

**TESTING FOR THE VERIFICATION OF
COMPLIANCE OF PV INVERTER WITH :
UNE 206007-1 IN: 2013, REQUISITOS DE CONEXIÓN
A LA RED ELÉCTRICA.
PARTE 1: INVERSORES PARA CONEXIÓN A LA
RED DE DISTRIBUCIÓN
(MAYO 2013)**

Protocol. PE.T-LE-62

Test Report Number.....: 2219-0185-G
 Type.....: Solar Grid-tied Inverter (Single Phase)
 Tested Model: SOFAR 2700TL-G3
 Variants Models: SOFAR 3000TL-G3, SOFAR 3300TL-G3
 SOFAR 2200TL- G3, SOFAR 1600TL-G3, SOFAR 1100TL-G3

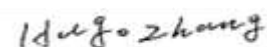
APPLICANT

Name.....: SGS Tecnos S.A. (Certification Body)
 Address.....: C/ Trespaderne, 29 - Edificio Barajas 1
 28042 MADRID (Spain)
 Hired by: Shenzhen SOFAR SOLAR Co., Ltd.
 Address.....: 401, Building 4, AnTongDa Industrial Park, District 68,
 XingDong Community, XinAn Street, BaoAn District,
 Shenzhen City, Guangdong Province, P.R. China

TESTING LABORATORY

Name.....: SGS Tecnos, S.A. (Electrical Testing Laboratory)
 Address.....: C/ Trespaderne, 29 - Edificio Barajas 1
 28042 Madrid (Spain)

Conducted (tested) by: Hugo Zhang
 (Project Engineer)
 Roger Hu
 (Project Engineer)




Reviewed & Approved by: Jacobo Tevar
 (Technical Reviewer)

Date of issue: 18/03/2020

Number of pages: 56

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- Unless otherwise stated the results shown in this test report refer only to the sample(s) tested as received. **Information of derived or extension models of the range as provided by the applicant, (if any), is included in this report only for informative purposes.** The Company SGS shall not be liable for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided by Client. This document cannot be reproduced except in full, without prior approval of the Company.

Test Report Historical Revision:

Test Report Version	Date	Resume
2219-0185-G	18/03/2020	First issuance

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1 SCOPE

SGS Tecnos, S.A. (Electrical Testing Laboratory) has been contracted by SGS Tecnos, S.A. (Certification body), in order to perform the testing according the following standard: "UNE 206007-1 IN, Requisitos de conexión a la red eléctrica. Parte 1: Inversores para conexión a la red de distribución" (mayo 2013).

2 GENERAL INFORMATION

2.1 Testing Period and Climatic conditions


The necessary testing has been performed along 11 working days between the 29th of October of 2019 and the 27^h of February of 2020.

All the tests and checks have been performed in accordance with the reference Standard (the tests are done at ≈ 25 °C).

SITE TEST

Name.....: Shenzhen SOFAR SOLAR Co., Ltd.
 Address: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen City, Guangdong Province, P.R. China

2.2 Equipment under Testing

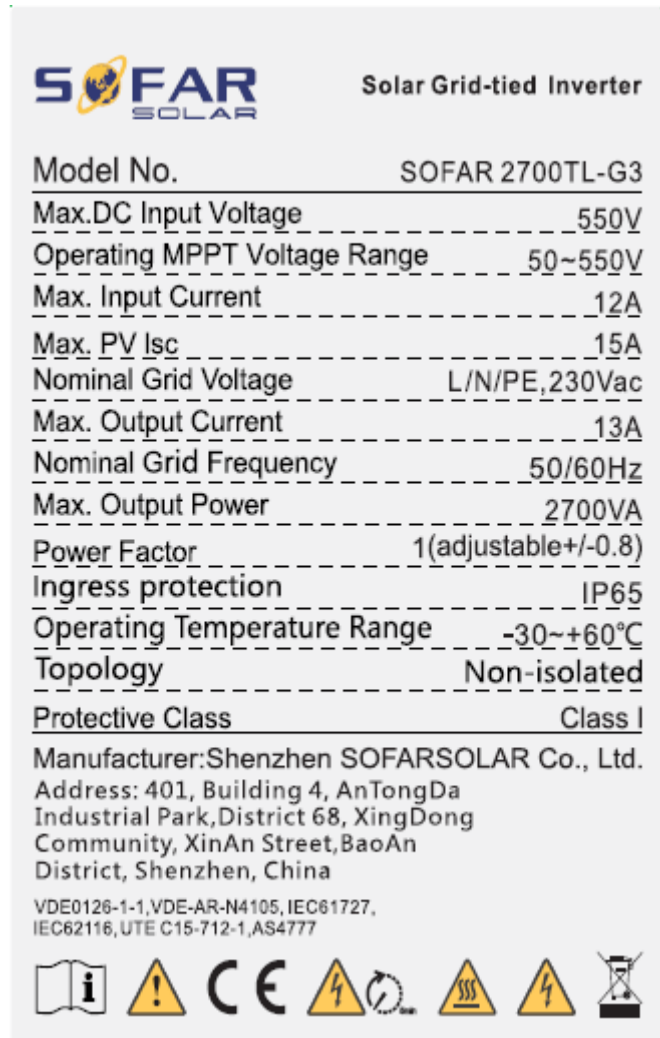
Apparatus type/ Installation: Solar Grid-tied Inverter (Single phase) / Fix installed
 Manufacturer/ Supplier/ Installer.....: Shenzhen SOFAR SOLAR Co., Ltd.
 Trade mark: 
 Model/ Type.....: SOFAR 2700TL-G3
 Serial Number.....: ZA3ES133K95156
 Serial Number ESE.....: SA3ES133K5K004
 Software Version.....: V2.1
 Rated Characteristics.....: DC input: 50-550V Max.12A
 AC output: 230Vac, 50Hz, 11.8A(Max.13A),2700VA

Date of manufacturing: 2019

Test item particulars

Input: DC
 Output.....: AC
 Class of protection against electric shock: Class I
 Degree of protection against moisture: IP 65
 Type of connection to the main supply: Single phase - Fixed installation
 Cooling group: Heating Sink
 Modular: No
 Internal Transformer.....: No

Copy of marking plate (representative):



Note:

1. The above markings are the minimum requirements required by the safety standard. For the final production samples, the additional markings which do not give rise to misunderstanding may be added.
2. Label is attached on the side surface of enclosure and visible after installation
3. Labels of other models are as the same with SOFAR 2700TL-G3's except the parameters of rating.

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Tested model:

- SOFAR 2700TL-G3

The variants models are:

- SOFAR 3300TL-G3
- SOFAR 3000TL-G3
- SOFAR 2200TL-G3
- SOFAR 1600TL-G3
- SOFAR 1100TL-G3

The parameter of each model as following:

Model Number	SOFAR 3300TL-G3	SOFAR 3000TL-G3	SOFAR 2700TL-G3	SOFAR 2200TL-G3	SOFAR 1600TL-G3	SOFAR 1100TL-G3
Max. input voltage	550Vd.c.			500Vd.c		
Max. input current	12Ad.c.	12Ad.c.	12Ad.c.	12Ad.c.	12Ad.c.	12Ad.c.
Operating MPPT voltage range	50-550Vd.c.			50-500Vd.c.		
Full load DC Voltage Range	300-500 Vd.c.	275-500 Vd.c.	250-500 Vd.c.	200-450 Vd.c.	150-450 Vd.c.	110-450 Vd.c.
Rated voltage	360V					
Rated grid voltage	230Va.c.					
Rated grid frequency	50Hz					
Rated output power	3.3kW	3.0kW	2.7kW	2.2kW	1.6kW	1.1kW
Rated output current	14.3Aa.c.	13 Aa.c.	11.8Aa.c.	9.6Aa.c.	7Aa.c.	4.8Aa.c.
Max. Output Current	16Aa.c.	14.5 Aa.c.	13Aa.c.	10.6Aa.c.	7.7Aa.c.	5.3Aa.c.
Power factor	0.8 leading to 0.8 lagging					
Ambient temperature	-30 °C ~60°C					
Ingress protection	IP65					
Protective class	Class I					

The variants models have been included in this test report without tests because the following features don't change regarding to the tested model:

- Same connection system and hardware topology
- Same control algorithm.
- Output power within 2.5 and 2/3 of the rated power output of the EUT.
- Same Firmware Version

The results obtained apply only to the particular sample tested that is the subject of the present test report. The most unfavorable result values of the verifications and tests performed are contained herein. Throughout this report a point (comma) is used as the decimal separator.

2.3 Test Equipment List

Equipment use from 2019/10/29 to 2019/12/30

From	No.	Equipment Name	Model No.	Equipment No.	Calibration Date	Equipment calibration due date
Sofar Solar	1	Digital oscilloscope	Keysight / DS05014A	MY50070266	2019-02-13	2020-02-12
	2	Voltage probe	SanHua / SI-9110	111541	2019-02-13	2020-02-12
	3	Voltage probe	SanHua / SI-9110	152627	2019-02-13	2020-02-12
	4	Voltage probe	SanHua / SI-9110	111134	2019-02-13	2020-02-12
	5	Power analyzer	Yokogawa / WT3000	91N610888	2019-02-13	2020-02-12
	6	Current probe	Fluke / i1000s	29503223	2019-02-13	2020-02-12
	7	Current probe	Fluke / i1000s	30413448	2019-02-13	2020-02-12
	8	Current probe	CA / CP5150	C150150008	2019-02-13	2020-02-12
	9	Temperature & Humidity meter	Anymeters / TH101B	201030245220	2019-02-13	2020-02-12
	10	Temperature & Humidity Chamber	HGTP-225R	HG13030801	2019-02-13	2020-02-12
SGS	11	True RMS Multimeter	Fluke / 289C	GZE012-53	2019-02-26	2020-02-25

Equipment use from 2020/02/21 to 2020/02/27

From	No.	Equipment Name	Model No.	Equipment No.	Calibration Date	Equipment calibration due date
Sofar Solar	1	Digital oscilloscope	Keysight / DS05014A	MY57231269	2020-01-14	2021-01-13
	2	Voltage probe	SanHua / SI-9110	111152	2020-01-14	2021-01-13
	3	Voltage probe	SanHua / SI-9110	152627	2020-01-14	2021-01-13
	4	Voltage probe	SanHua / SI-9110	111134	2020-01-14	2021-01-13
	5	Power analyzer	Yokogawa / WT3000	91N610888	2020-01-14	2021-01-13
	6	Current probe	CYBERTEK/ CP1000A	C181000922	2020-01-14	2021-01-13
	7	Current probe	CYBERTEK/ CP1000A	C181000925	2020-01-14	2021-01-13
	8	Current probe	CYBERTEK/ CP1000A	C181000929	2020-01-14	2021-01-13
	9	Temperature & Humidity meter	Anymeters / TH101B	201030245220	2020-01-14	2021-01-13

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SGS	10	True RMS Multimeter	Fluke / 187	GZE012-8	2019-12-05	2020-12-04
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2.4 Factory information

Manufacturer Name : Dongguan SOFAR SOLAR Co.Ltd.

Manufacturer Address..... : 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City, Guangdong Province, P.R. China.

2.5 Measurement Uncertainty

	Voltage measurement uncertainty	±1.5 %
	Current measurement uncertainty	±2.0 %
	Frequency measurement uncertainty	±0.2 %
	Time measurement uncertainty	±0.2 %
	Power measurement uncertainty	±2.5 %
	Phase Angle	±1°
	cosφ	±0.01

Note1: Measurements uncertainties showed in this table are maximum allowable uncertainties. The measurement uncertainties associated with other parameters measured during the tests are in the laboratory at disposal of the solicitant.

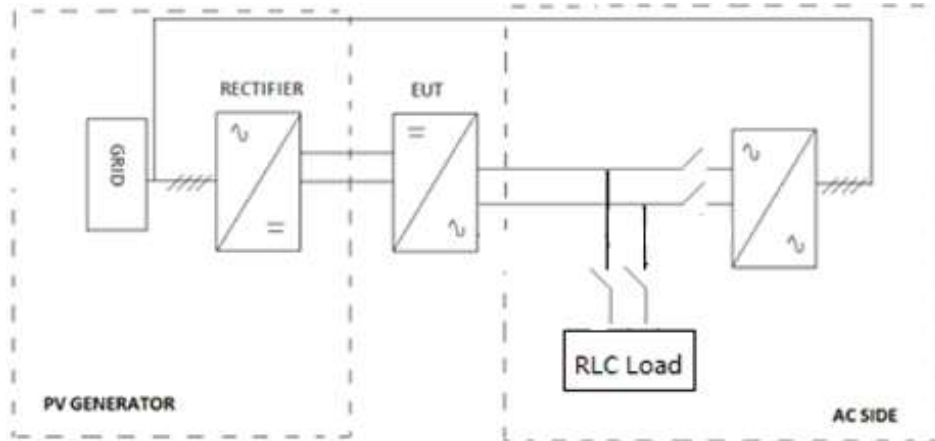
Note2: Where the standard requires lower uncertainties that those in this table. Most restrictive uncertainty has been considered.

2.6 Definitions

ESE	Auxiliary inverter	P _n	Nominal Power
EUT	Equipment under testing	Q _f	Quality factor
I _n	Nominal Current	UF	Under frequency
OF	Over frequency	U _n	Nominal Voltage
OV	Over voltage	UV	Under voltage

2.7 Test set up.

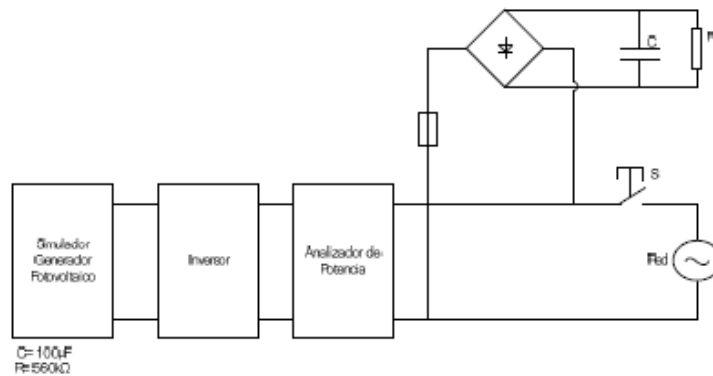
Below is the simplified construction of the test set up.



Current and voltage clamps have been connected to the inverter output for all the tests.

All the tests and checks have been performed in accordance with the reference Standard as specified previously. The used quality factor of resonant load was $Q_f=2$.

For overvoltage generation test, the following test set up has been done.



The test bench used includes:

EQUIPMENT	MARK / MODEL	RATED CHARACTERISTICS	OWNER / ID.CODE
AC source	Kwell / AFG-S-33800	Voltage: 0-600 V 750KVA	Sofar solar / EP-026
PV source	Kwell / TVS-630kW	Voltage: 0 - 1000 V 630kW	Sofar solar / EP-027

3 RESUME OF TEST RESULTS

INTERPRETATION KEYS

- Test object does meet the requirement..... : **P** Pass
- Test object does not meet the requirement..... : **F** Fails
- 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 realized..... : **N/R** Not realized

STANDARD SECTION	STANDARD REQUIREMENTS	
	UNE 206007-1 IN: 2013	
5	Technical requirements	
5.1	Limitation of the DC injection into the grid side	P
5.2	Requirements base on inverter isolation and array grounding	N/R
5.3	Fault tolerance of residual current monitoring	N/R
5.4	Frequency and Voltage trip limits and trip times	P
5.5	Self-reconnection	P
5.6	Unintentional islanding	P
5.7	Overvoltage generation	P
5.8	Grid quality	P
5.9	Reconnection out of synchronism	P

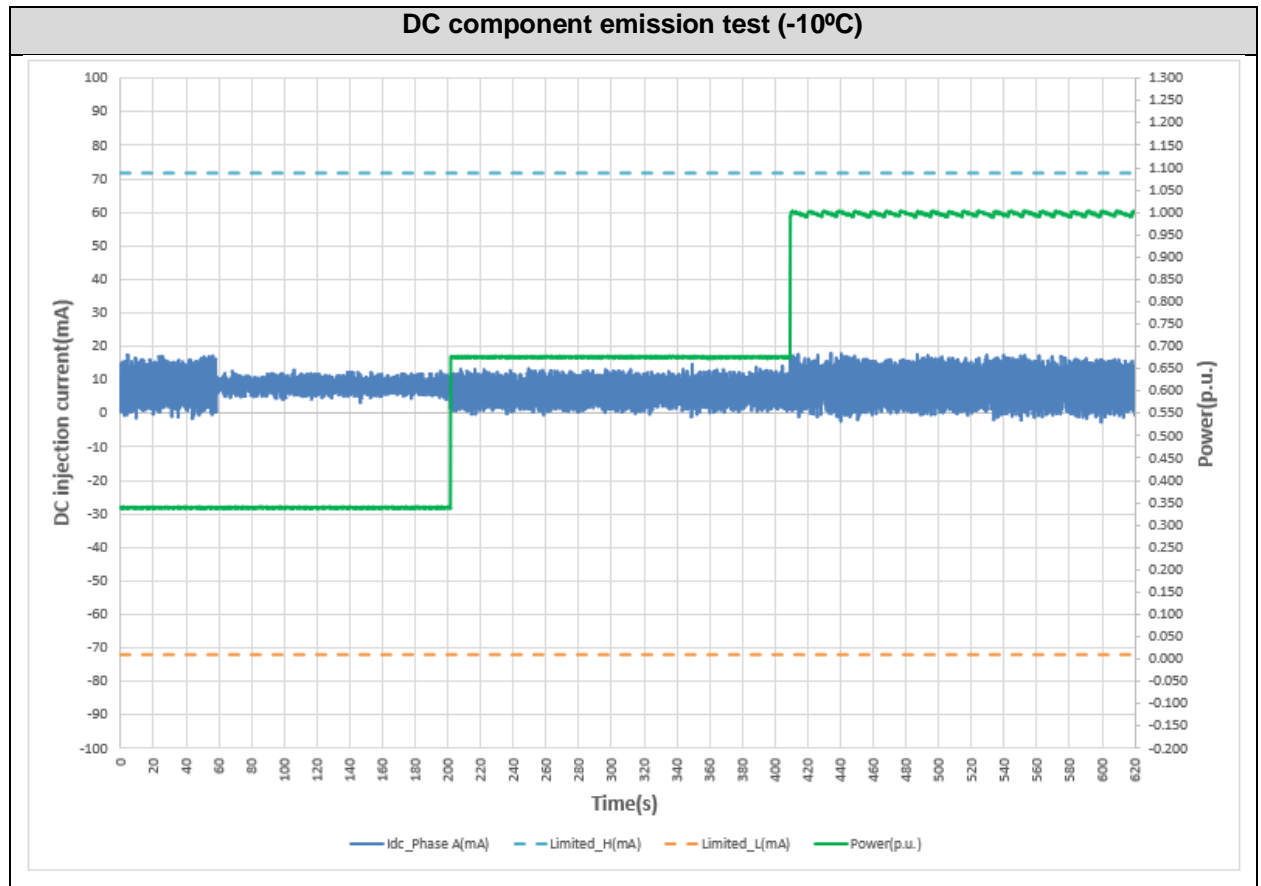
Note: The declaration of conformity has been evaluated taking into account the IEC Guide 115.

4 TEST RESULTS

4.1 LIMITATION OF DC INJECTION

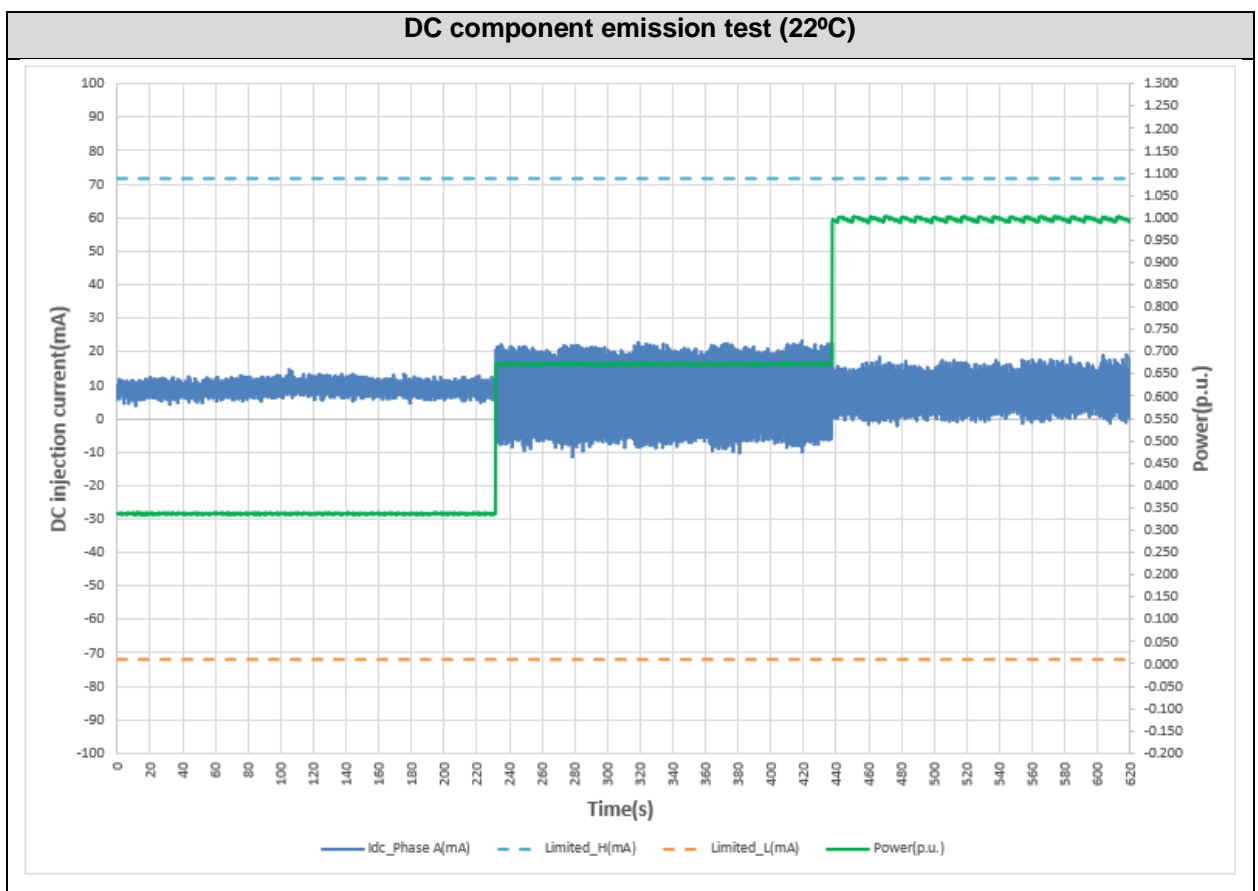
The verification of DC component emission test has been measured according to the chapter 5.1 of the standard. DC current injection shall be $\leq 0.5\%I_n$ which is 72 mA.

