

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 : 2219/0019-1

Trademark :



Tested Model : HYD 6000-ES

Variants Models :
HYD 3000-ES
HYD 3600-ES
HYD 4000-ES
HYD 5000-ES

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)

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(Technical Reviewer)



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Test Report Historical Revision:

Test Report Version	Date	Resume
2219/0019-1	23/01/2019	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).

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2 GENERAL INFORMATION

2.1 Testing Period and Climatic conditions

The necessary testing has been performed along 8 working days between the 11th of December and the 18th of December of 2018.

All the tests and checks have been performed in accordance with the reference Standard (the tests are done at $\approx 25^{\circ}\text{C}$).

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: Hybrid Inverter
Manufacturer/ Supplier/ Installer: Shenzhen SOFARSOLAR Co., Ltd.
Trade mark: 
Type.....: HYD-ES
Model/ Type: HYD 6000-ES
Serial Number.....: ZM1ES060J8A025
Serial Number ESE: ZM1ES060J11111
Software Version: V1.30
Rated Characteristics: DC input: 90-580V for MPPT Max. 12 A x 2 and 42-58V for battery, Max. 70 A
AC output: 230Vac, 50/60Hz, 27.3A, 6000VA

Date of manufacturing: 2018

Test item particulars

Input.....: PV and Batteries
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: Natural Convection
Modular.....: No
Internal Transformer: No

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Copy of marking plate (representative):

SOFAR Hybrid Inverter	
Model No.	HYD 3000-ES
Max. DC Input Voltage	600V
Operating MPPT Voltage Range	90V-580V
MAX. PV Isc	2x15A
Battery Type	Lead-acid/Lithium-ion
Battery Voltage Range	42-58V
Max. Charging Current	65A
Max. Discharging Current	70A
Max. Charging&Discharging Power	3000VA
Nominal Grid Voltage	230V _{ac}
Nominal Output Voltage	230V _{ac}
Max. Output Current	13.7A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable±0.8)
Nominal Output Power	3000VA
Backup Rated Current	13.2A
Backup Rated Apparent Power	3000VA
Ingress Protection	IP65
Operating Temperature Range	-25~+60°C
Protective Class	Class I
Manufacturer: Shenzhen SOFARSOLAR Co., Ltd. Address: 401, Building 4, AnTongDa Industrial Park, District 66, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1, VDE-AR-N 4105, GB312, EN50438, C10/11, ASA4777, RD1699, UTE C15-712-1	

SOFAR Hybrid Inverter	
Model No.	HYD 3600-ES
Max. DC Input Voltage	600V
Operating MPPT Voltage Range	90V-580V
MAX. PV Isc	2x15A
Battery Type	Lead-acid/Lithium-ion
Battery Voltage Range	42-58V
Max. Charging Current	65A
Max. Discharging Current	70A
Max. Charging&Discharging Power	3000VA
Nominal Grid Voltage	230V _{ac}
Nominal Output Voltage	230V _{ac}
Max. Output Current	15A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable±0.8)
Nominal Output Power	3600VA
Backup Rated Current	13.2A
Backup Rated Apparent Power	3000VA
Ingress Protection	IP65
Operating Temperature Range	-25~+60°C
Protective Class	Class I
Manufacturer: Shenzhen SOFARSOLAR Co., Ltd. Address: 401, Building 4, AnTongDa Industrial Park, District 66, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1, VDE-AR-N 4105, GB312, EN50438, C10/11, ASA4777, RD1699, UTE C15-712-1	

SOFAR Hybrid Inverter	
Model No.	HYD 4000-ES
Max. DC Input Voltage	600V
Operating MPPT Voltage Range	90V-580V
MAX. PV Isc	2x15A
Battery Type	Lead-acid/Lithium-ion
Battery Voltage Range	42-58V
Max. Charging Current	65A
Max. Discharging Current	70A
Max. Charging&Discharging Power	3000VA
Nominal Grid Voltage	230V _{ac}
Nominal Output Voltage	230V _{ac}
Max. Output Current	18.2A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable±0.8)
Nominal Output Power	4000VA
Backup Rated Current	13.2A
Backup Rated Apparent Power	3000VA
Ingress Protection	IP65
Operating Temperature Range	-25~+60°C
Protective Class	Class I
Manufacturer: Shenzhen SOFARSOLAR Co., Ltd. Address: 401, Building 4, AnTongDa Industrial Park, District 66, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1, VDE-AR-N 4105, GB312, EN50438, C10/11, ASA4777, RD1699, UTE C15-712-1	

