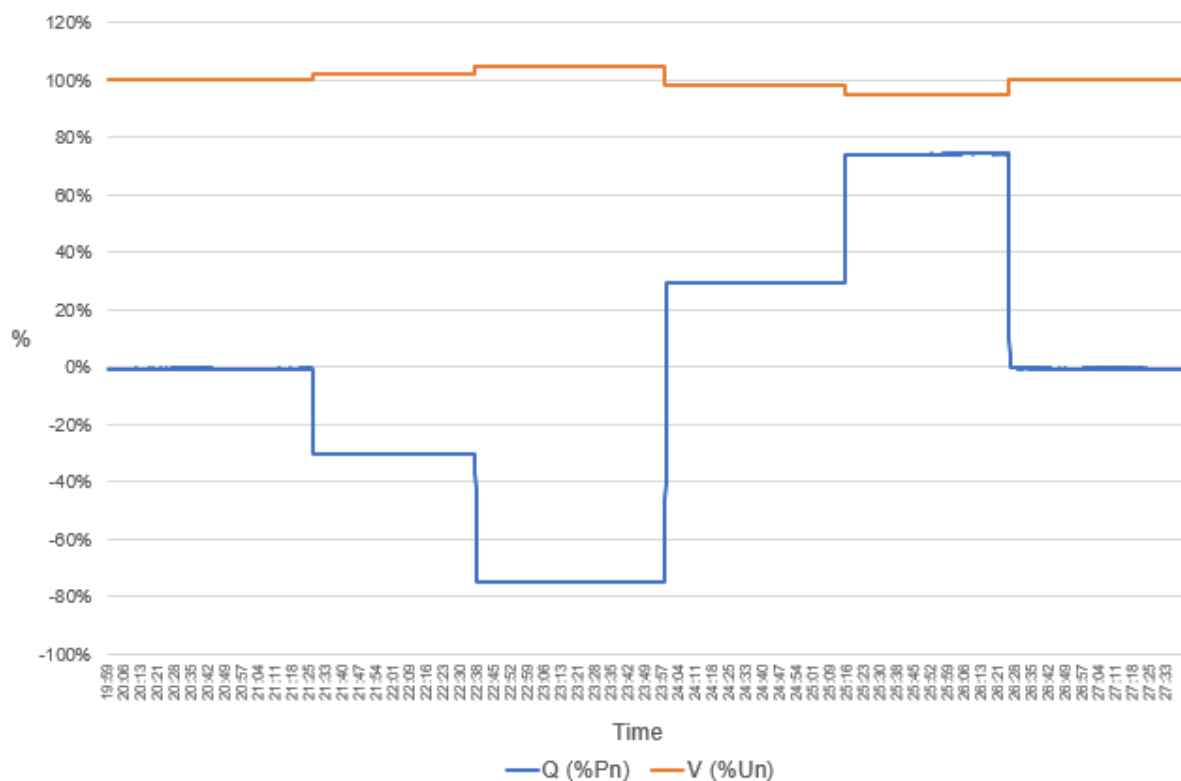




Voltage Control Mode for 2% slope 50%Q/V

U in GCP [pu]	U Setpoint [pu]	Q (%Pmax)	Q min (Q/Pmax)	t1	t1 máx ≤	t2	t2 máx ≤
		measured		measured		measured	
1,00	1,00	-0,63%	0% ± 1,5%	-	-	-	-
1,02	1,00	-30,45%	-30% ± 1,5%	0,35	1,00 s	0,50	5,00 s
1,05	1,00	-75,24%	-75% ± 1,5%	0,50	1,00 s	0,65	5,00 s
0,98	1,00	29,52%	30% ± 1,5%	1,00	1,00 s	1,25	5,00 s
0,95	1,00	74,50%	75% ± 1,5%	0,45	1,00 s	0,60	5,00 s
1,00	1,00	-0,61%	0% ± 1,5%	0,70	1,00 s	0,75	5,00 s

Voltage Control Mode for 2% slope 50%Q/V



6. PICTURES



7. ELECTRICAL SCHEME