DC component emission test (-10°C)			
Power Lever	Min ~ 33%	Medium ~ 66%	Max ~ 100%
Watt(W)	1117	2230	3289
Vrms(V)	230.6	231.0	231.3
Arms(A)	4.9	9.7	14.2
PF	0.998	0.998	0.999
d.c.(mA)	17.6	14.6	18.0
d.c(% In)	0.02	0.02	0.03



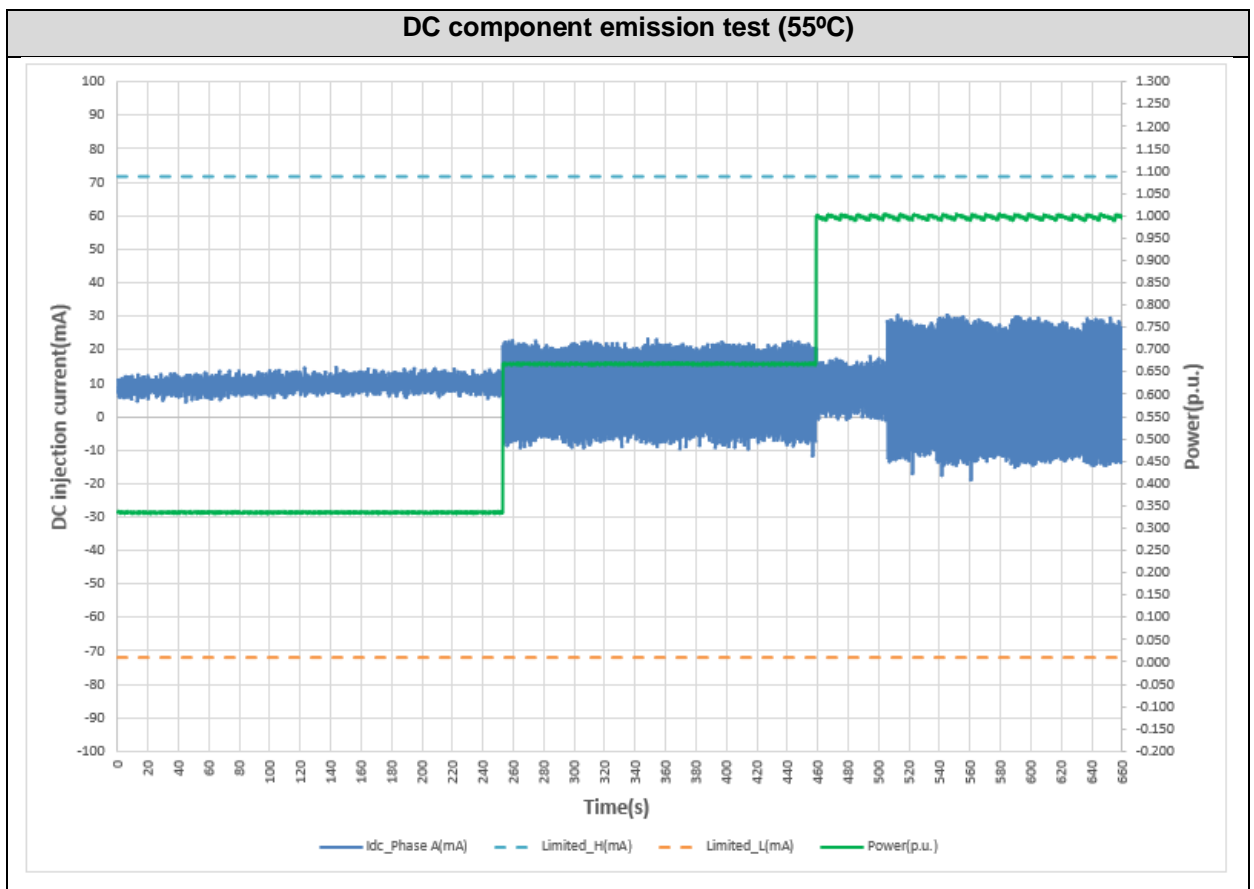
UNE 206 007-1 IN: 2013

DC component emission test (22°C)			
Power Lever	Min ~ 33%	Medium ~ 66%	Max ~ 100%
Watt(W)	1111	2216	3288
Vrms(V)	230.6	231.0	231.3
Arms(A)	4.8	9.6	14.2
PF	0.998	0.999	0.999
d.c.(mA)	14.6	23.2	14.6
d.c.(% In)	0.02	0.03	0.02



UNE 206 007-1 IN: 2013

DC component emission test (55°C)			
Power Lever	Min ~ 33%	Medium ~ 66%	Max ~ 100%
Watt(W)	1105	2204	3289
Vrms(V)	230.7	231.0	231.2
Arms(A)	4.8	9.6	14.2
PF	0.998	0.999	0.999
d.c.(A)	14.8	23.2	14.8
d.c.(% In)	0.02	0.03	0.02



4.2 REQUIREMENTS BASE ON THE INVERTER ISOLATION AND ARRAY GROUNDING

According to article 5.2 the inverter should not start unless the resistance between ground and PV input terminal is higher than the required insulation resistance.

This test has been done according to the standard IEC 62109-2:2011-04, Clause 4.8.2

The compliances with these requirements are stated in Attachment 1 section 4.8.2 of following test report:

- IEC 62109-2:2011 Test Report no BL-SZ1930601-B01
Date on 2019/08/29 which issued by Shenzhen BALUN Technology Co., Ltd.

4.3 DETECTION OF RESIDUAL CURRENT MONITORING IN THE PV

This test is required according to the article 5.3 of the standard.

This test has been done according to the standard IEC 62109-2:2011-04, Clause 4.8.3

The compliances with these requirements are stated in Attachment 1 section 4.8.3 of following test report:

- IEC 62109-2:2011 Test Report no BL-SZ1930601-B01
Date on 2019/08/29 which issued by Shenzhen BALUN Technology Co., Ltd.

4.4 FREQUENCY AND VOLTAGE TRIP LIMITS AND TRIP TIMES

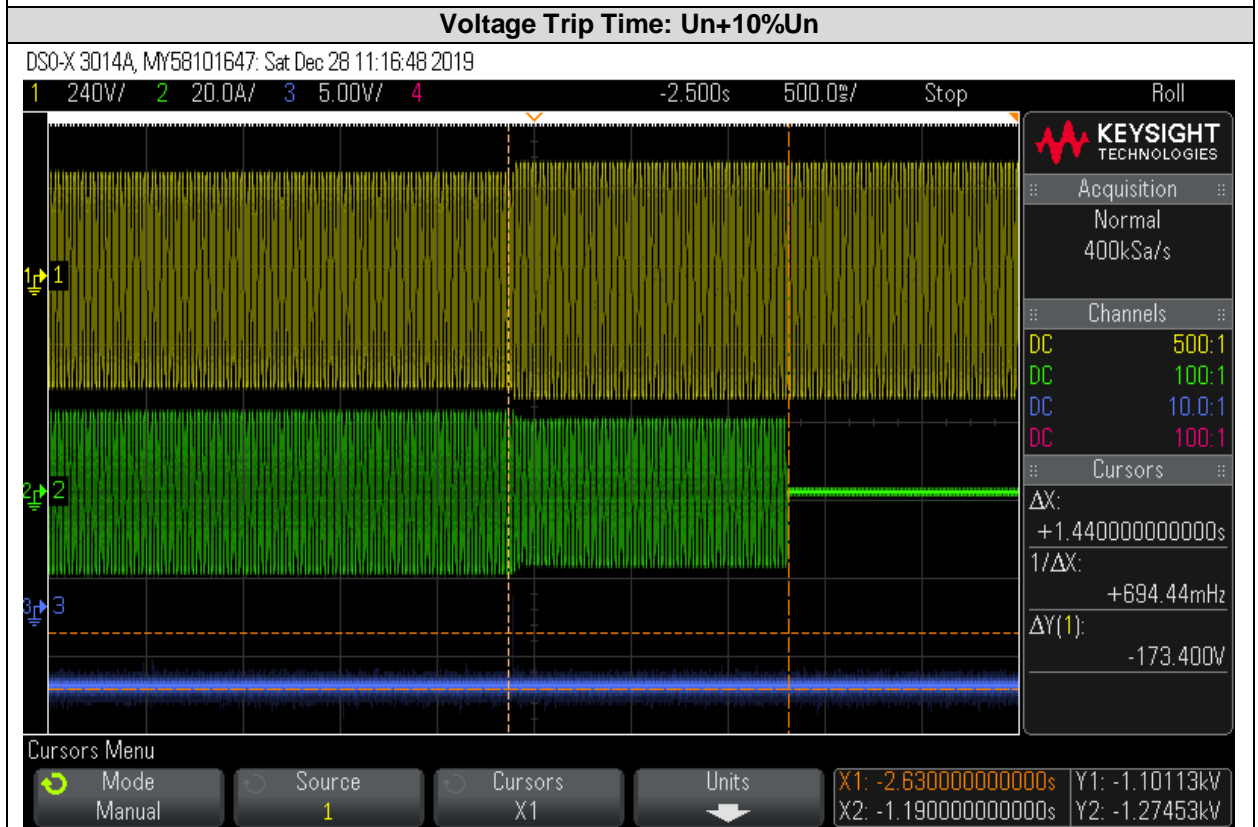
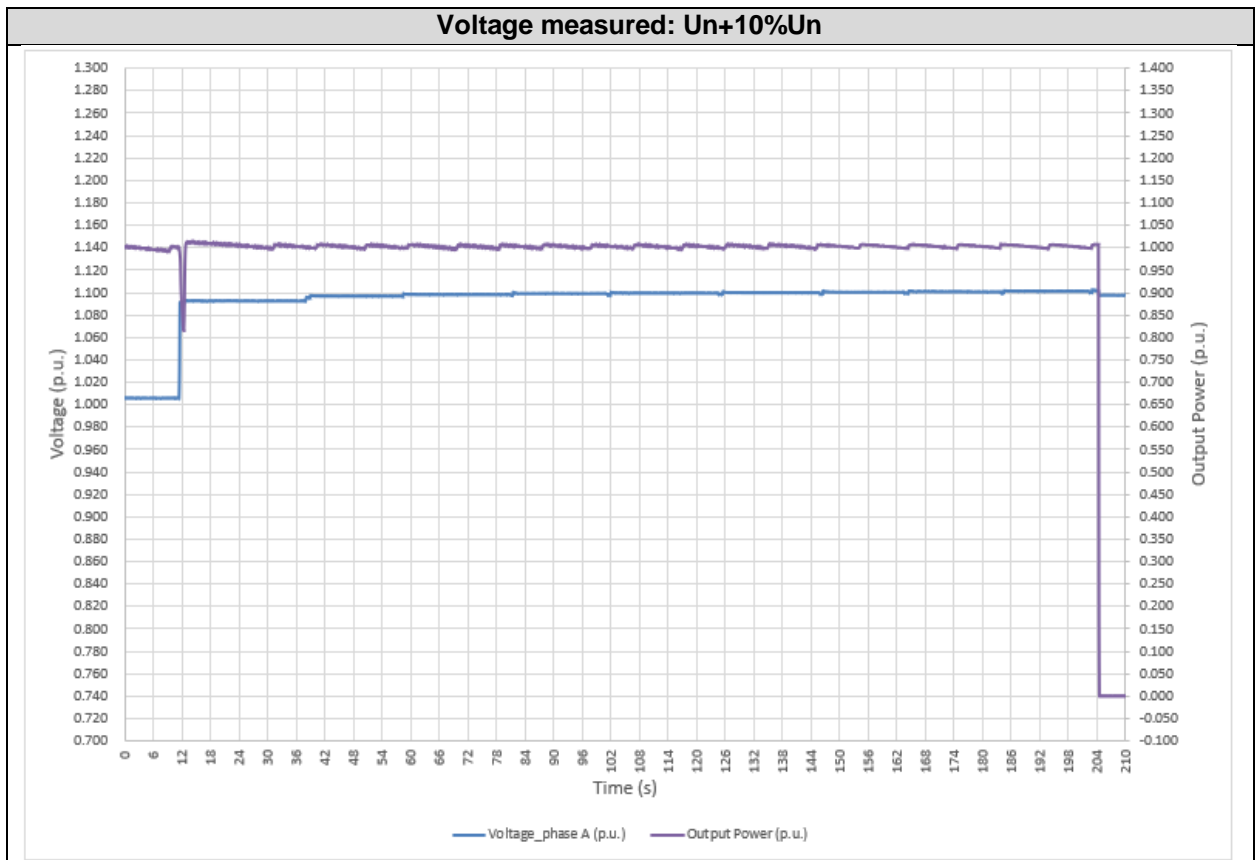
Abnormal conditions tests have been performed according to ranges and requirements stated in point 5.4 of the standard.

Thresholds stated in the Real Decreto 1699/2011 have been considered.

4.4.1 Voltage

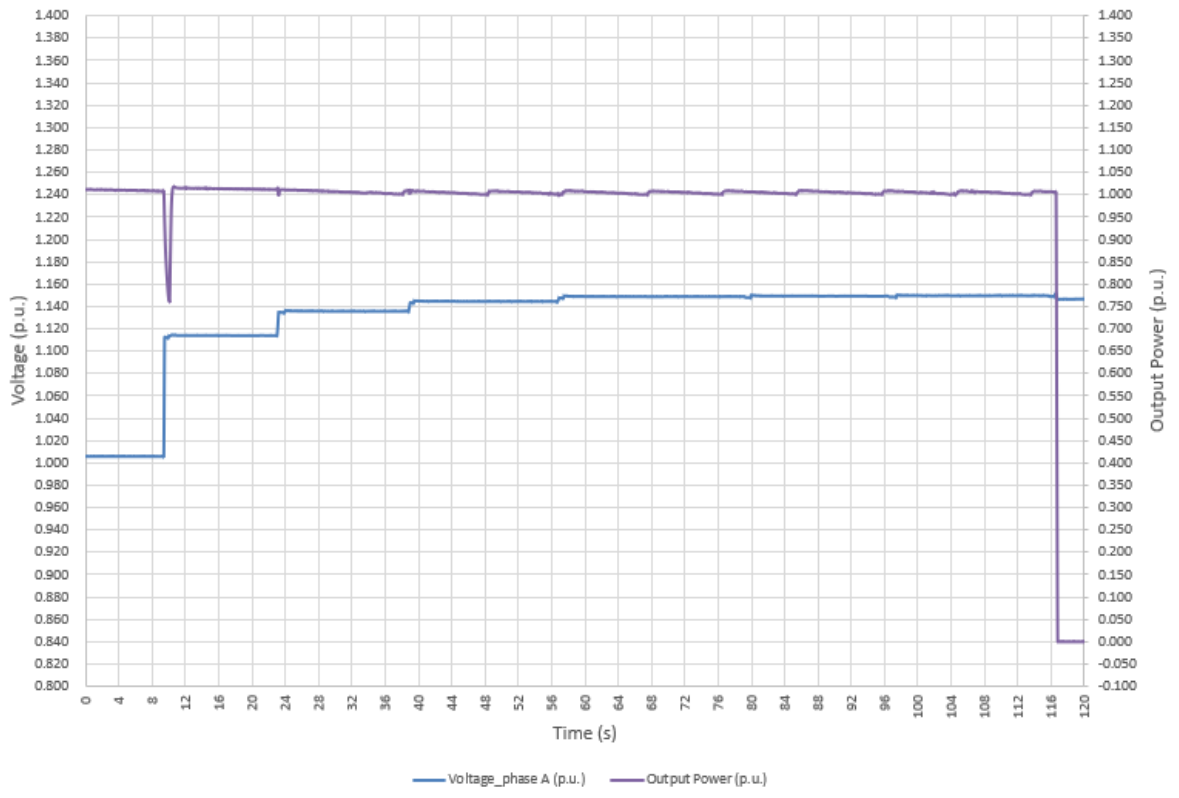
Setting Voltage	Measured Voltage (p.u.)	Disconnection time limits (s)	Disconnection time measured (s)
Un+10%Un	1.098	1.5	1.440
Un+15%Un	1.148	0.2	0.184
Un-15%Un	0.848	1.5	1.440

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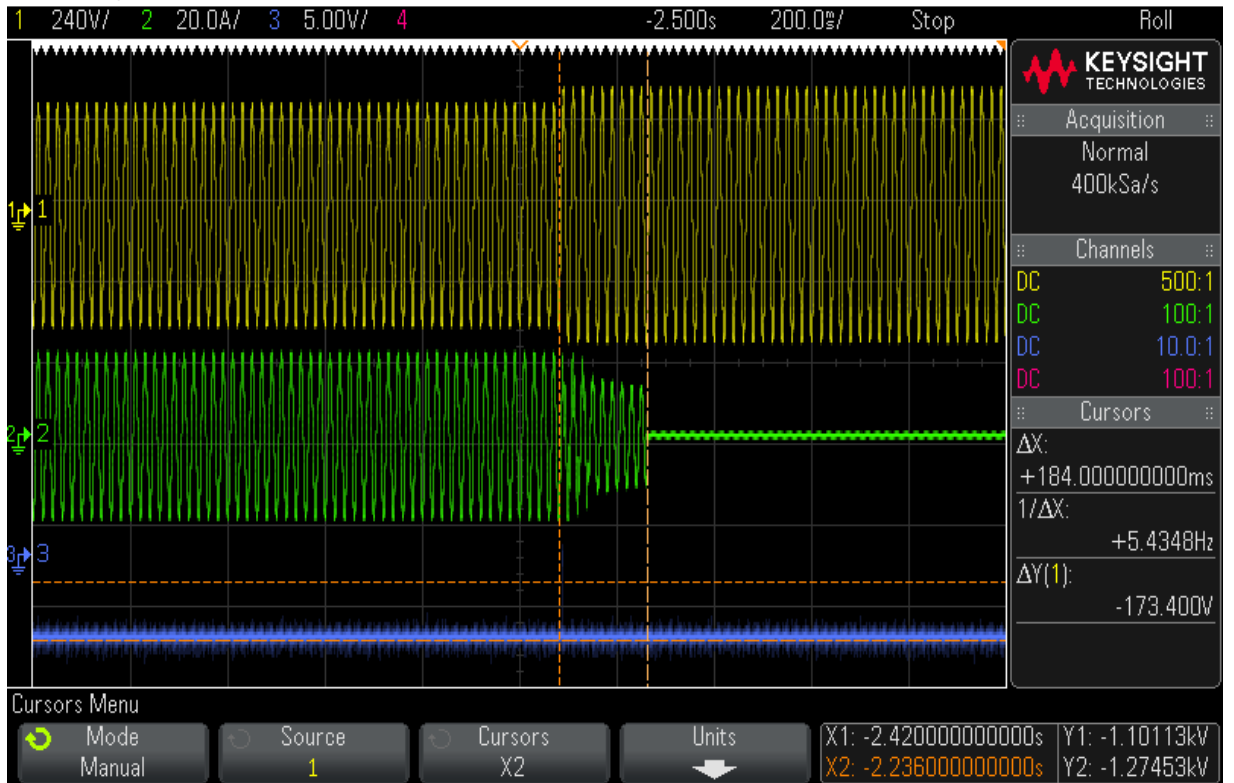
UNE 206 007-1 IN: 2013