SOFAR Hybrid Inverter	
Model No.	HYD 5000-ES
Max. DC Input Voltage	600V
Operating MPPT Voltage Range	90V-580V
MAX. PV Isc	2x15A
Battery Type	Lead-acid/Lithium-ion
Battery Voltage Range	42-58V
Max. Charging Current	65A
Max. Discharging Current	70A
Max. Charging&Discharging Power	3000VA
Nominal Grid Voltage	230V _{ac}
Nominal Output Voltage	230V _{ac}
Max. Output Current	22.8A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable±0.8)
Nominal Output Power	5000VA
Backup Rated Current	13.2A
Backup Rated Apparent Power	3000VA
Ingress Protection	IP65
Operating Temperature Range	-25~+60°C
Protective Class	Class I
Manufacturer: Shenzhen SOFARSOLAR Co., Ltd. Address: 401, Building 4, AnTongDa Industrial Park, District 66, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1, VDE-AR-N 4105, GB312, EN50438, C10/11, ASA4777, RD1699, UTE C15-712-1	

SOFAR Hybrid Inverter	
Model No.	HYD 6000-ES
Max. DC Input Voltage	600V
Operating MPPT Voltage Range	90V-580V
MAX. PV Isc	2x15A
Battery Type	Lead-acid/Lithium-ion
Battery Voltage Range	42-58V
Max. Charging Current	65A
Max. Discharging Current	70A
Max. Charging&Discharging Power	3000VA
Nominal Grid Voltage	230V _{ac}
Nominal Output Voltage	230V _{ac}
Max. Output Current	27.3A
Nominal Grid Frequency	50/60Hz
Power Factor	1(adjustable±0.8)
Nominal Output Power	6000VA
Backup Rated Current	13.2A
Backup Rated Apparent Power	3000VA
Ingress Protection	IP65
Operating Temperature Range	-25~+60°C
Protective Class	Class I
Manufacturer: Shenzhen SOFARSOLAR Co., Ltd. Address: 401, Building 4, AnTongDa Industrial Park, District 66, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China VDE0126-1-1, VDE-AR-N 4105, GB312, EN50438, C10/11, ASA4777, RD1699, UTE C15-712-1	

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

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Equipment under testing:

- **HYD 6000-ES**

The variants models are:

- **HYD 3000-ES**
- **HYD 3600-ES**
- **HYD 4000-ES**
- **HYD 5000-ES**

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 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

From	No.	Equipment Name	MARK/Model No.	Equipment No.	Equipment calibration due date
Sofarsolar	1	Digital oscilloscope	Agilent / DSO5014A	MY50070266	2019-02-27
	2	Current clamp	FLUKE / i1000s	32233919	2019-02-27
	3	Current clamp	FLUKE / i1000s	30413452	2019-02-27
	4	Current clamp	FLUKE / i1000s	30413448	2019-02-27
	5	Differential probe	Sanhua / SI-9110	153200	2019-02-27
	6	Differential probe	Sanhua / SI-9110	152655	2019-02-27
	7	Differential probe	Sanhua / SI-9110	111539	2019-02-27
	8	Power analyzer	ZLG / PA3000	703010002	2019-02-27
	9	Temperature & Humidity meter	Anymetre/ TH101B	SH-W001	2019-02-28
	10	Multimeter	FLUKE / 87C	001	2019-02-27
	11	Power analyzer	Yokogawa / WT3000	91N61088	2019-02-27
	12	Digital oscilloscope	KEYSIGHT/ DSOX3024T	MY57251898	2019-02-27
SGS	13	True RMS Multimeter	Fluke / 289C	GZE012-53	2019-03-05

2.4 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.