Voltage measured: Un+15%Un



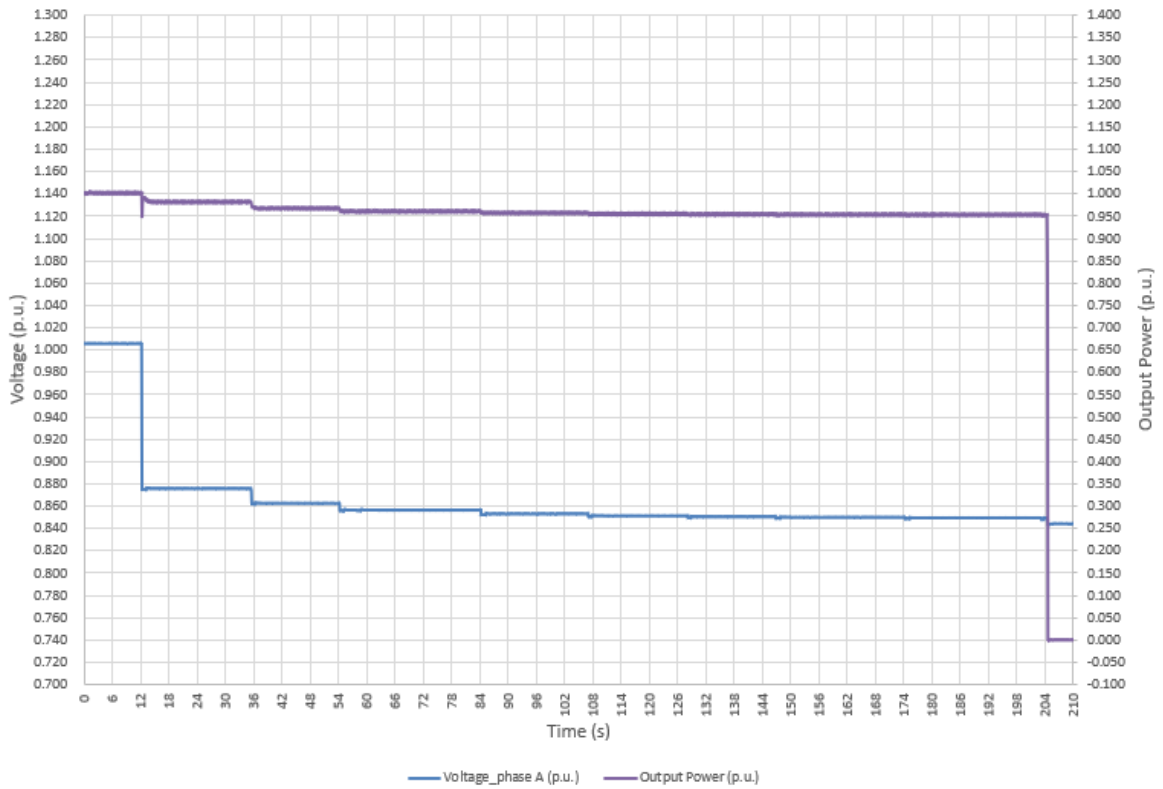
Voltage Trip Time: Un+15%Un

DSO-X 3014A, MY58101647: Sat Dec 28 11:18:43 2019



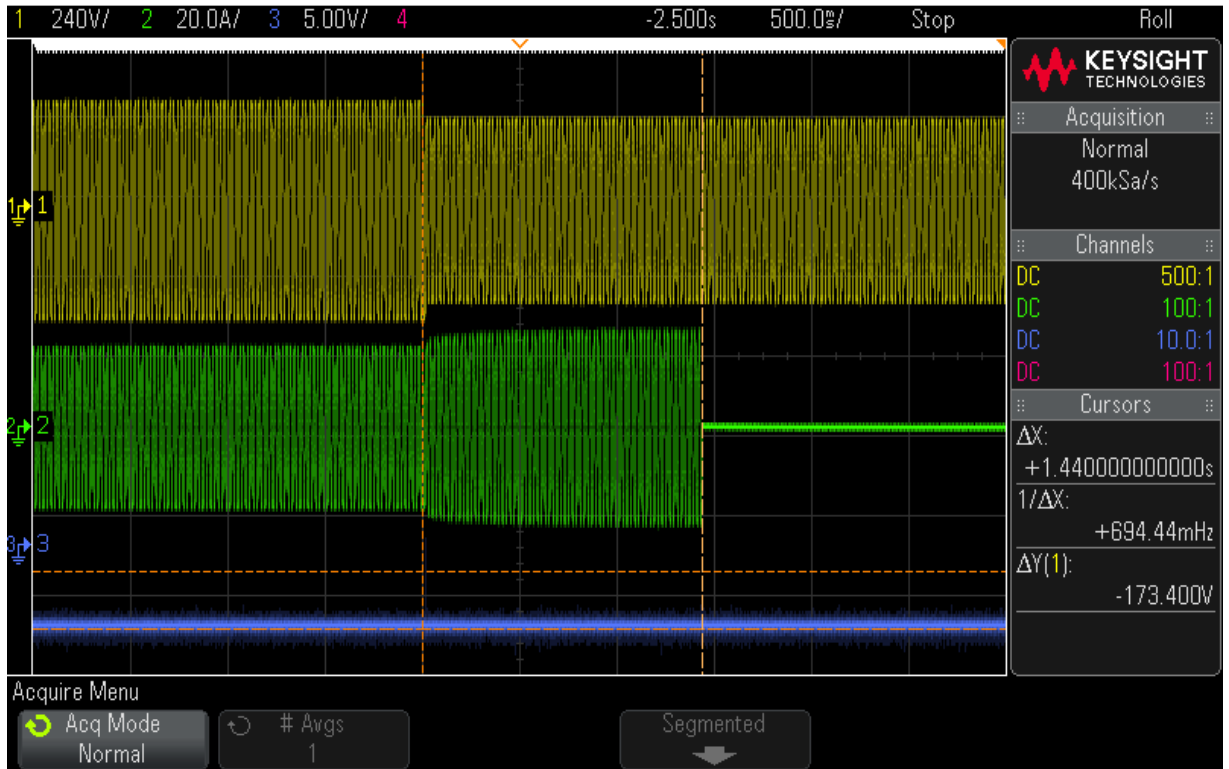
UNE 206 007-1 IN: 2013

Voltage measured: Un-15%Un



Voltage Trip Time: Un-15%Un

DSO-X 3014A, MY58101647: Sat Dec 28 14:53:10 2019

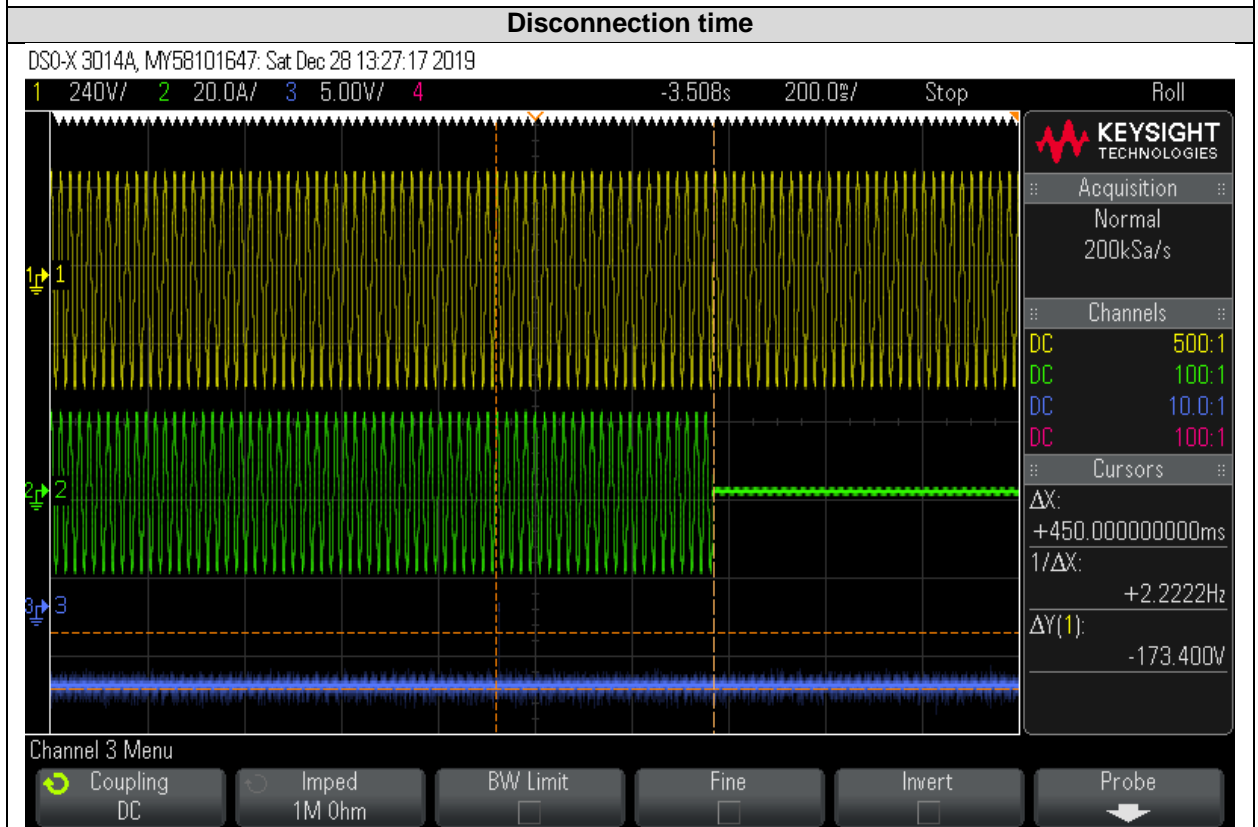
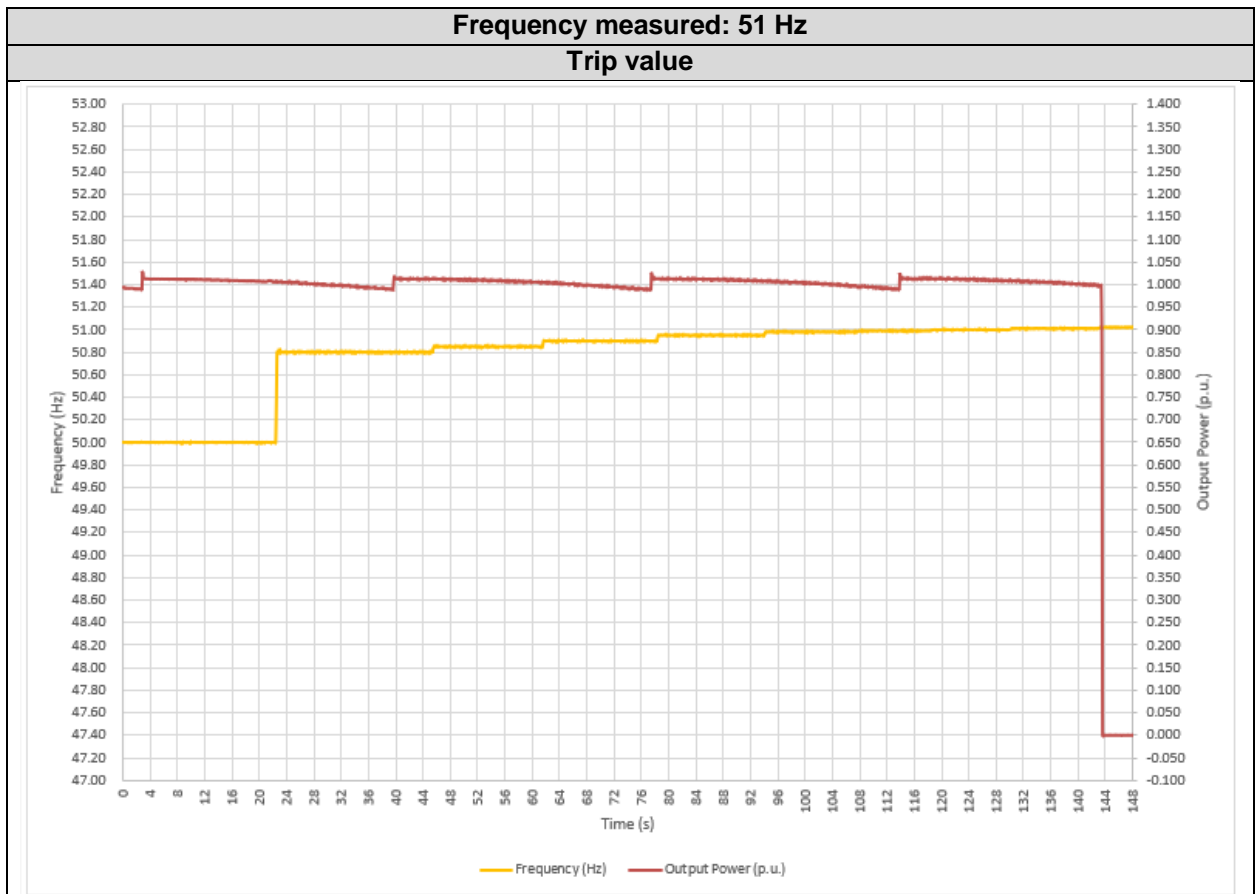


4.4.2 Frequency disconnection

Setting Frequency (Hz)	Measured Frequency (Hz)	Disconnection time limits (s)	Disconnection time measured (s)
51	51.01	0.5	0.450
48	48.00	>3.0(*)	3.240

(*) Minimum disconnection time according to RD1699/2011.

UNE 206 007-1 IN: 2013



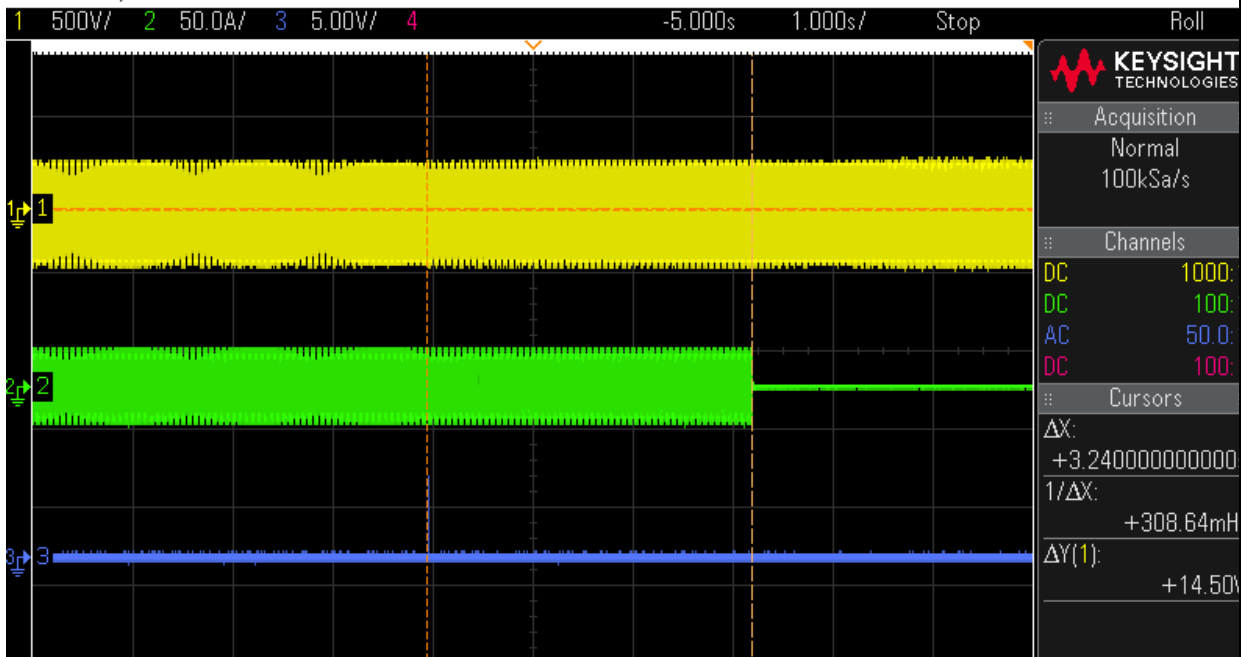
UNE 206 007-1 IN: 2013

Frequency measured: 48 Hz



Disconnection time

DSO-X 3014A, MY58101647: Fri Feb 21 14:47:56 2020



KEYSIGHT TECHNOLOGIES

- Acquisition: Normal, 100kSa/s
- Channels:
 - DC 1000
 - DC 100
 - AC 50.0
 - DC 100
- Cursors:
 - ΔX : +3.240000000000
 - $1/\Delta X$: +308.64mH
 - $\Delta Y(1)$: +14.50V

Cursors Menu

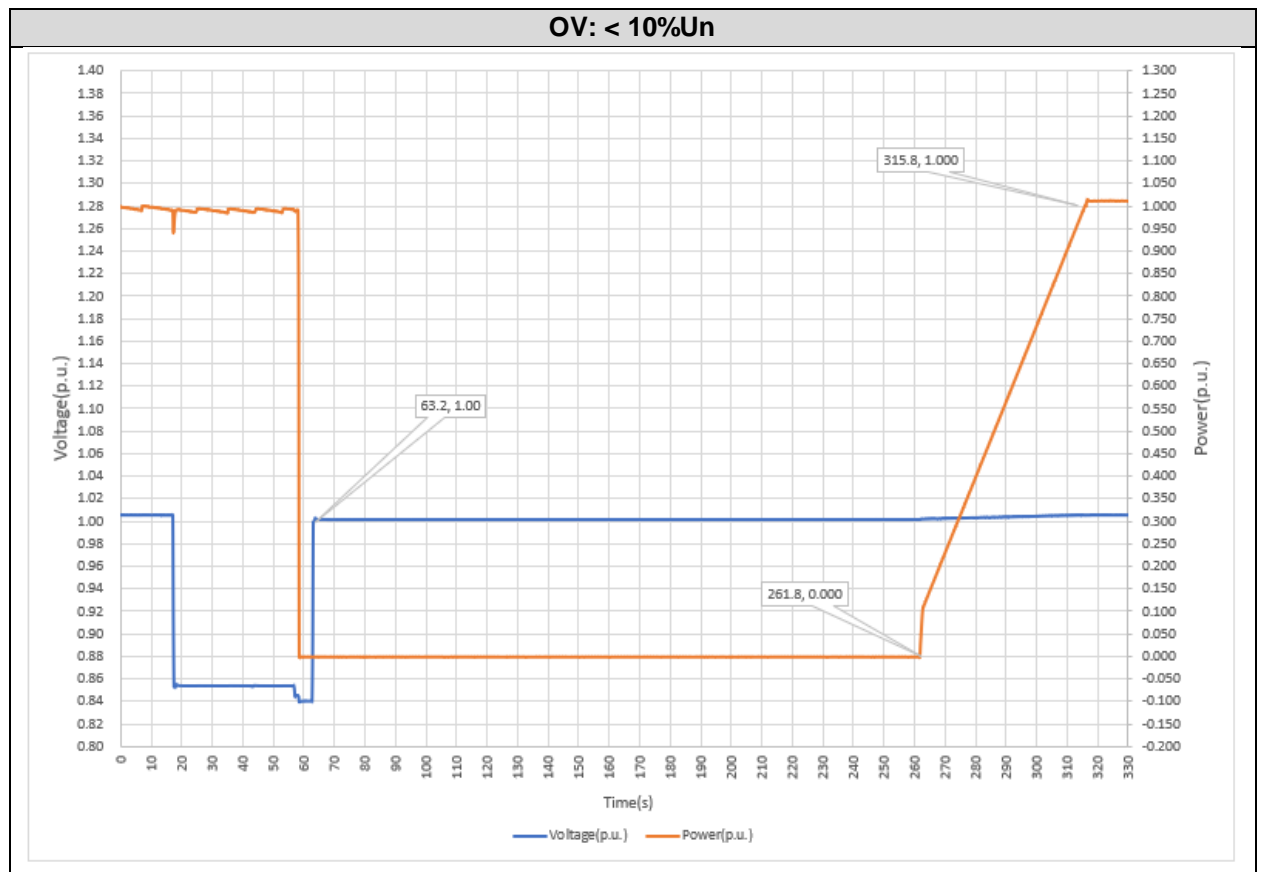
- Mode: Manual
- Source: 1
- Cursors: X2
- Units: [Down Arrow]
- X1: -6.060000000000s, Y1: -7.50V
- X2: -2.820000000000s, Y2: 7.00V

4.5 SELF RECONNECTION

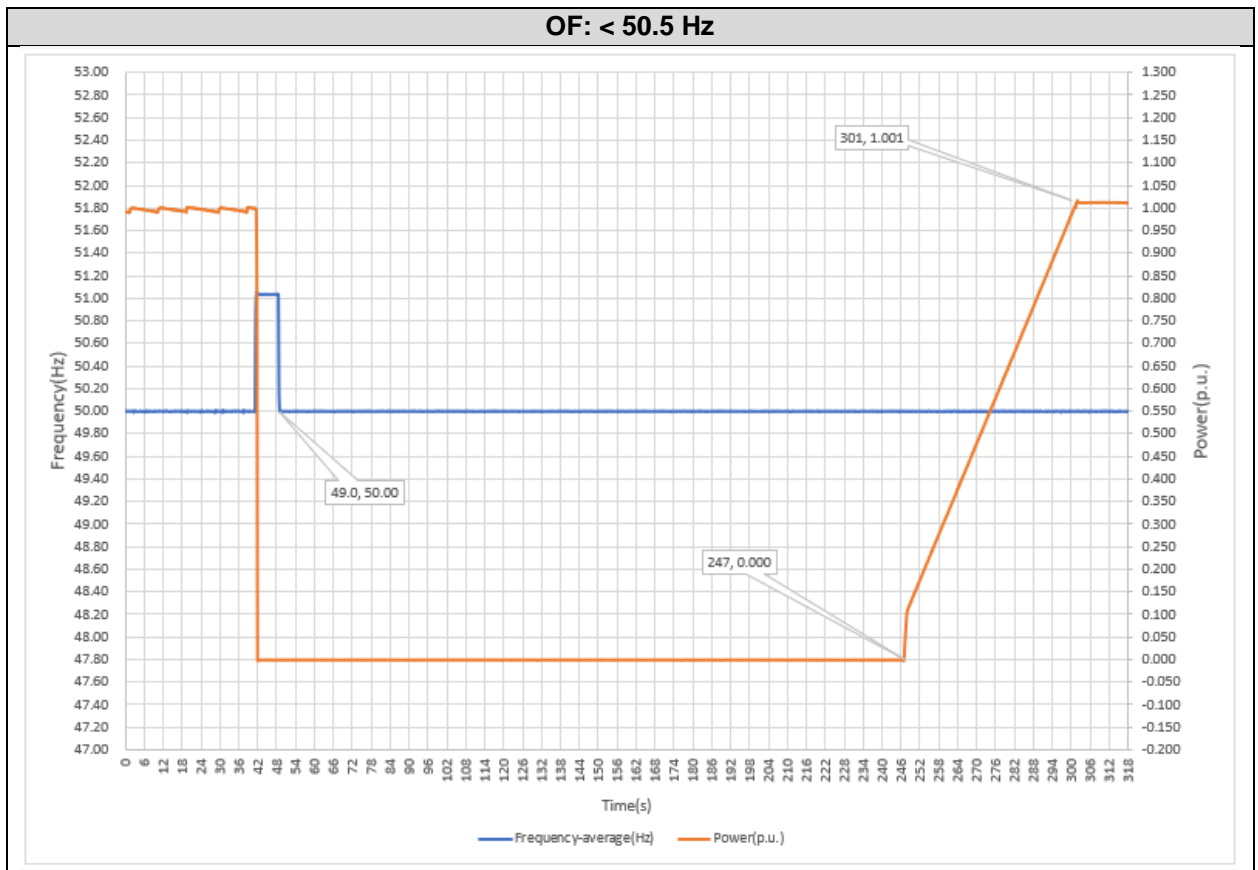
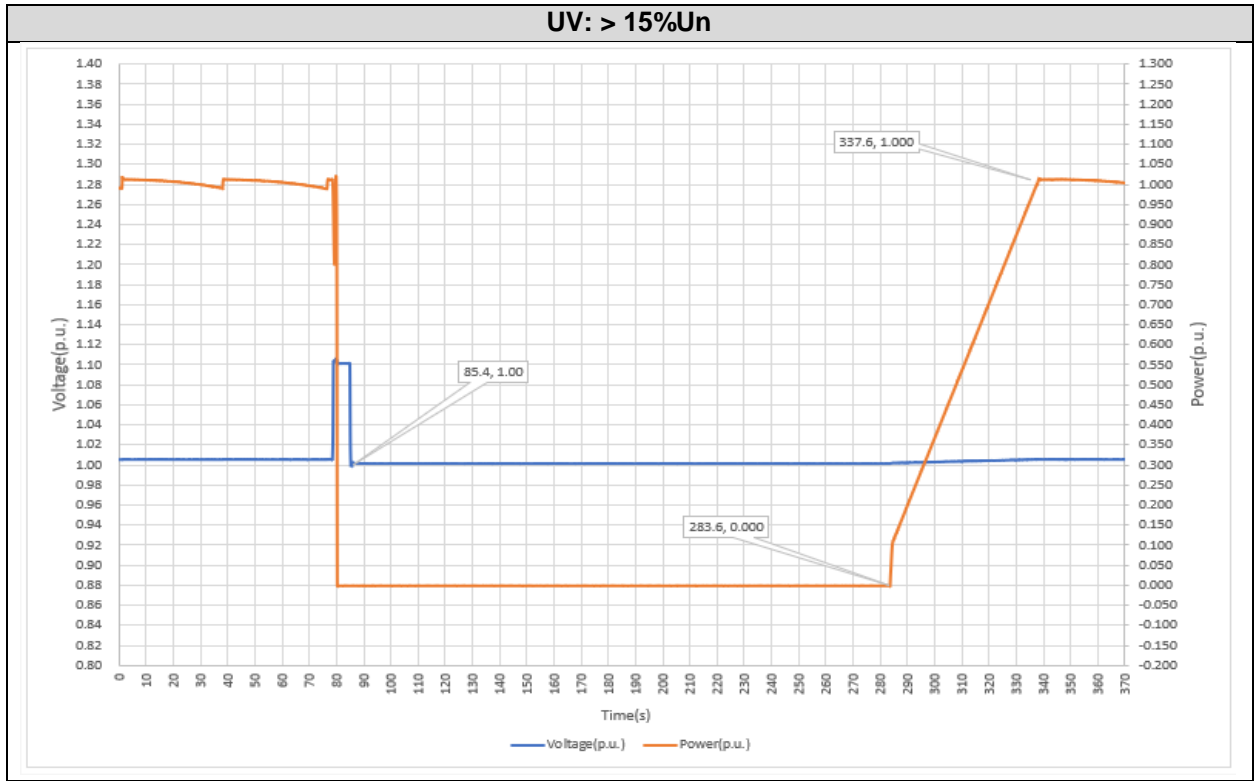
Self-reconnection tests have been performed according to the point 5.5 of the standard.

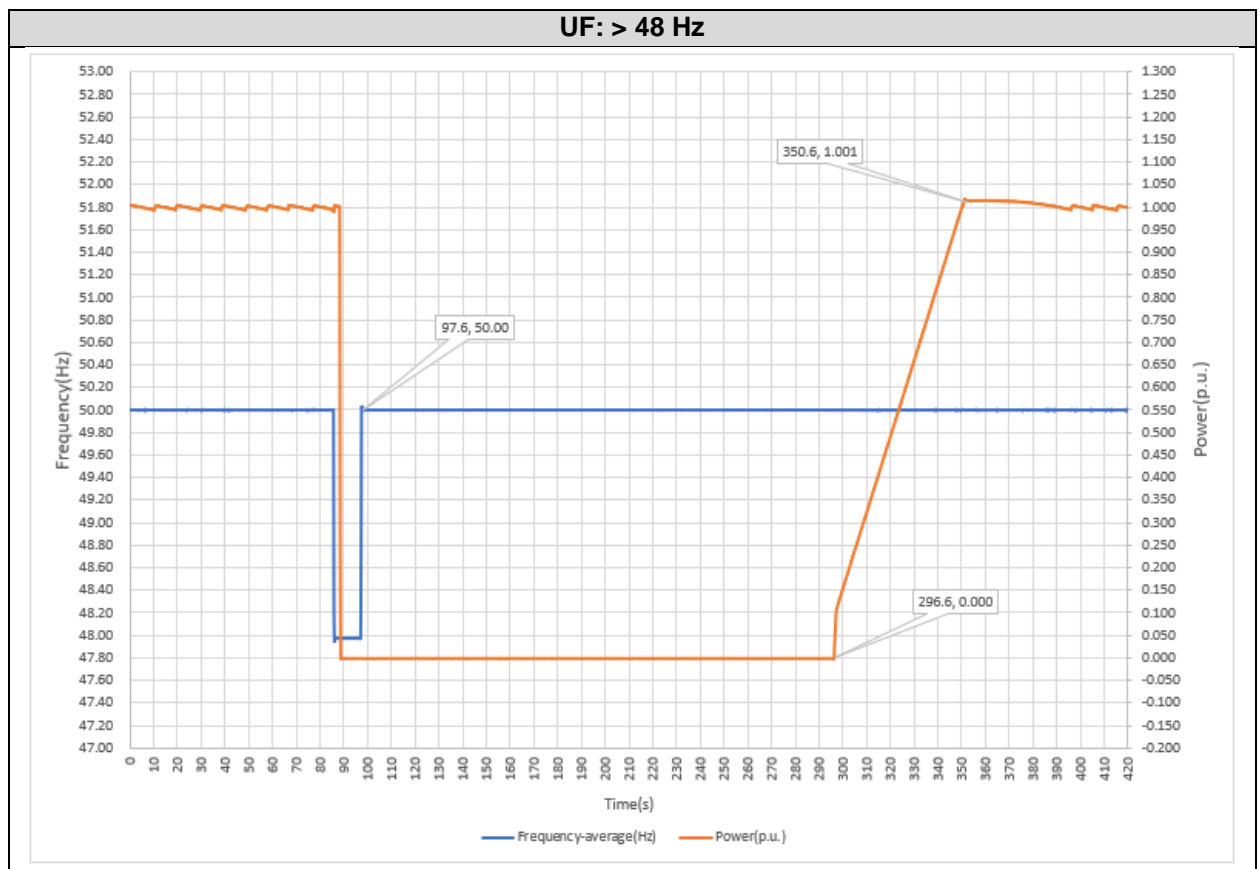
The inverter must be capable to reconnect when voltage and frequency are within the normal ranges according to standard.

Type	Delay time	Time measured (s)
OV: < 10%Un	>3 min	198.6
UV: > 15%Un	>3 min	198.2
OF: < 50.5 Hz	--	198.0
UF: > 48.0 Hz	--	199.0



UNE 206 007-1 IN: 2013





4.6 UNINTENTIONAL ISLANDING

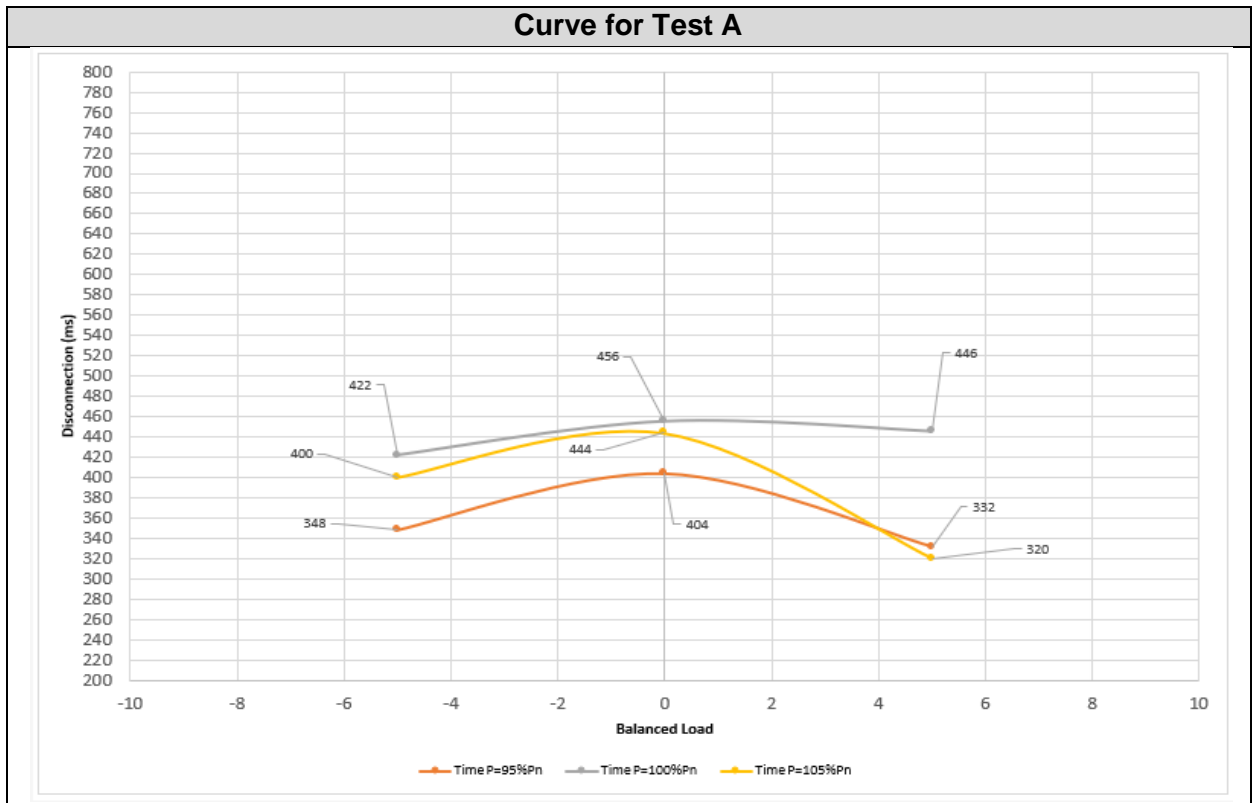
Anti-Islanding requirements are detailed in the article 5.6 of the standard. Test A is at full power, Test B is at 66%Pn, Test C is at 33%Pn

As the inverter can be connected to the LV network, compliances with these requirements have been verified according to the standard UNE 206006 IN. Following conditions with an ESE inverter has been tested:

- Condition 1: EUT and ESE with islanding prevention activated.
- Condition 2: EUT with islanding prevention activated and ESE deactivated.
- Condition 3: EUT and ESE with islanding prevention deactivated.

4.6.1 Active Power > 90% Pn. Test A

Balanced Load		
M (%)	N (%)	Disconnection (ms) (limit at t=2s)
-5	+5	400
-5	0	422
-5	-5	348
0	+5	444
0	0	456
0	-5	404
+5	+5	320
+5	0	446
+5	-5	332



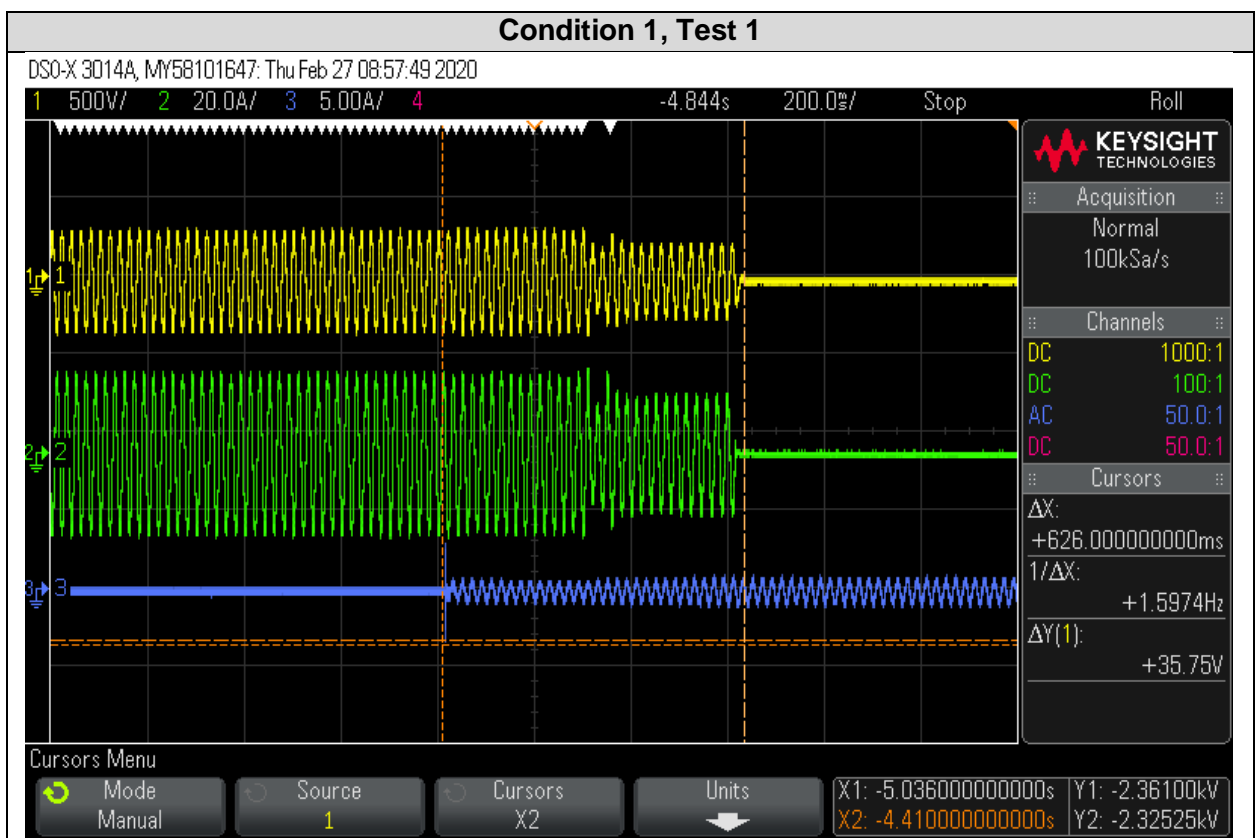
UNE 206 007-1 IN: 2013

Conditions	P (kw)	Qc(KVAr)	Ql(KVAr)	Time limit (s)	Time measured (ms)
1	3.125	-3.088	3.085	<2	626
1	3.125	-3.088	3.085	<2	506
2	3.125	-3.088	3.085	<2	1070
2	3.125	-3.088	3.085	<2	864
3	3.125	-3.088	3.085	--	--

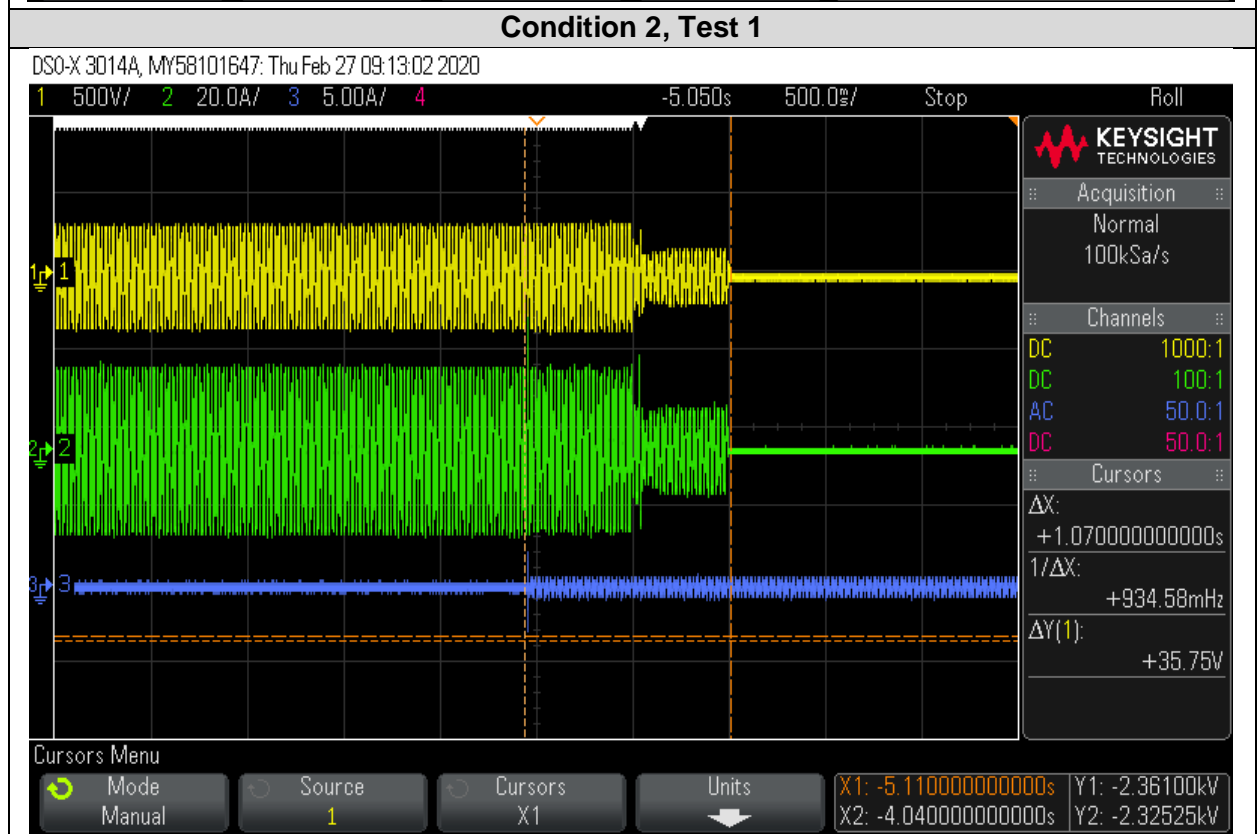
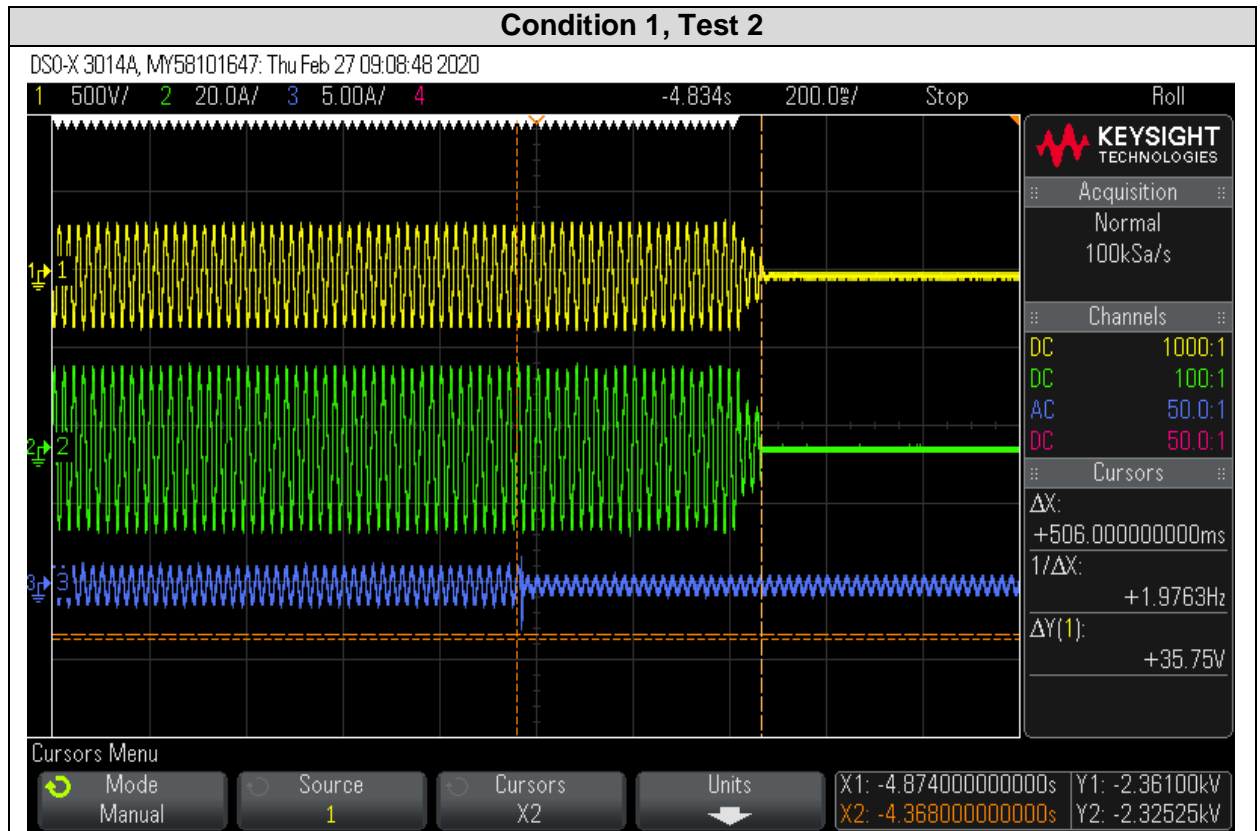
Condition 1: EUT and ESE with islanding prevention activated.

Condition 2: EUT with islanding prevention activated and ESE deactivated.

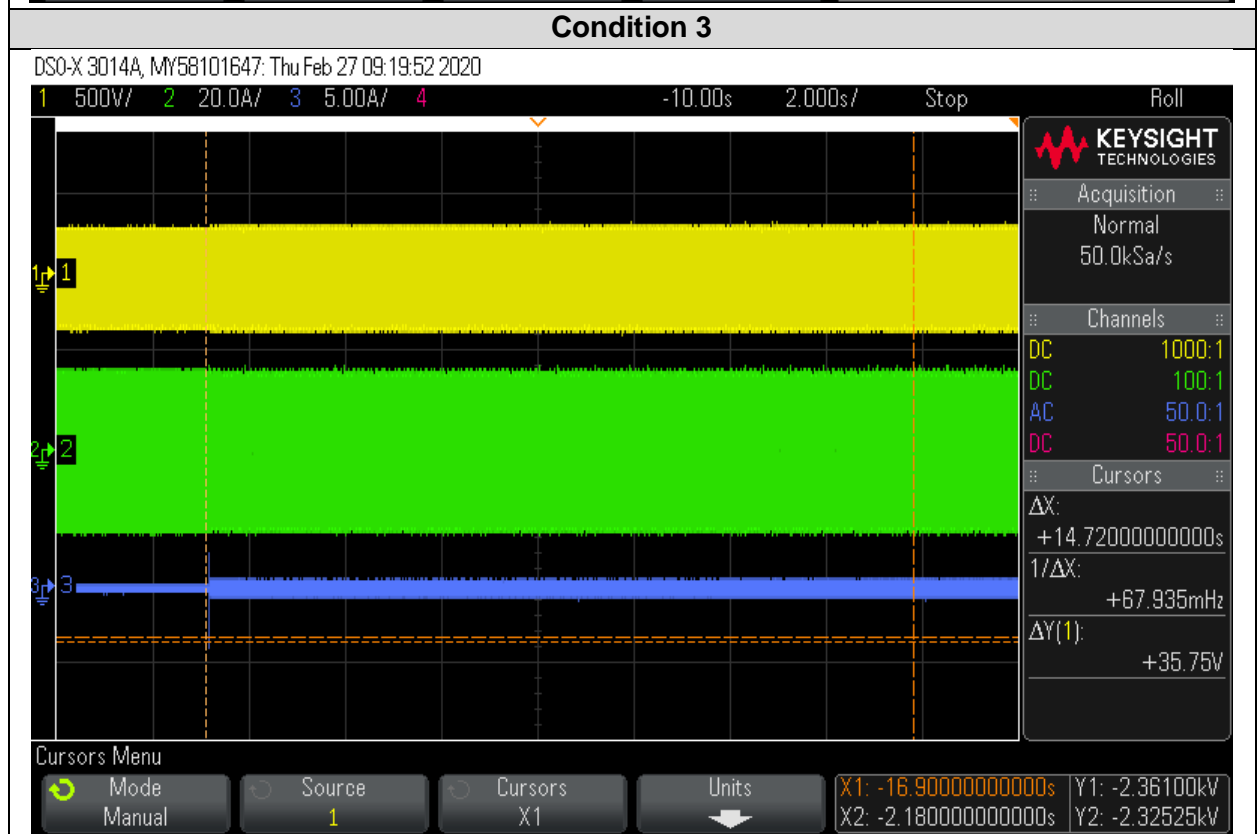
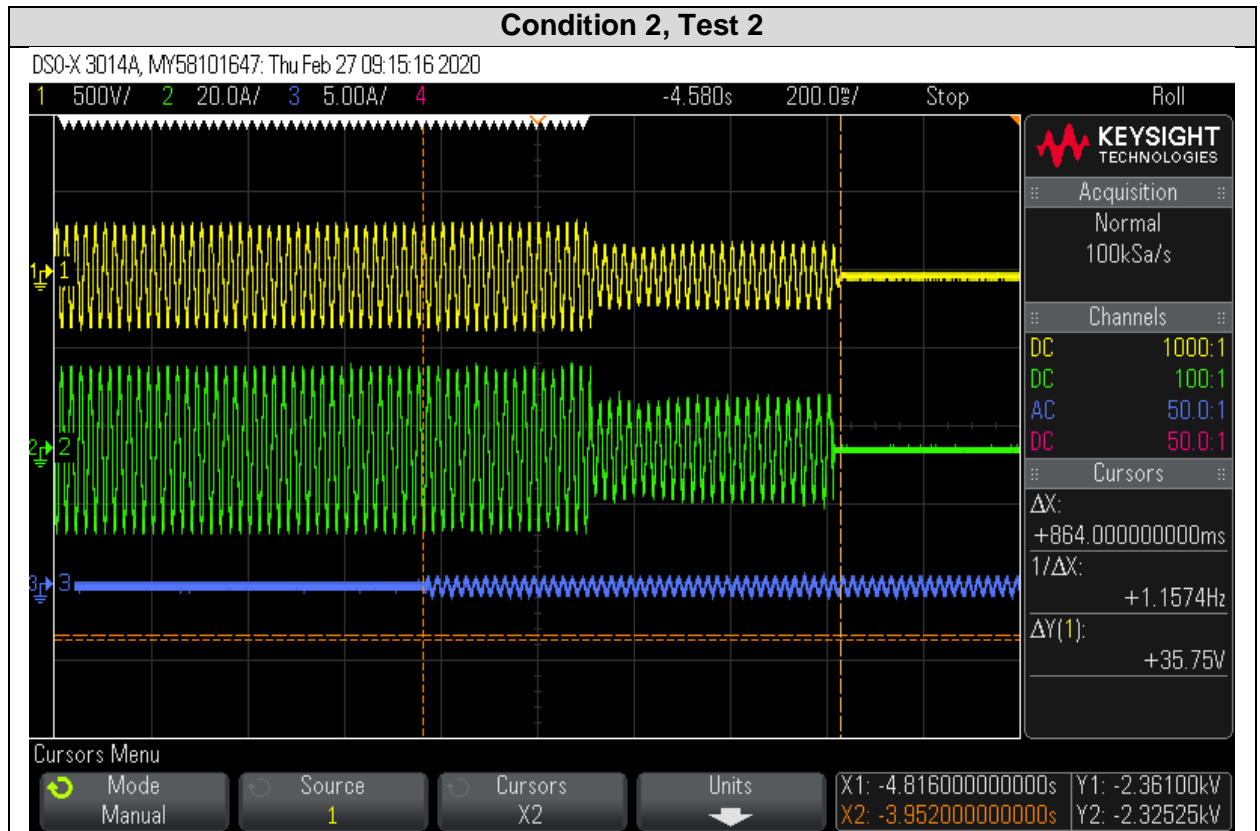
Condition 3: EUT and ESE with islanding prevention deactivated.