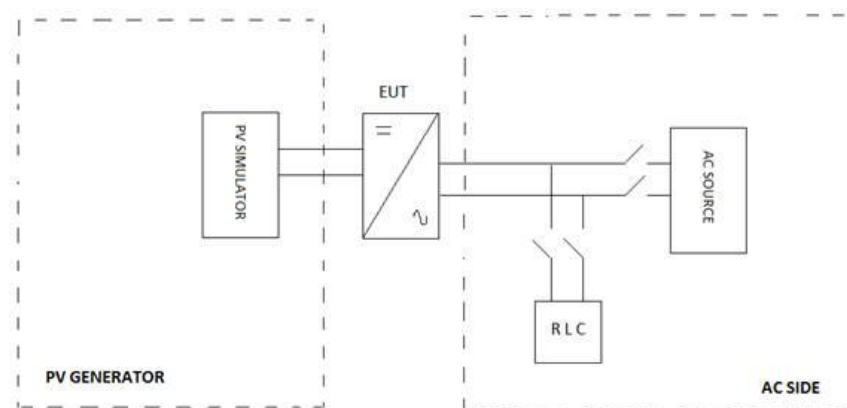
Note2: Where the standard requires lower uncertainties that those in this table. Most restrictive uncertainty has been considered.

2.5 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

2.6 Test set up.

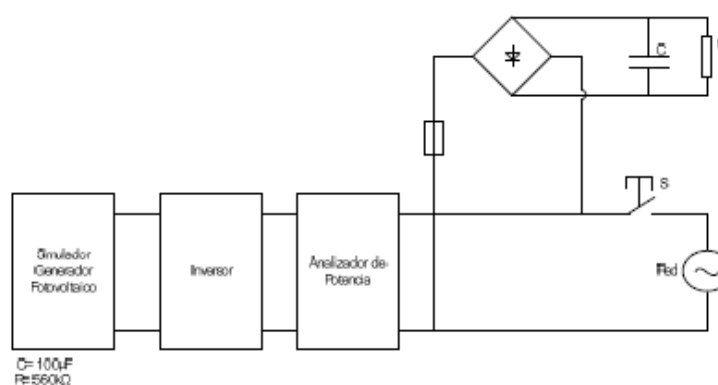
Below is the simplified construction of the test set up.



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	Chroma / 61860	100KVA 10-300Vrms 45-65Hz	--
DC source	Chroma / 62150H-1000S	0 – 1000Vdc (0.01V step) 0 – 40A (0.01A step)	--

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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	P
5.3	Fault tolerance of residual current monitoring	P
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.

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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 $\leq 0.5\%I_n$.

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

- CEI 0-21: Test Report no. 18TH0539-CEI 0-21_0 on 2018/11/26 which issued by Bureau Veritas Consumer Products Services Germany GmbH.

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.

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

- IEC/EN 62109-1:2010, IEC/EN 62109-2:2011: Test Report no. LD180903N042-R1 on 2018/12/04 which issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

4.3 DETECTION OF RESIDUAL CURRENT MONITORING IN THE PV

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

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

- IEC/EN 62109-1:2010, IEC/EN 62109-2:2011: Test Report no. LD180903N042-R1 on 2018/12/04 which issued by Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

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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 413/2014 have been considered.