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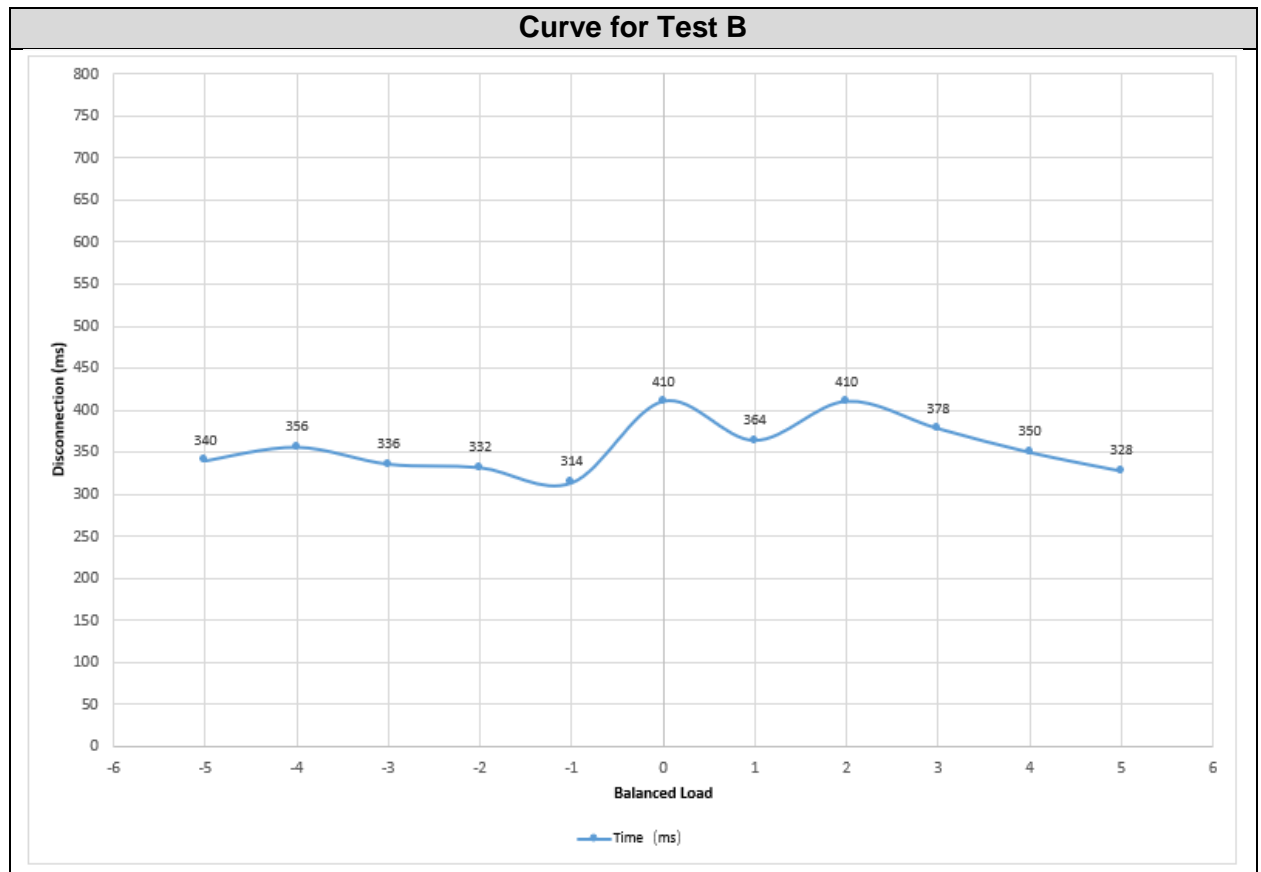


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4.6.2 Active Power 50-66% Pn. Test B

Balanced Load		
M (%)	N (%)	Disconnection (ms) (limit at t=2s)
0	-5	340
0	-4	356
0	-3	336
0	-2	332
0	-1	314
0	0	410
0	1	364
0	2	410
0	3	378
0	4	350
0	5	328



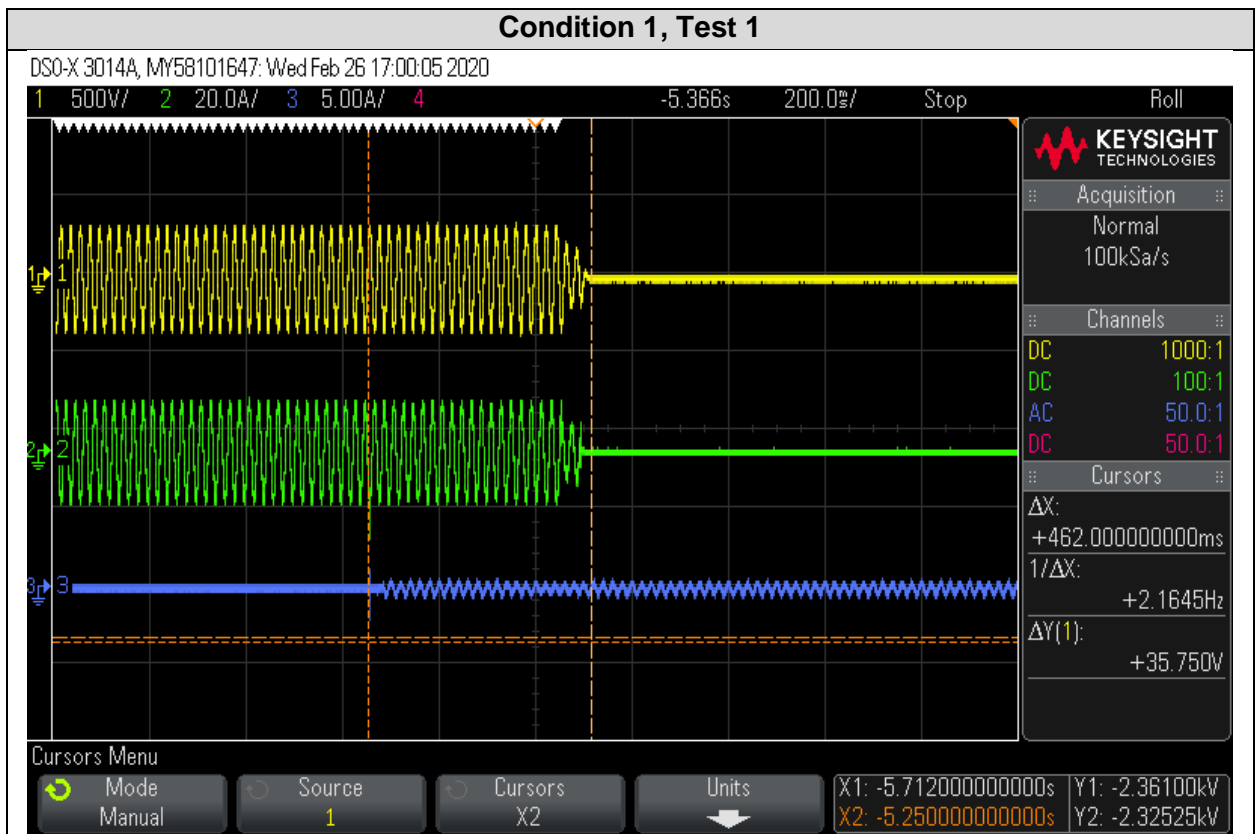
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Conditions	P (kw)	Qc(KVAr)	Ql(KVAr)	Time limit (s)	Time measured (ms)
1	1.963	-2.035	2.038	<2	462
1	1.963	-2.035	2.038	<2	394
2	1.963	-2.035	2.038	<2	834
2	1.963	-2.035	2.038	<2	920
3	1.963	-2.035	2.038	--	--

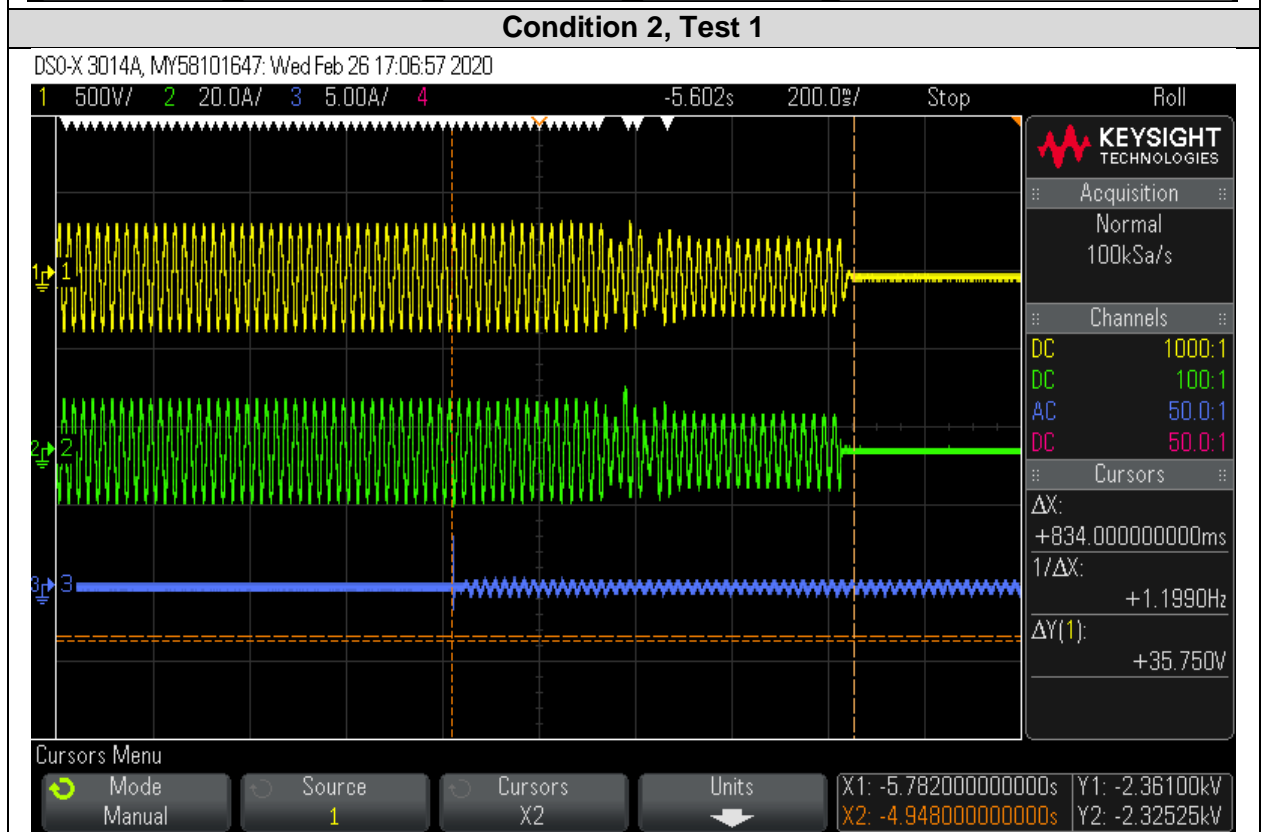
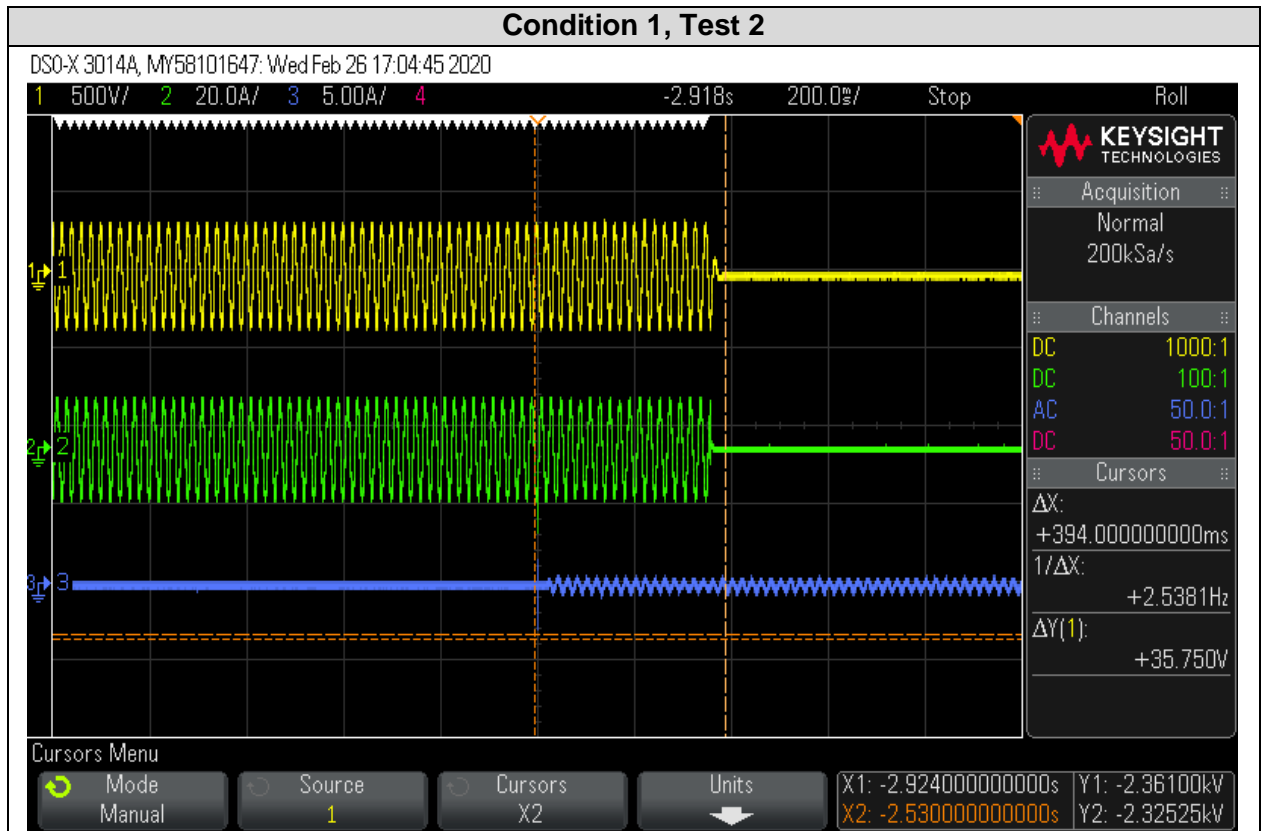
Condition 1: EUT and ESE with islanding prevention activated.

Condition 2: EUT with islanding prevention activated and ESE deactivated.

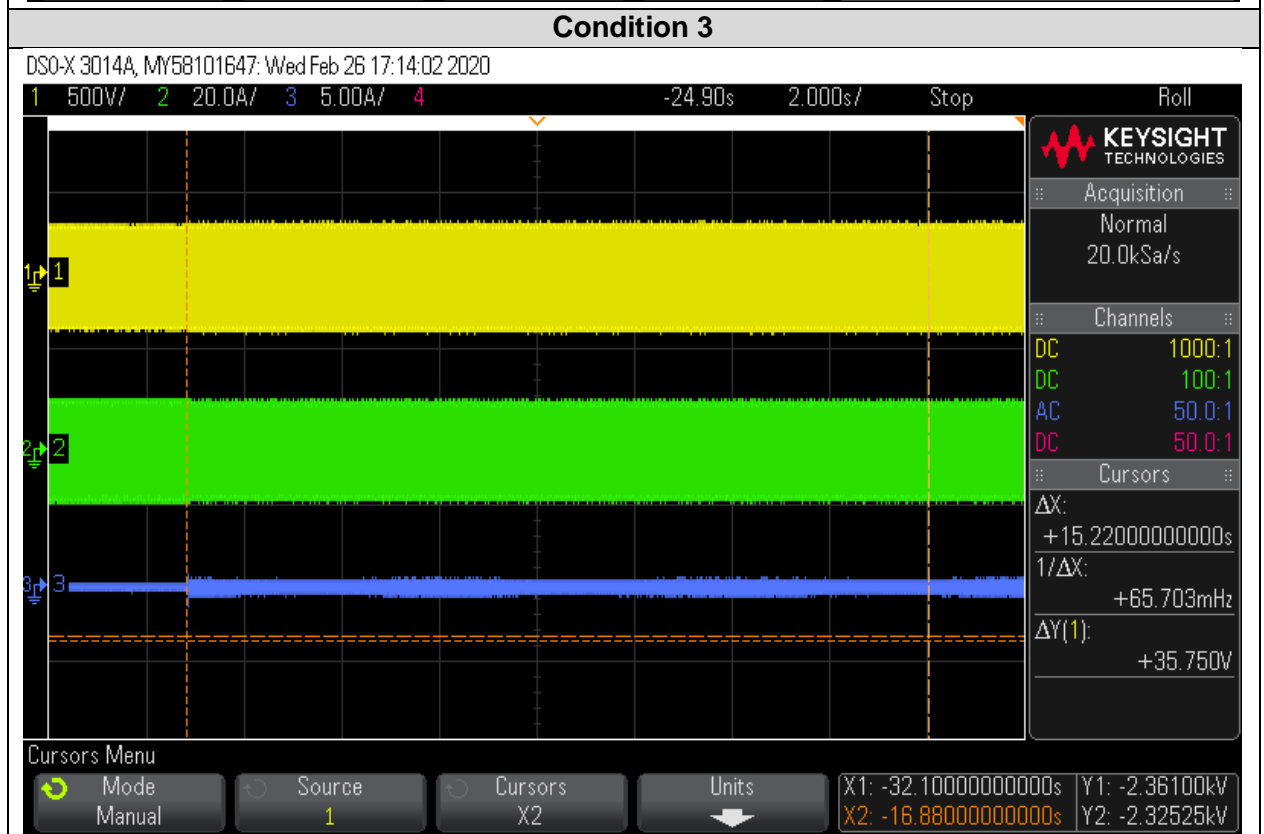
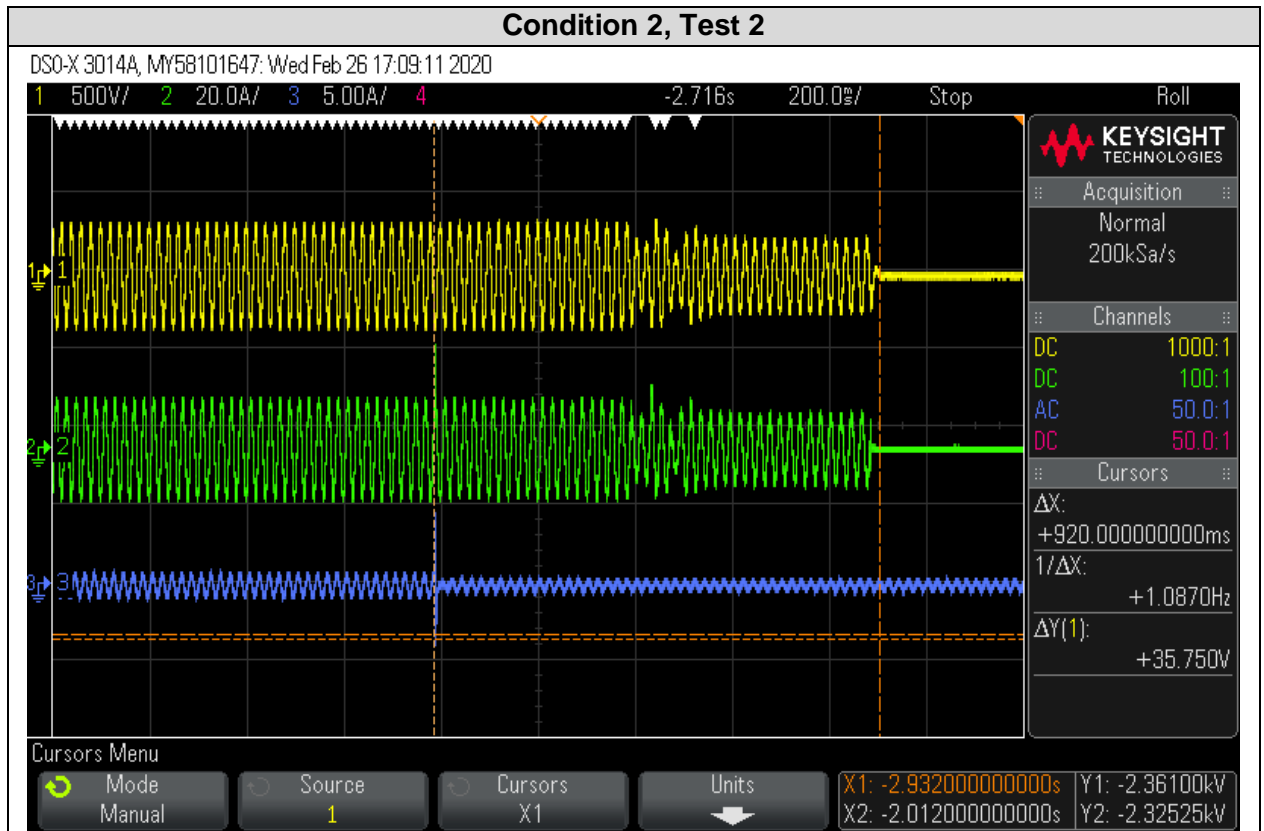
Condition 3: EUT and ESE with islanding prevention deactivated.



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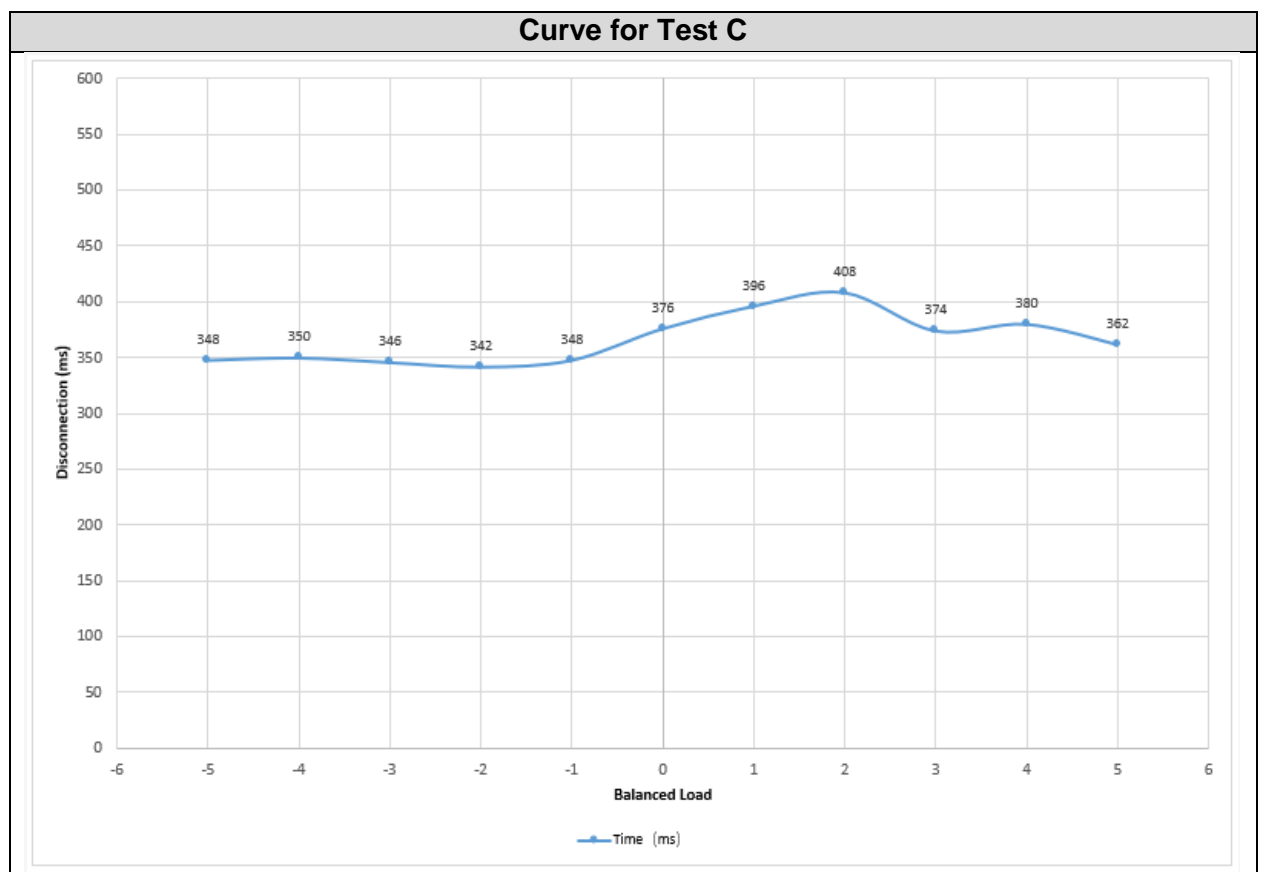


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4.6.3 Active Power 25 - 33% Pn. Test C

Balanced Load		
M (%)	N (%)	Disconnection (ms) (limit at t=2s)
0	-5	348
0	-4	350
0	-3	346
0	-2	342
0	-1	348
0	0	376
0	1	396
0	2	408
0	3	374
0	4	380
0	5	362

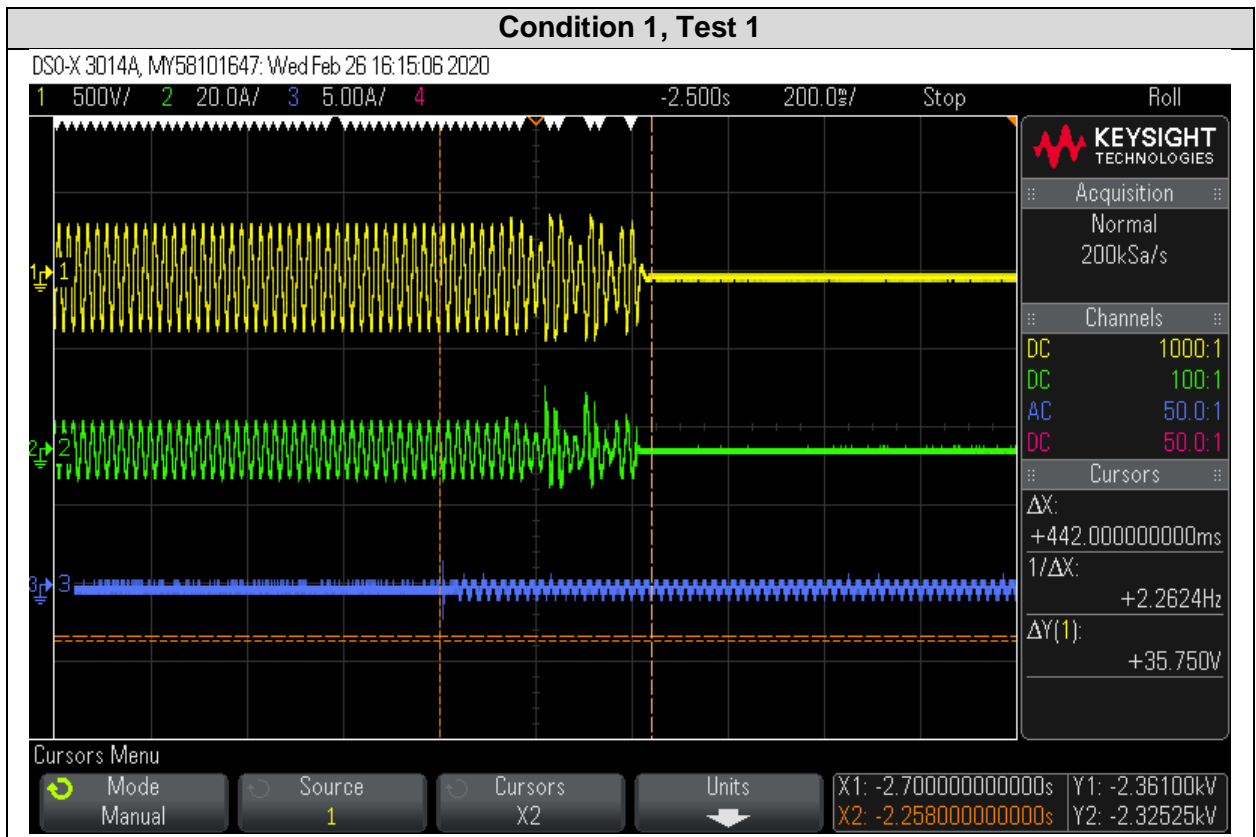


Conditions	P (kw)	Qc(KVAr)	Ql(KVAr)	Time limit (s)	Time measured (ms)
1	1.033	-1.013	1.010	<2	442
1	1.033	-1.013	1.010	<2	404
2	1.033	-1.013	1.010	<2	1.86
2	1.033	-1.013	1.010	<2	1.93
3	1.033	-1.013	1.010	--	--

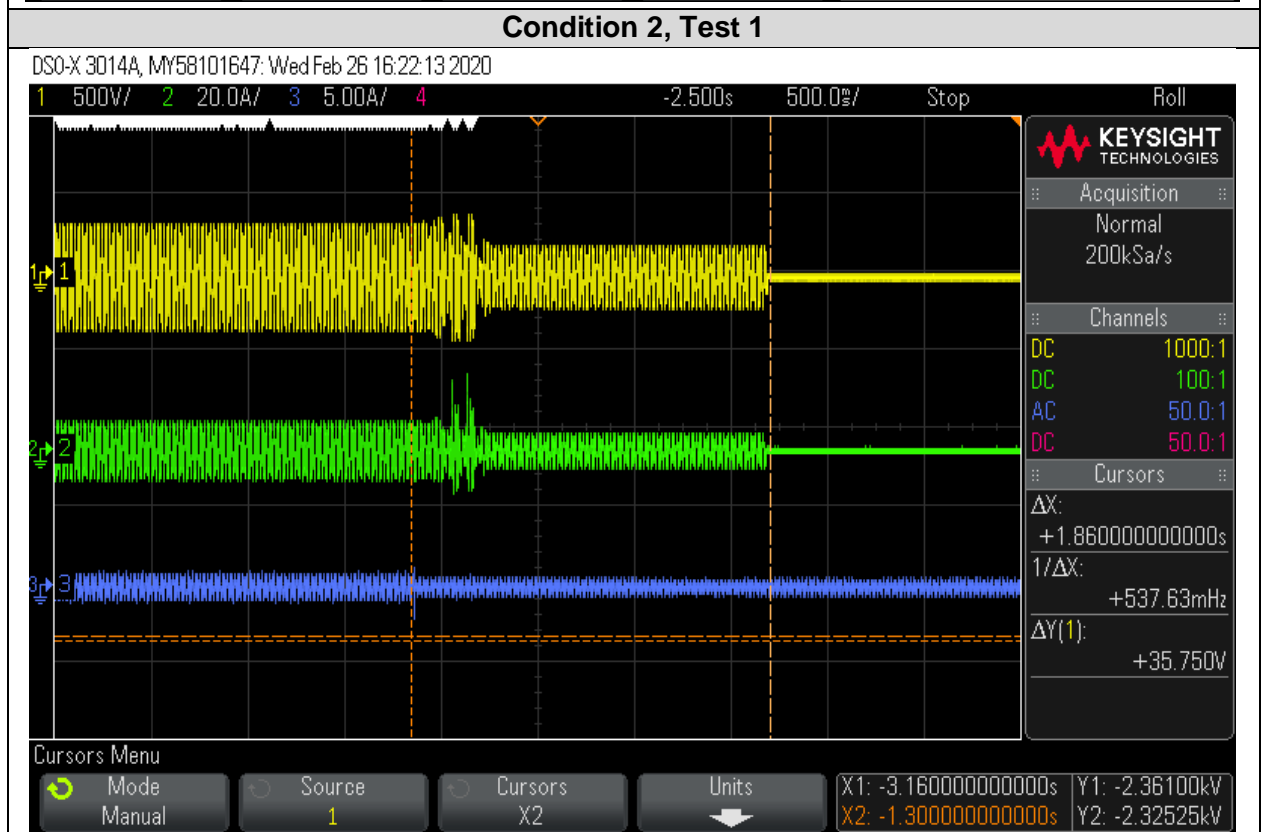
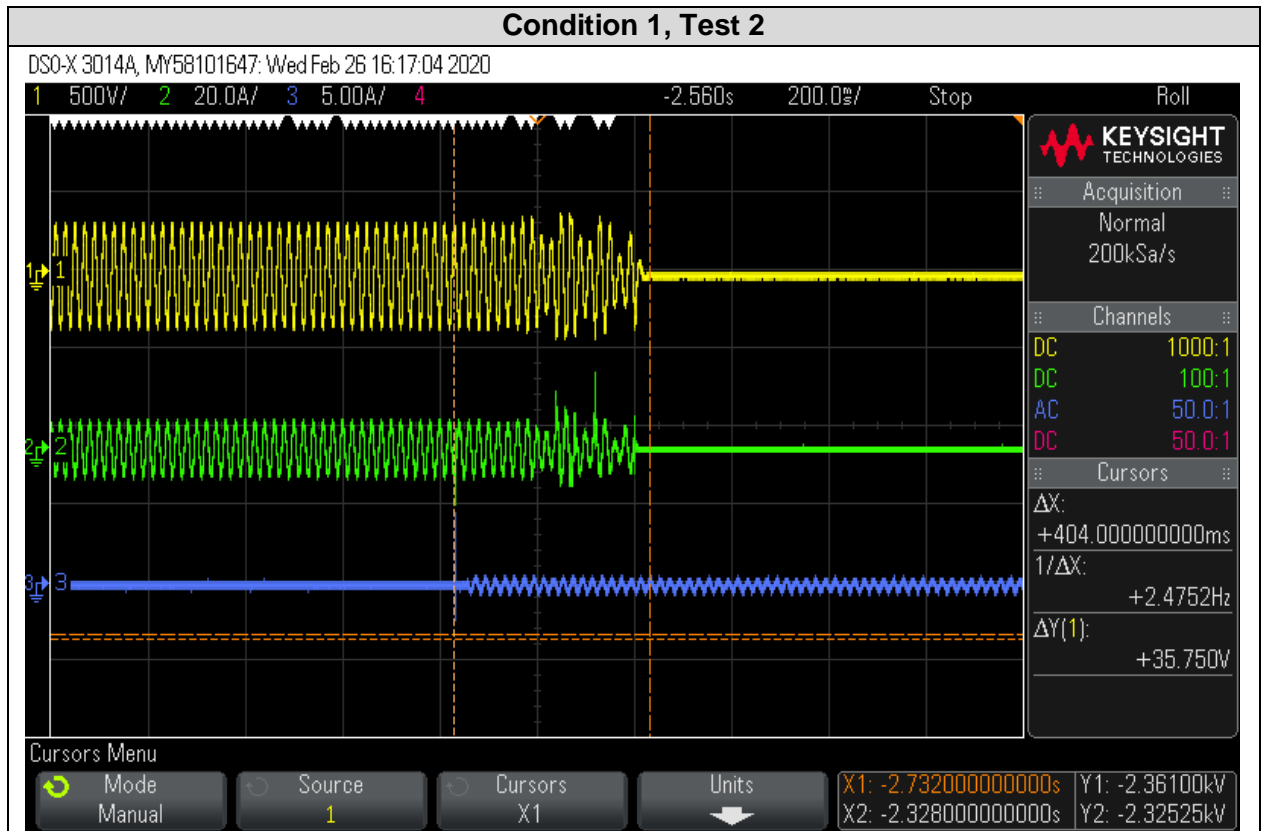
Condition 1: EUT and ESE with islanding prevention activated.

Condition 2: EUT with islanding prevention activated and ESE deactivated.

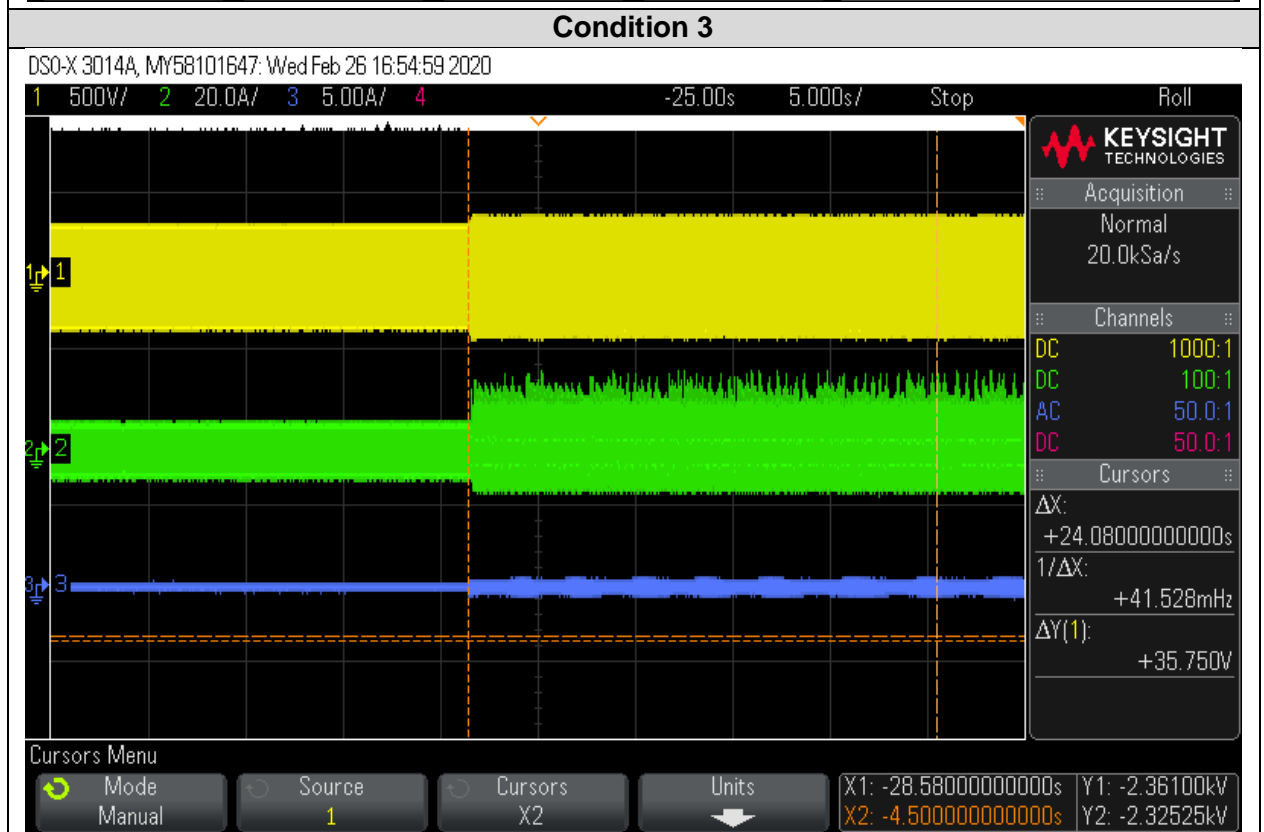
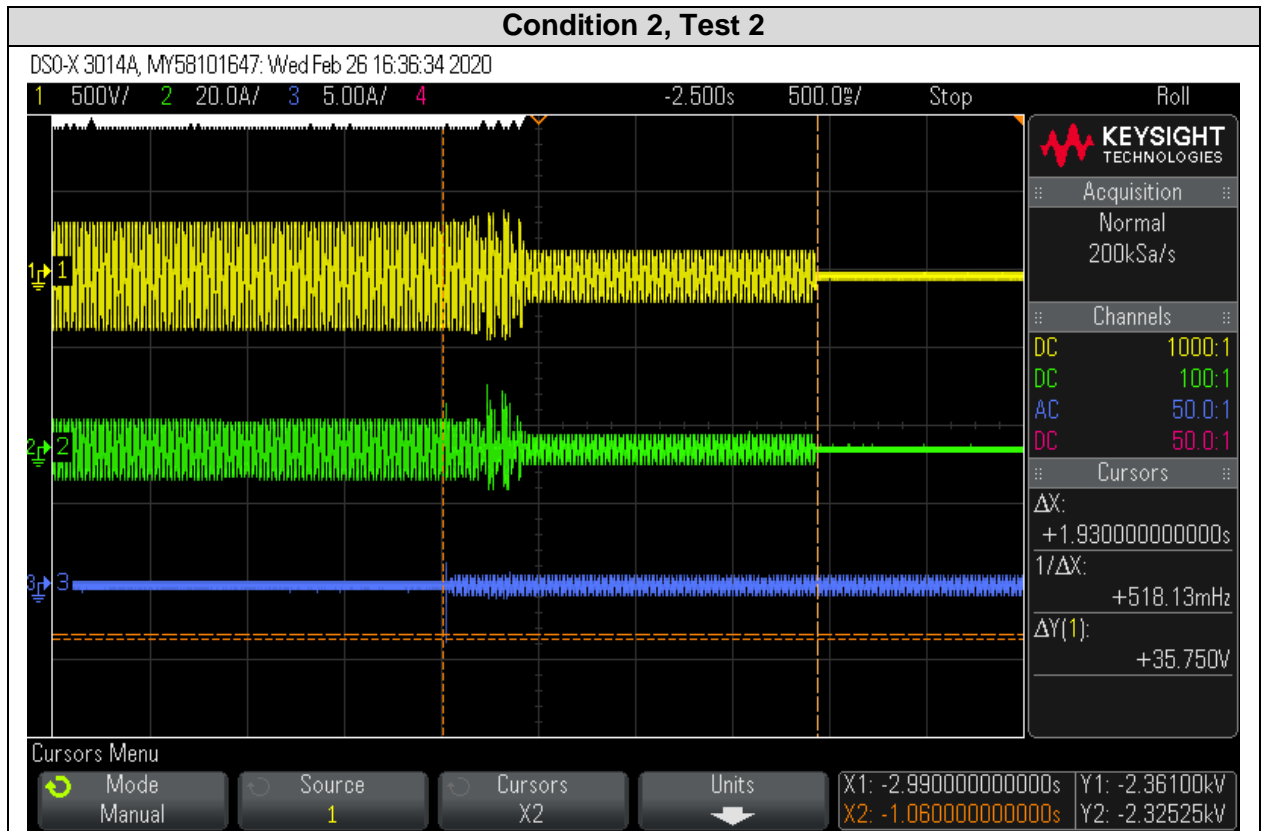
Condition 3: EUT and ESE with islanding prevention deactivated.