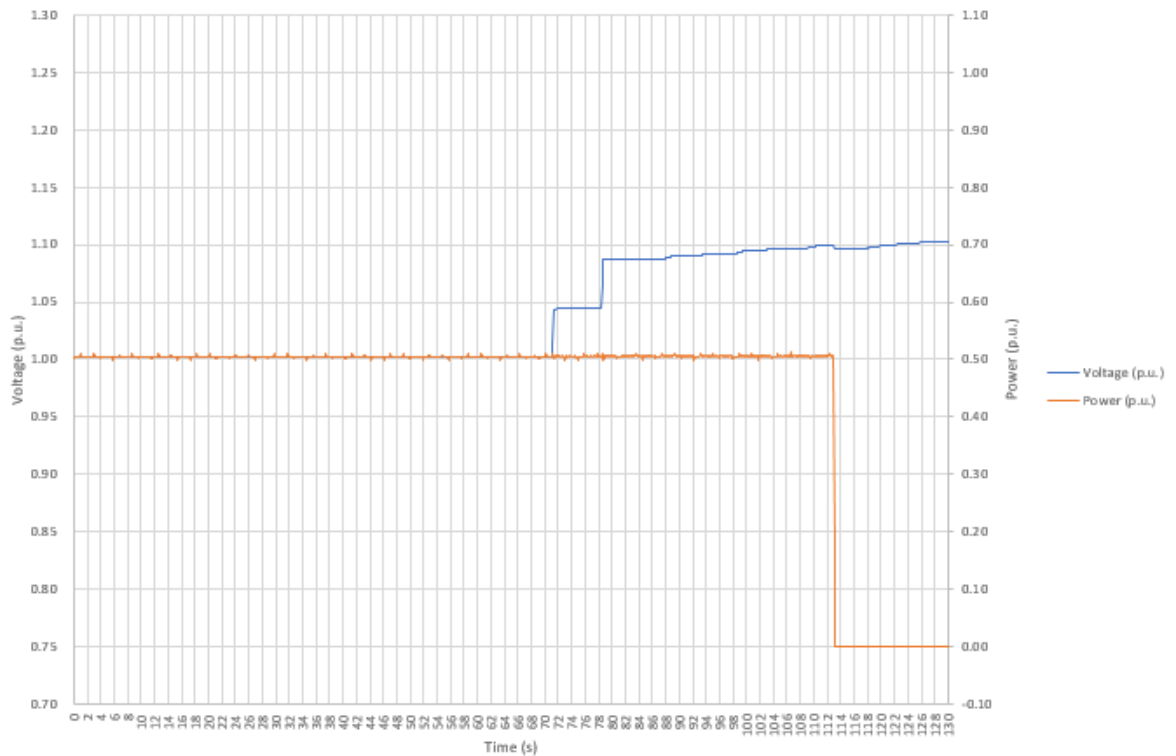
4.4.1 Voltage

Voltage trip value	Voltage trip value measured (%Un)	Disconnection time measured (s)	Disconnection time measured (s)
Un+10%Un	109.9%	<1.500	1.435
Un+15%Un	114.6%	<0.200	0.188
Un-15%Un	85.3%	<1.500	1.430

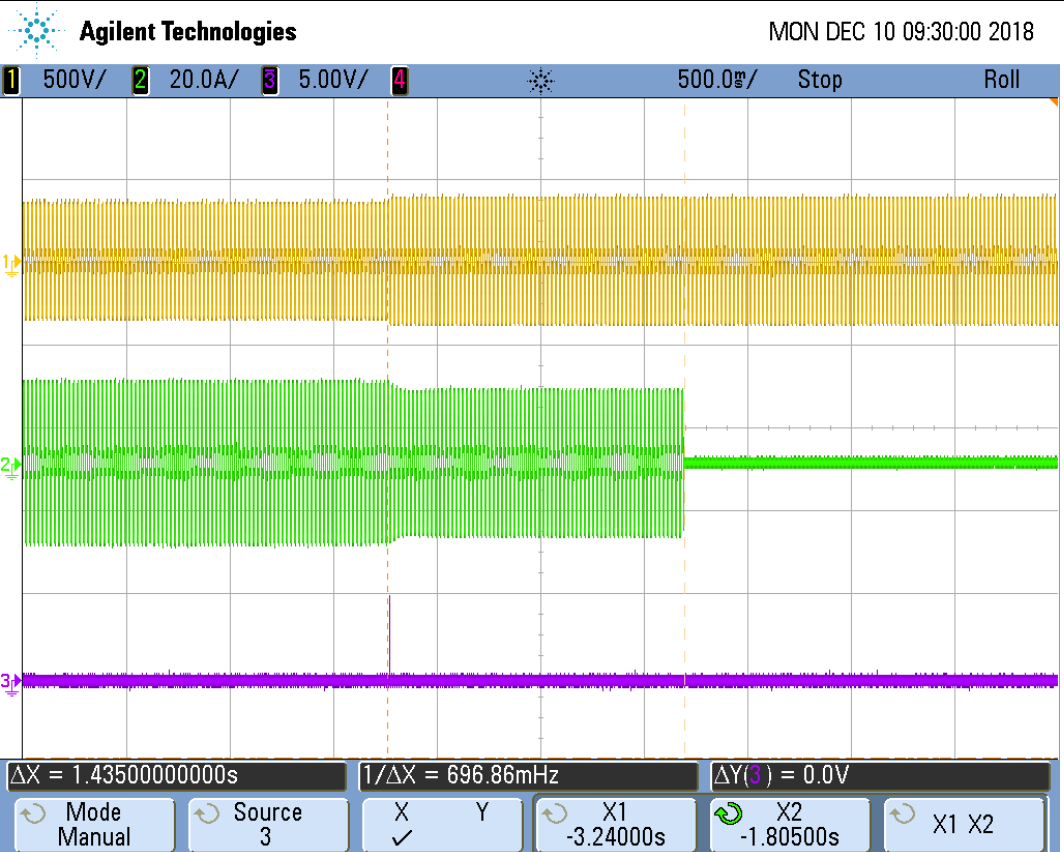
Test results are graphically shown in following pages.