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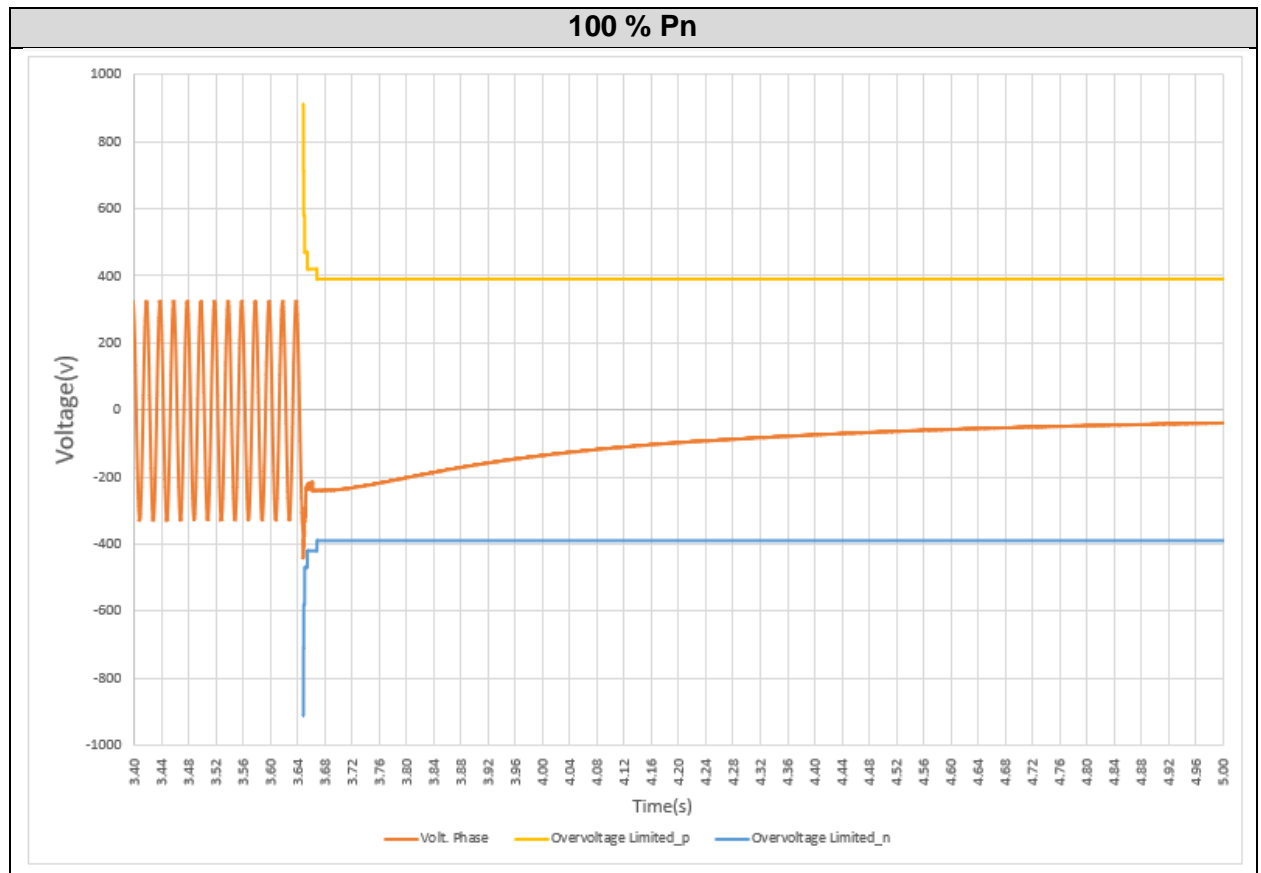
UNE 206 007-1 IN: 2013



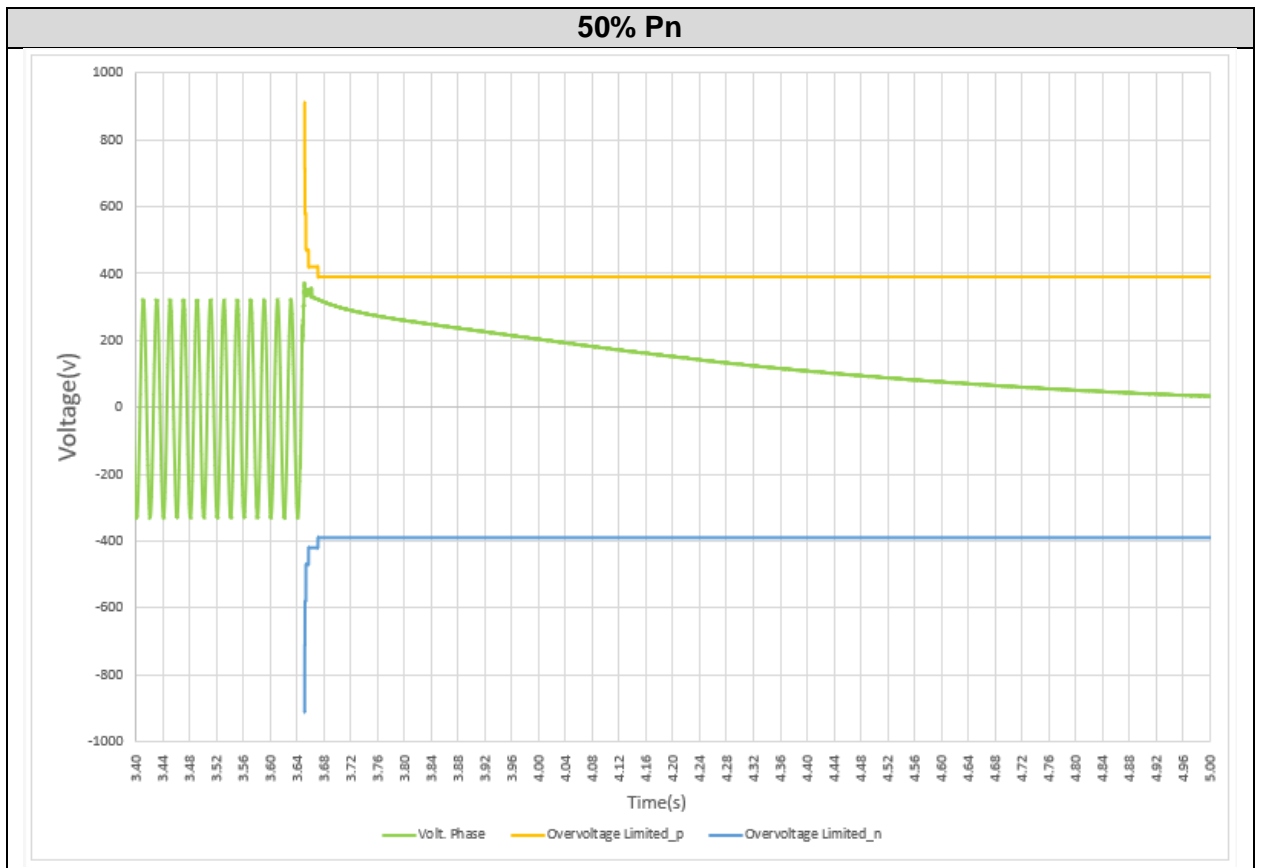
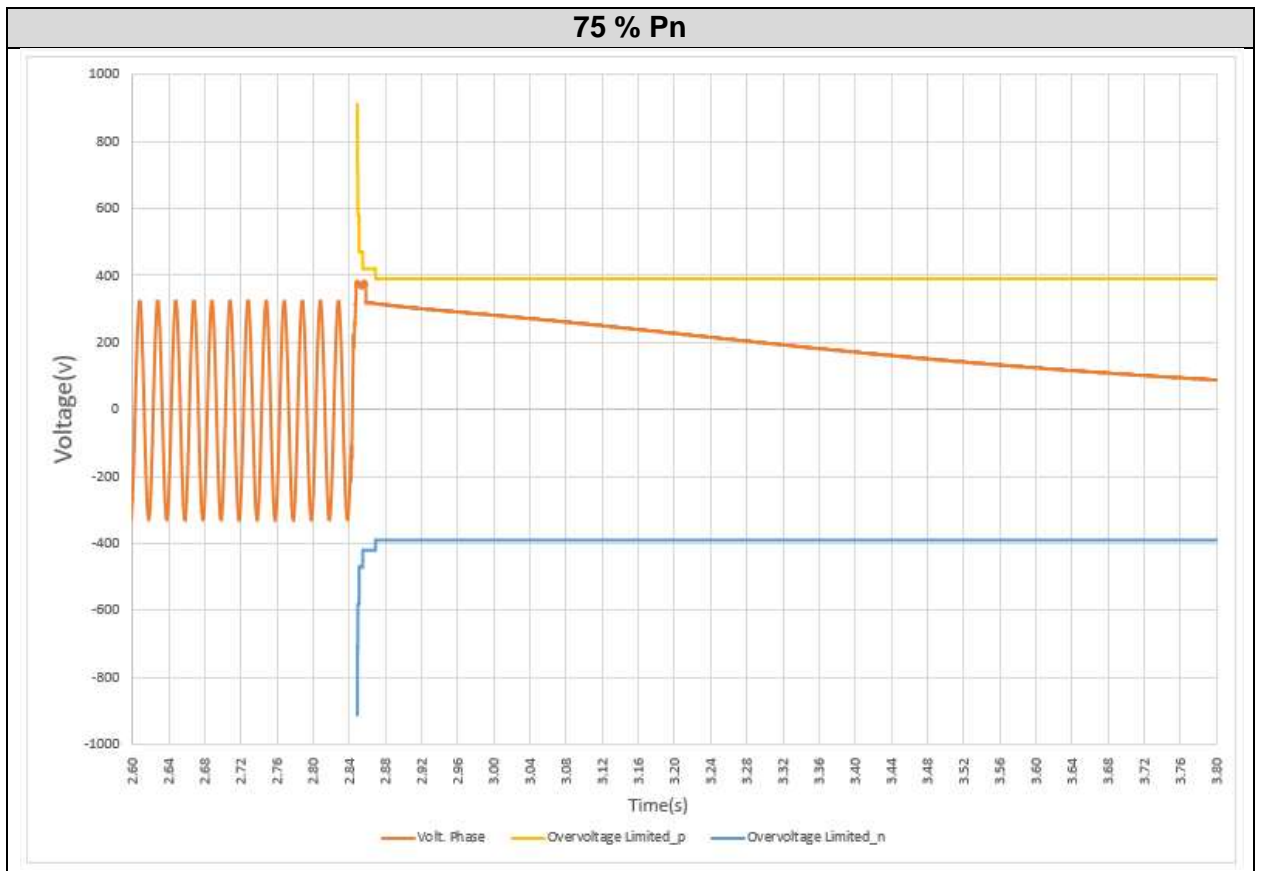
4.7 OVERVOLTAGE GENERATION

The purpose of this test is to verify that the inverter complies with the transient voltage limits specified below when the grid is disconnected from the inverter. The transient voltage limits have been measured according to the article 5.7 of the standard.

Overvoltage duration (s)	Overvoltage limit value (%Un)	Overvoltage value measured (%Un) at 100% Pn	Overvoltage value measured (%Un) at 75% Pn	Overvoltage value measured (%Un) at 50% Pn
Phase L-N				
0.0002	±280	-128.7	112.1	114.5
0.0006	±218	-123.4	112.0	115.0
0.002	±178	-100.2	103.2	115.1
0.006	±145	-72.0	107.0	113.8
0.02	±129	-74.1	99.1	97.0
0.06	±120	-72.6	90.4	93.2
0.2	±120	-56.4	75.1	82.6
0.6	±120	-28.3	42.6	48.6



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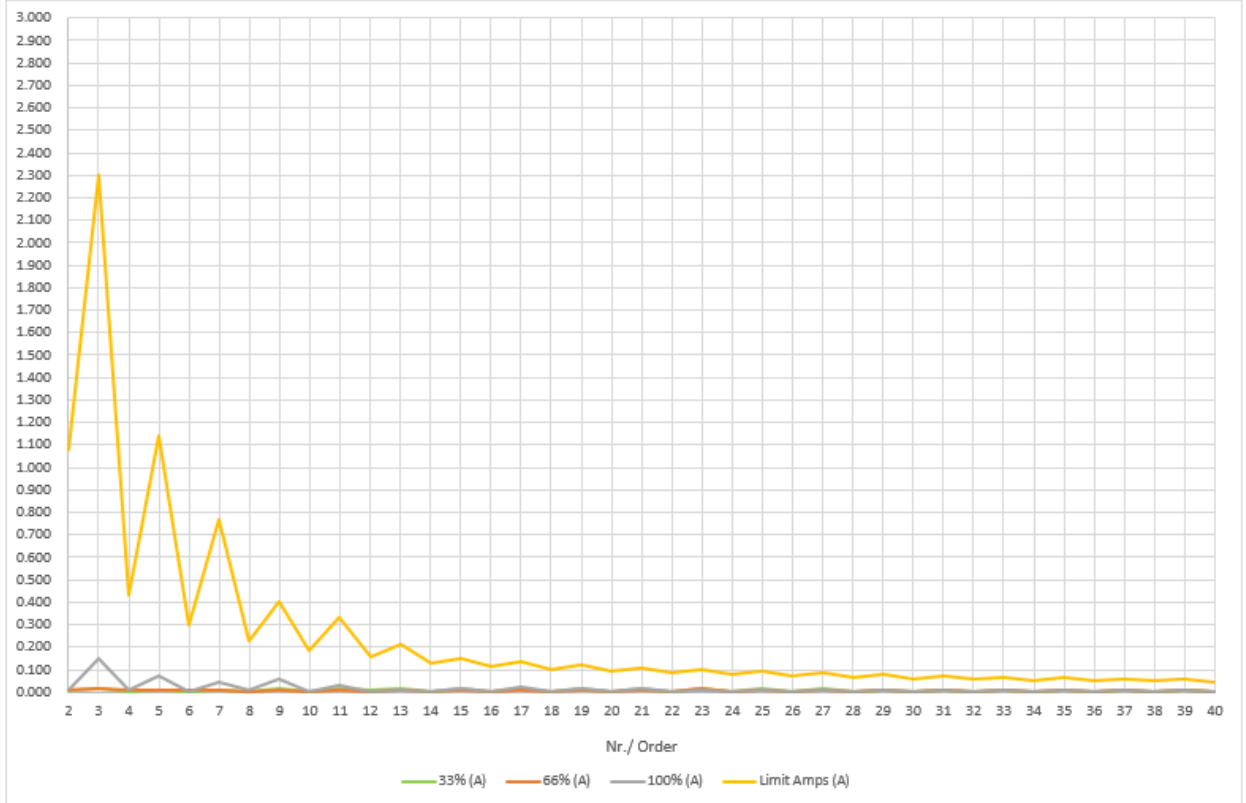
4.8 GRID QUALITY

4.8.1 Harmonics

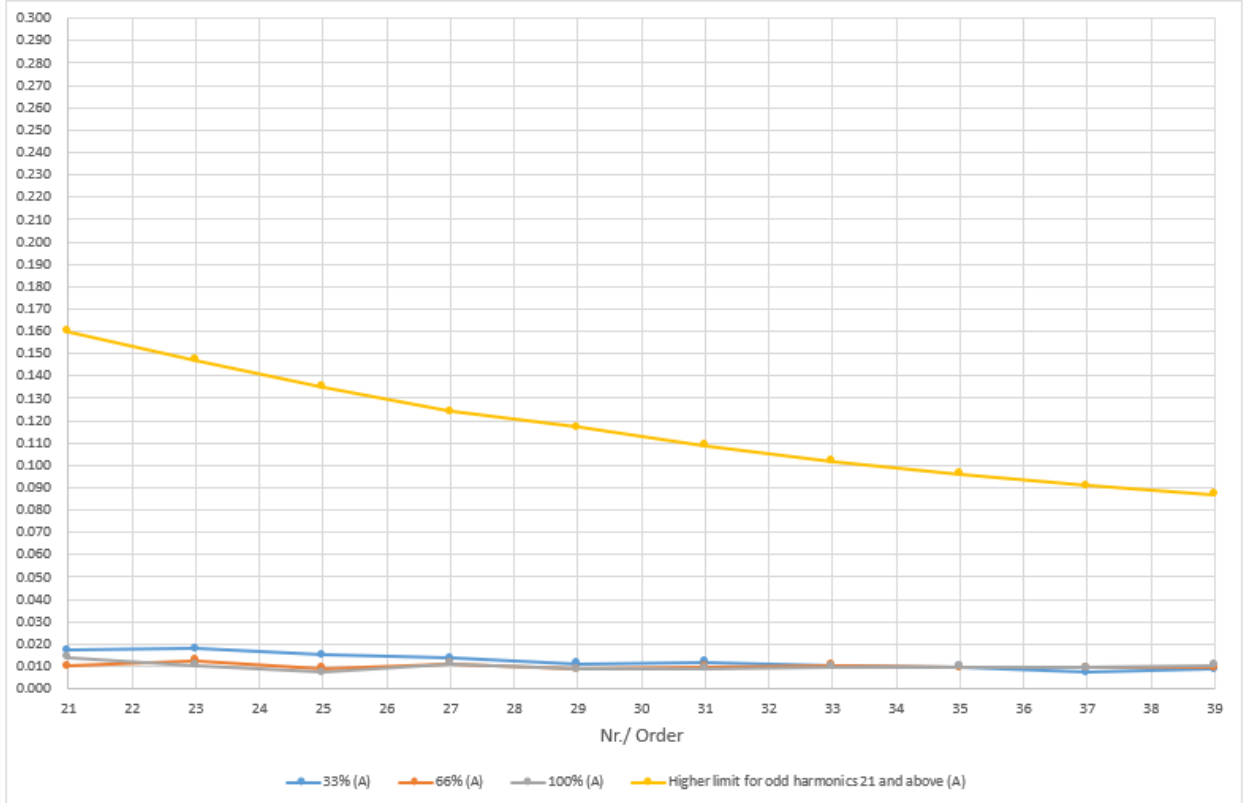
Applied limits according to the standard EN 61000-3-2.

SOFAR 2700TL-G3					
P (%P _n)	33%	66%	100%	Limit Amps	Higher limit for odd harmonics 21 and above
Nr./ Order	(A)	(A)	(A)	(A)	(A)
2	0.007	0.008	0.011	1.080	--
3	0.015	0.018	0.152	2.300	--
4	0.004	0.008	0.005	0.430	--
5	0.008	0.007	0.071	1.140	--
6	0.002	0.007	0.005	0.300	--
7	0.010	0.009	0.046	0.770	--
8	0.003	0.005	0.006	0.230	--
9	0.015	0.008	0.058	0.400	--
10	0.003	0.004	0.004	0.184	--
11	0.016	0.009	0.027	0.330	--
12	0.005	0.004	0.003	0.153	--
13	0.018	0.012	0.011	0.210	--
14	0.005	0.003	0.002	0.131	--
15	0.017	0.008	0.015	0.150	--
16	0.005	0.004	0.003	0.115	--
17	0.018	0.008	0.023	0.132	--
18	0.005	0.005	0.004	0.102	--
19	0.018	0.010	0.017	0.118	--
20	0.002	0.004	0.002	0.092	--
21	0.017	0.010	0.014	0.107	0.160
22	0.002	0.003	0.003	0.084	--
23	0.018	0.012	0.011	0.098	0.147
24	0.003	0.002	0.003	0.077	--
25	0.015	0.009	0.007	0.090	0.135
26	0.002	0.005	0.002	0.071	--
27	0.014	0.011	0.011	0.083	0.124
28	0.003	0.003	0.003	0.066	--
29	0.011	0.009	0.009	0.078	0.117
30	0.003	0.005	0.002	0.061	--
31	0.012	0.010	0.009	0.073	0.109
32	0.003	0.001	0.002	0.058	--
33	0.010	0.010	0.010	0.068	0.102
34	0.003	0.001	0.002	0.054	--
35	0.010	0.010	0.010	0.064	0.096
36	0.003	0.002	0.002	0.051	--
37	0.007	0.010	0.009	0.061	0.091
38	0.002	0.002	0.002	0.048	--
39	0.009	0.009	0.011	0.058	0.087
40	0.002	0.001	0.001	0.046	--

Limit Amps



Higher limit for odd harmonics 21 and above



4.8.2 Flickers

The measurements of voltage fluctuations have been measured at 33 %, 66% and 100 % of the nominal power value of the inverter.

This test has two steps:

- 1.Starting operation
- 2.Stopping operation

The values took of Pst and Plt are the most unfavorable of the two steps.

P _{bin} (%)	Limit	33 %	66 %	100 %
P _{st}	≤ 1	0.07	0.09	0.11
P _{lt}	≤ 0.65	0.07	0.08	0.10

33%

Flicker Mode Uover: ■ ■ ■ ■ YOKOGAWA ◆
 Iover: ■ ■ ■ ■ Flicker:Complete 0:20:00

Count 2/2
 Interval 10m00s/10m00s

Element 1
 Volt Range 600V/50Hz Element1 Judgement: Pass
 Un (U1) 230.130 V Total Judgement: Pass
 Freq(U1) 50.000 Hz (Element1)



	dc[%]	dmax[%]	d(t)[ms]	Pst	Plt
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N: 2
No. 1	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
2	0.09 Pass	0.15 Pass	0 Pass	0.07 Pass	
Result	Pass	Pass	Pass	Pass	0.07 Pass

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66%

Flicker Mode Uover: ■ ■ ■ ■ YOKOGAWA ◆
 Iover: ■ ■ ■ ■ Flicker:Complete 0:20:00

Count  2/2
 Interval  10m00s/10m00s
 Element 1
 Volt Range 600V/50Hz Element1 Judgement: Pass
 Un (U1) 229.590 V Total Judgement: Pass
 Freq(U1) 50.000 Hz (Element1)



	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N: 2
No. 1	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
2	0.42 Pass	0.45 Pass	0 Pass	0.09 Pass	
Result	Pass	Pass	Pass	Pass	0.08 Pass

Update 600

2019/11/08 15:12:33

100%

Flicker Mode Uover: ■ ■ ■ ■ YOKOGAWA ◆
 Iover: ■ ■ ■ ■ Flicker:Complete 0:20:00

Count  2/2
 Interval  10m00s/10m00s
 Element 1
 Volt Range 600V/50Hz Element1 Judgement: Pass
 Un (U1) 230.100 V Total Judgement: Pass
 Freq(U1) 50.000 Hz (Element1)

	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N: 2
No. 1	0.00 Pass	0.00 Pass	0 Pass	0.07 Pass	
2	0.61 Pass	0.69 Pass	0 Pass	0.11 Pass	
Result	Pass	Pass	Pass	Pass	0.10 Pass

Update 600

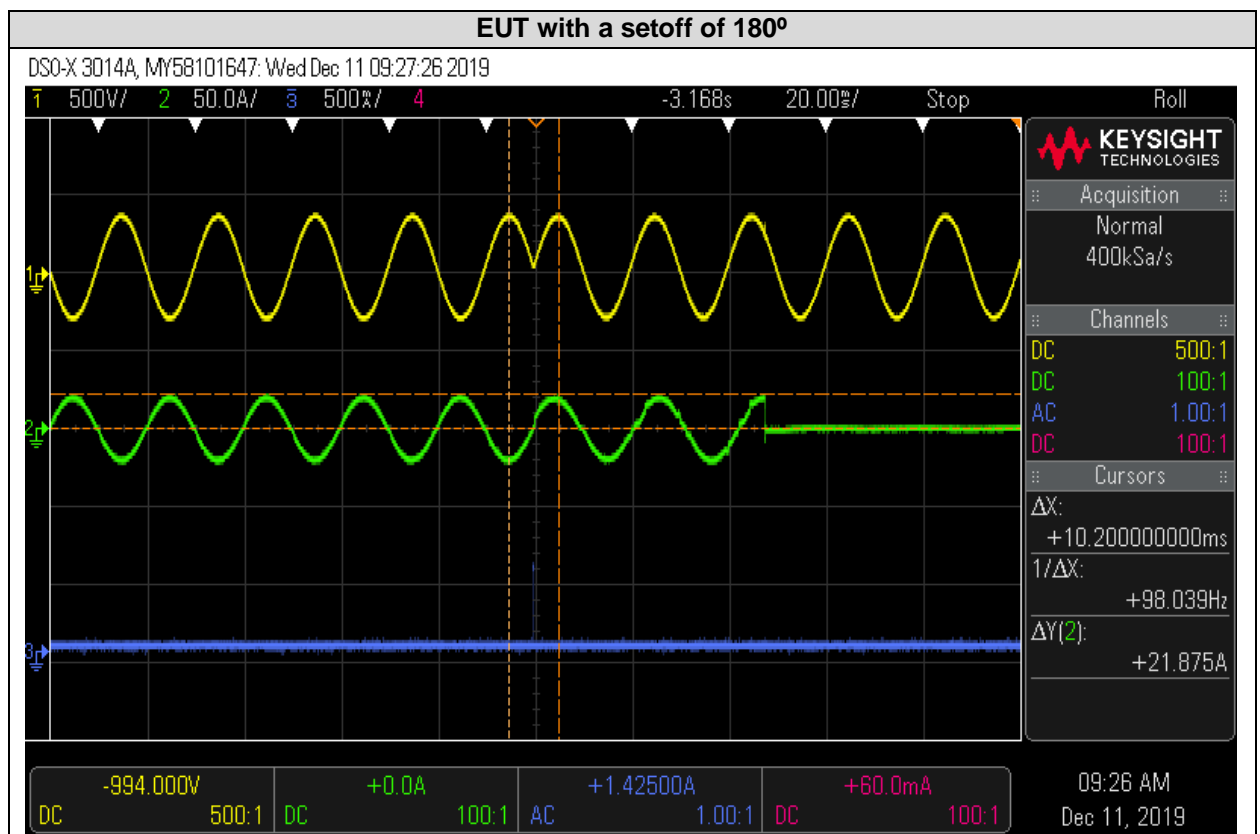
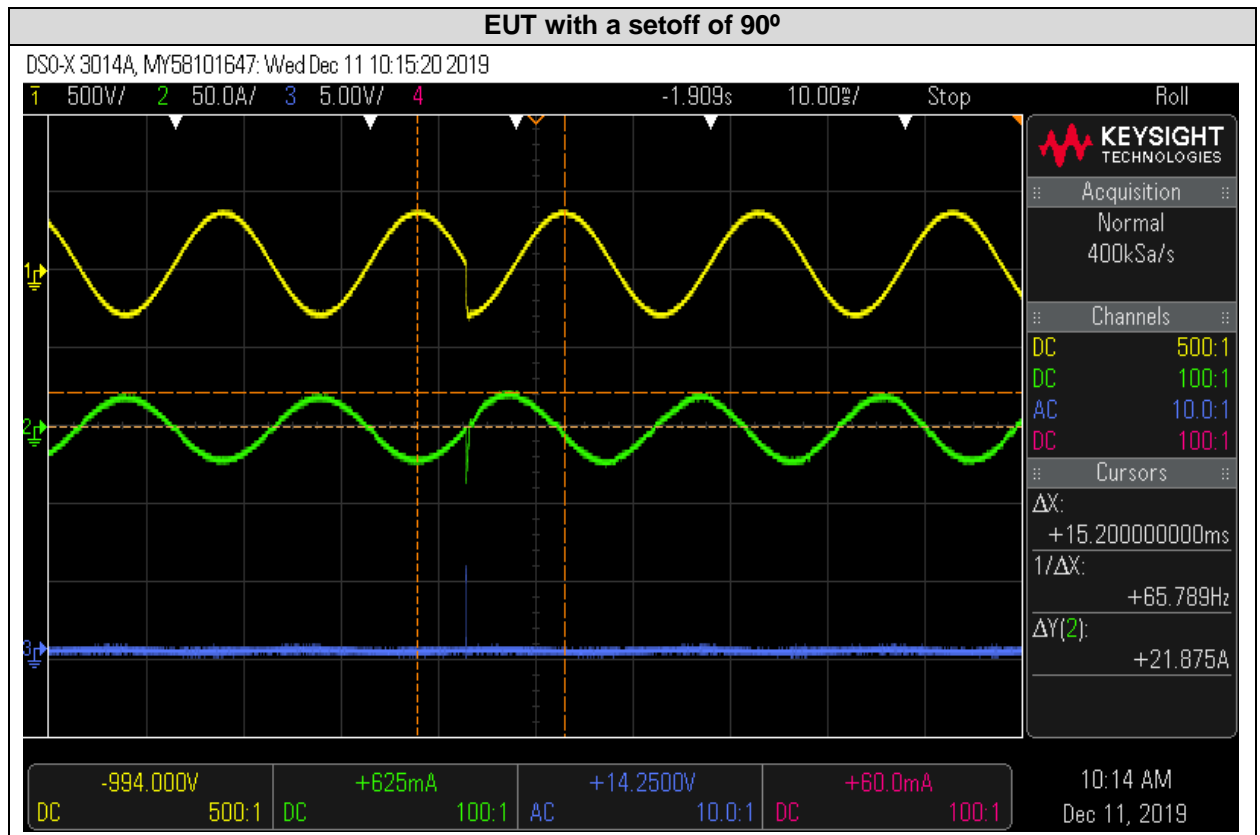
2019/11/08 15:33:58

4.9 RECONNECTION OUT OF SYNCHRONISM

The compliances with these requirements are stated in following test report:

Setoff	Angle before the setoff	Angle after the setoff	Current 20 ms before the setoff	Current 200 ms after the setoff
90°	0°	90°	14.3	0.6
180°	0°	180°	14.3	0.7

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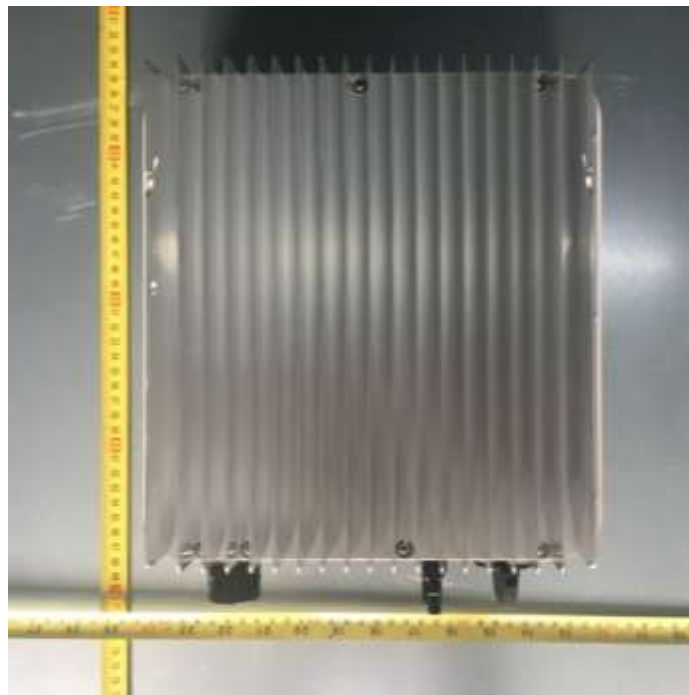


5 PICTURES

Front view 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Back view 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



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Front view 2 (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)

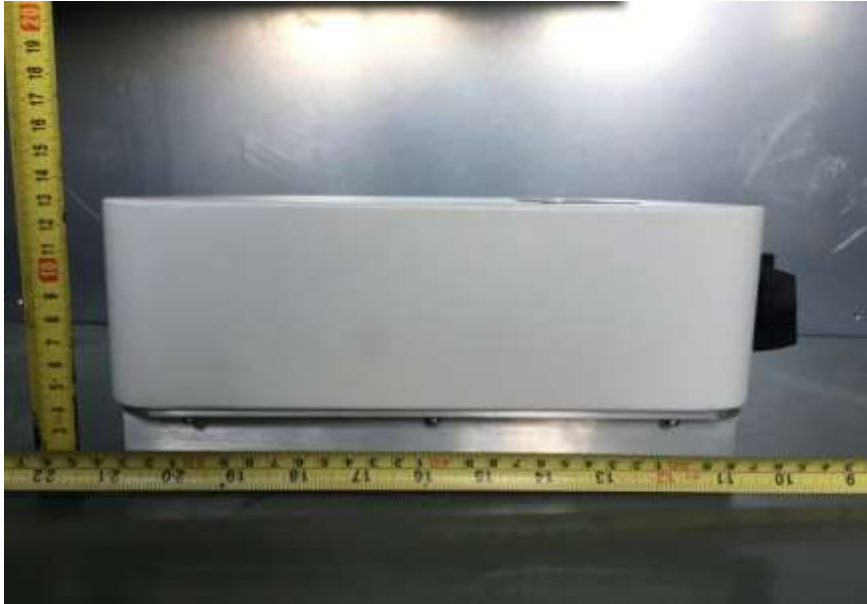


Back view 2 (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



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Side View (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Side View (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



Internal view of enclosure (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



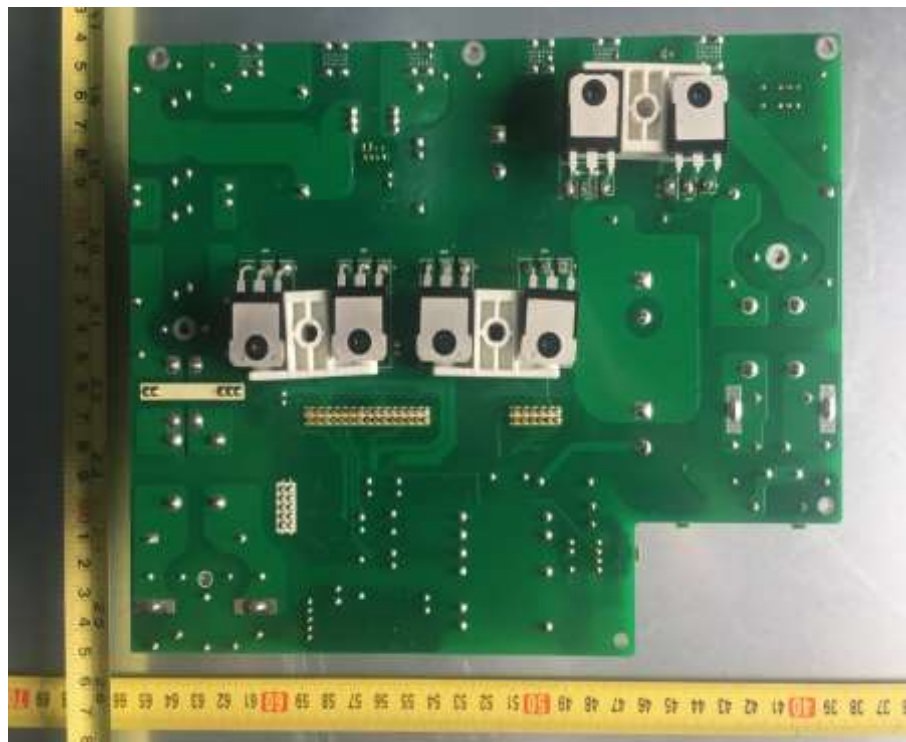
Internal view of enclosure (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



Front side of main board 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Back side of main board 1 (SOFAR 2700TL-G3, SOFAR 3000TL-G3, SOFAR 3300TL-G3)



Front side of main board 2 (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)

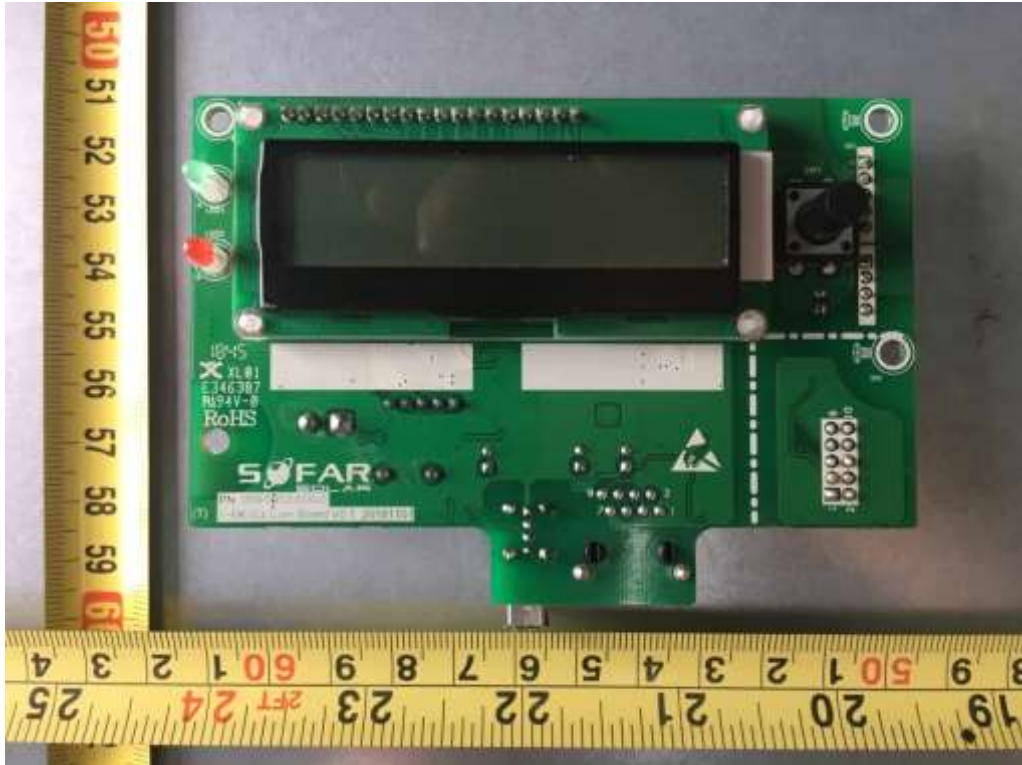


Back side of main board 2 (SOFAR 1100TL-G3, SOFAR 1600TL-G3, SOFAR 2200TL-G3)



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Front side of Control board

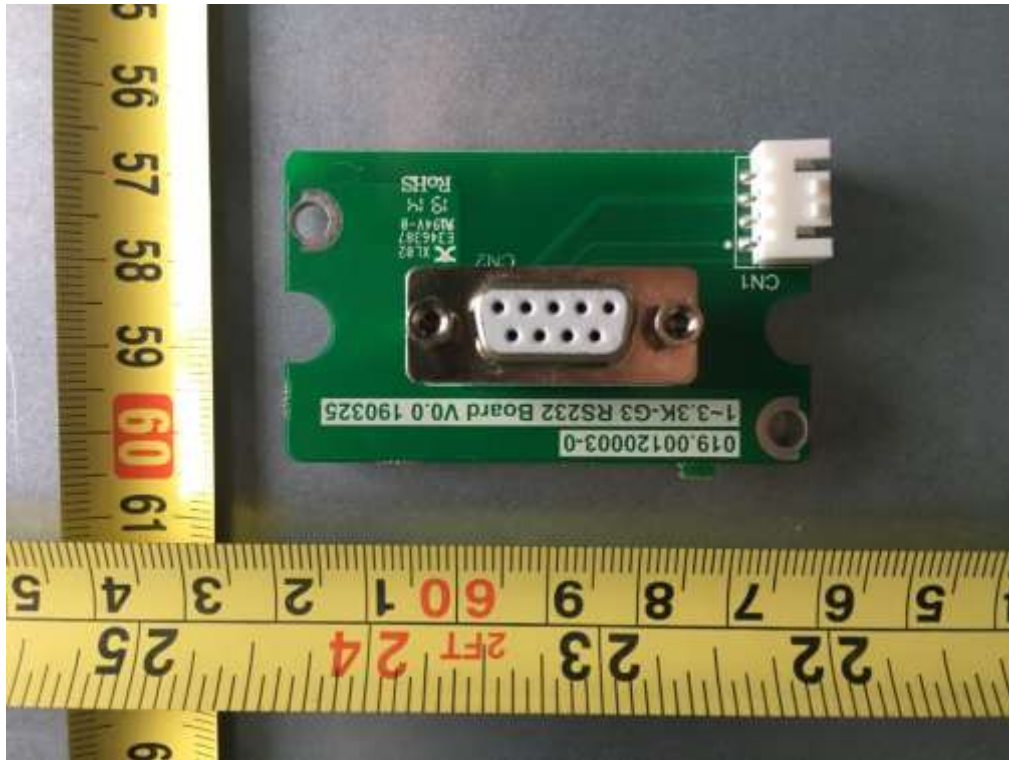


Front side of Control board

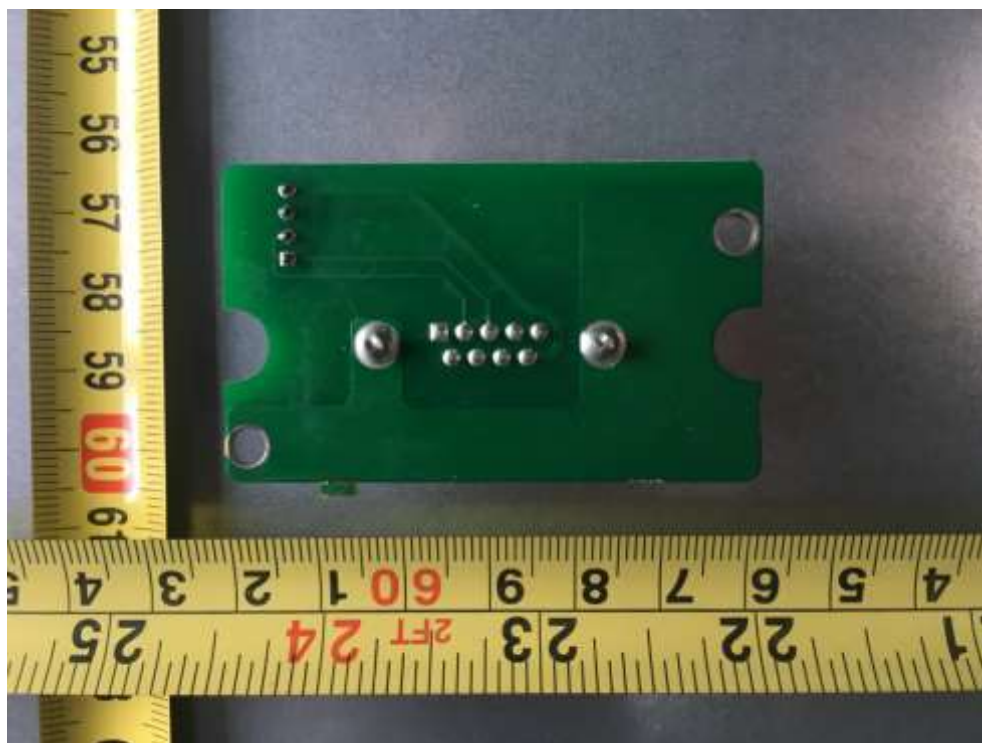


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Front view of RS 232 board



Back view of RS 232 board



Connection interface



Grounding

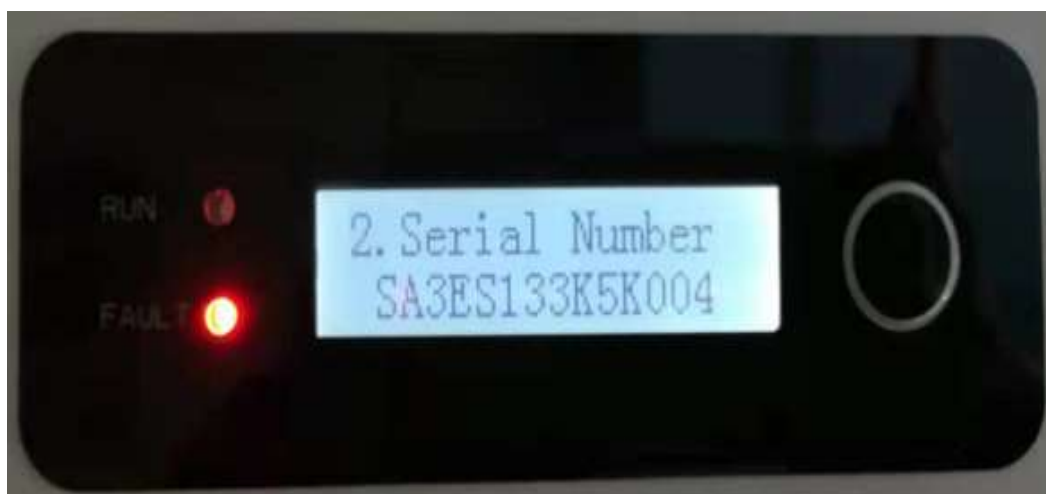


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ETU Software Number



ESE Software Number

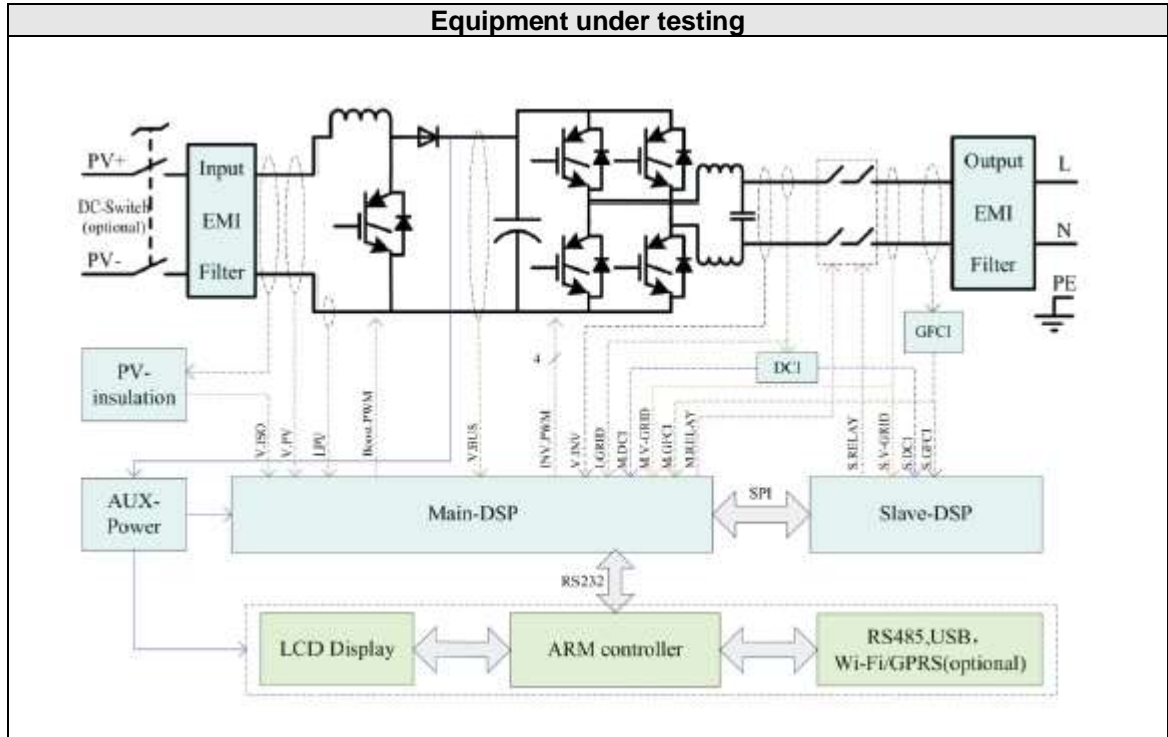


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Software version



6 ELECTRICAL SCHEME



-----END OF REPORT-----