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Voltage measured: Un+10%Un

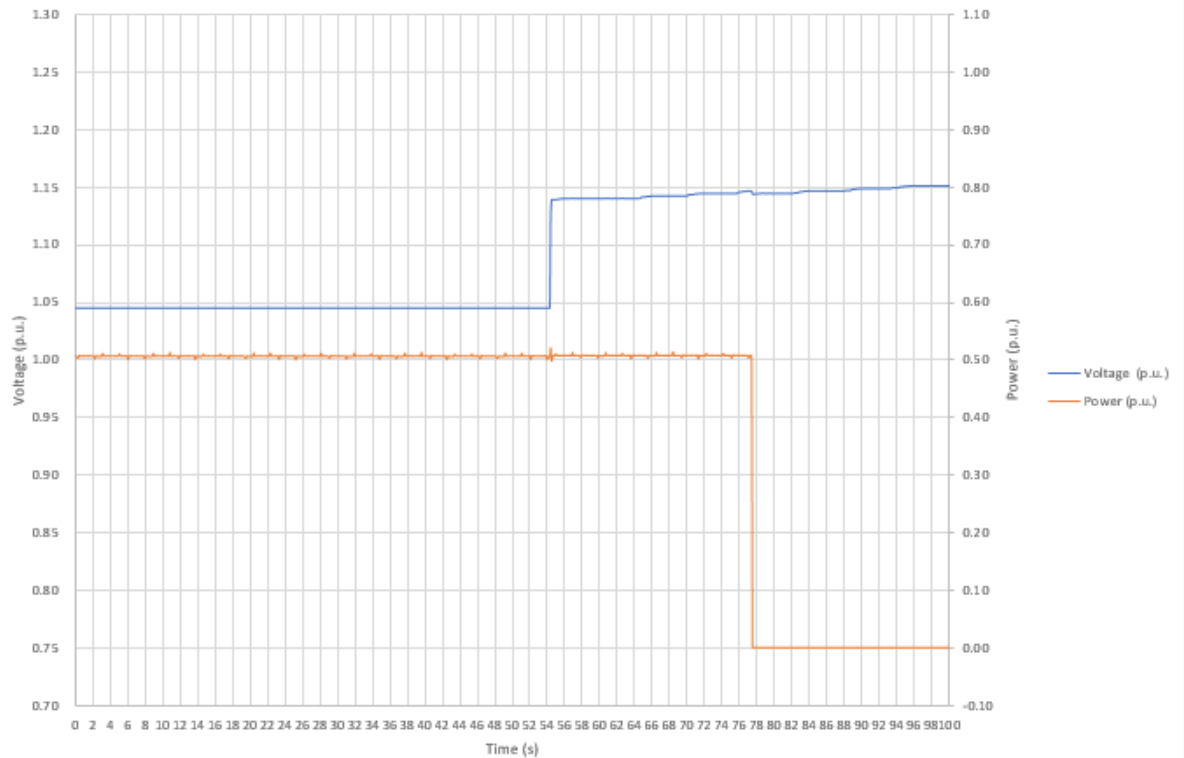


Voltage Trip Time: Un+10%Un

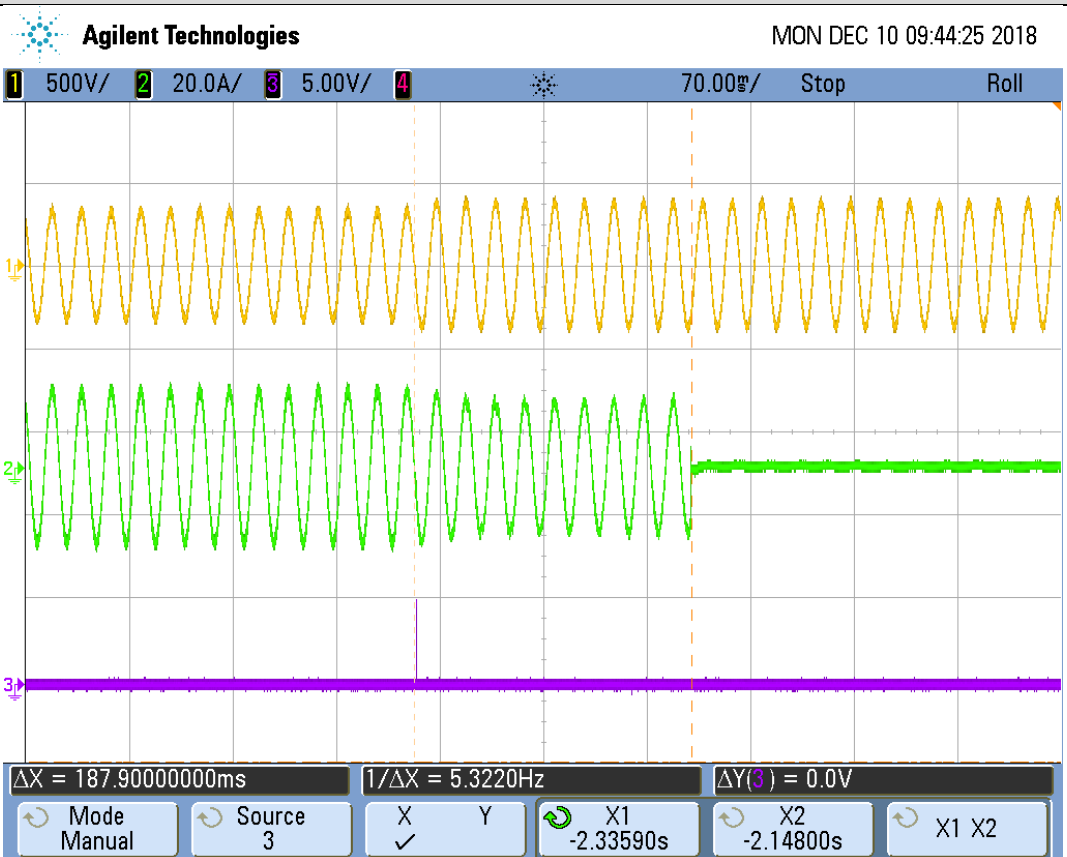


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Voltage measured: Un+15%Un

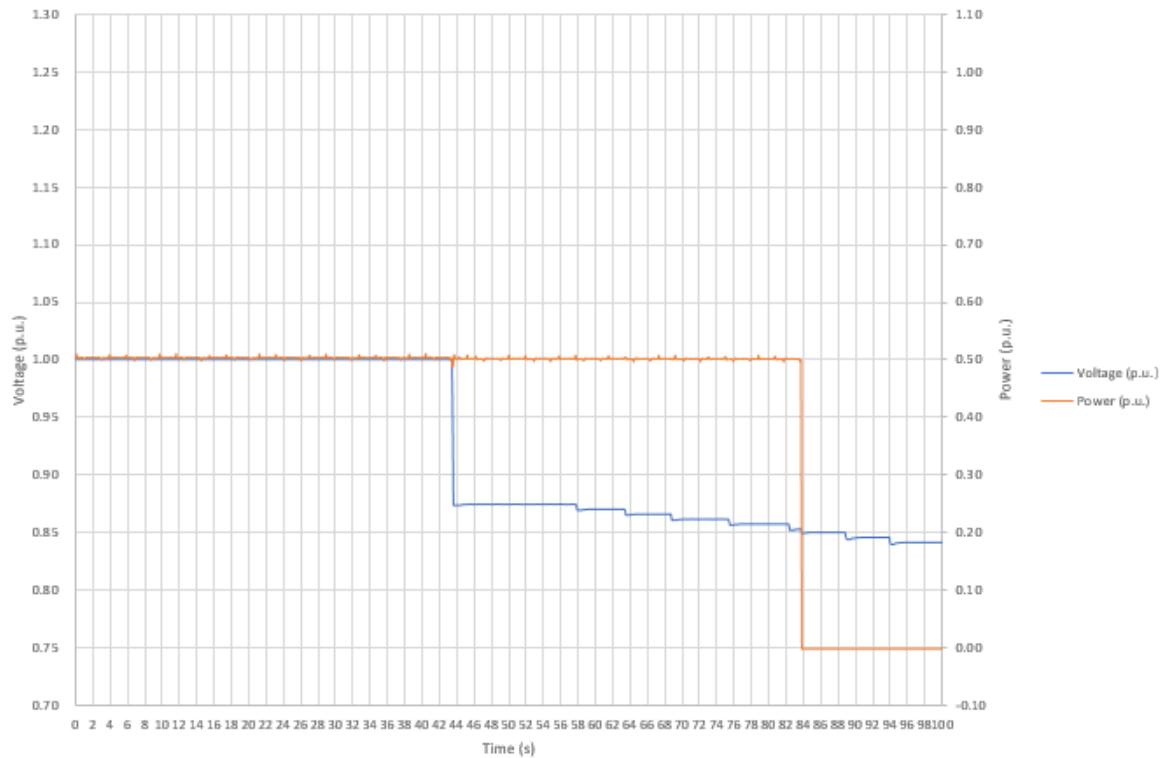


Voltage Trip Time: Un+15%Un

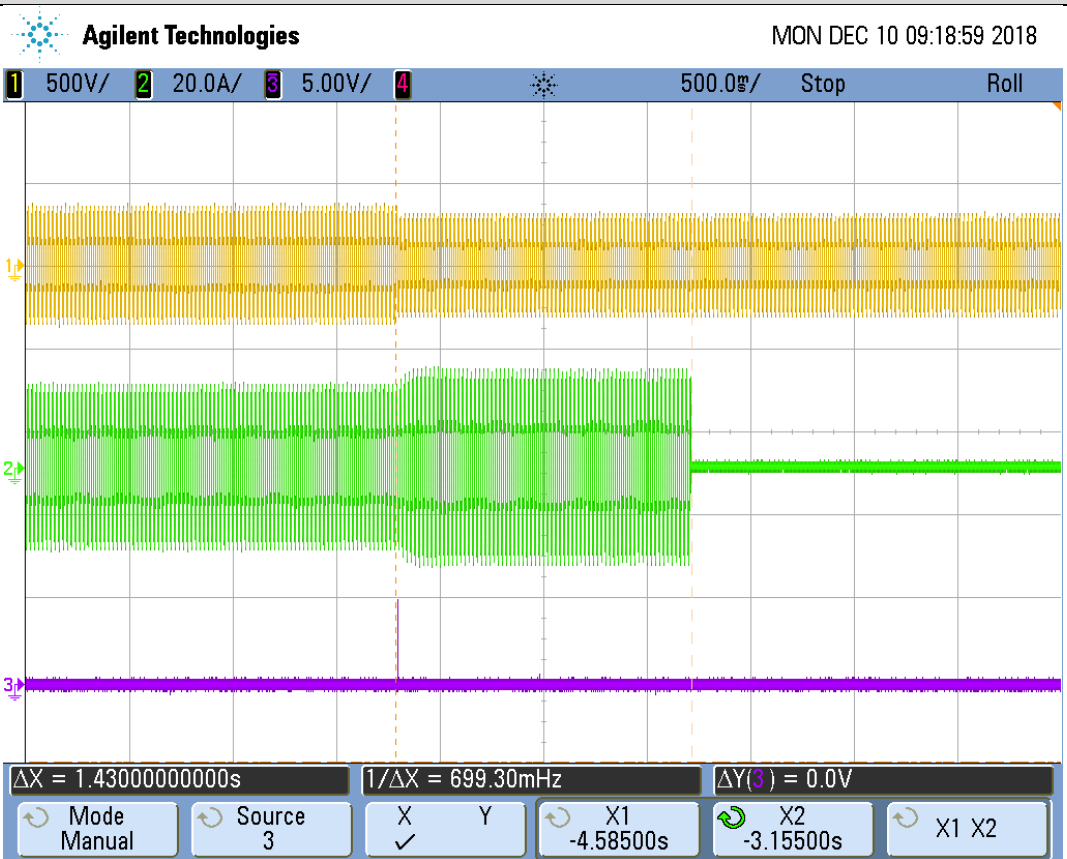


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Voltage measured: Un-15%Un



Voltage Trip Time: Un-15%Un



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4.4.2 *Frequency disconnection*

Frequency (Hz)	Disconnection time limits (s)	Disconnection time measured (s)
51	< 0.5*	0.428*
48	> 3.0**	3.330**

(*) For the maximum frequency limit (51Hz), the maximum disconnection time is 0.5s.

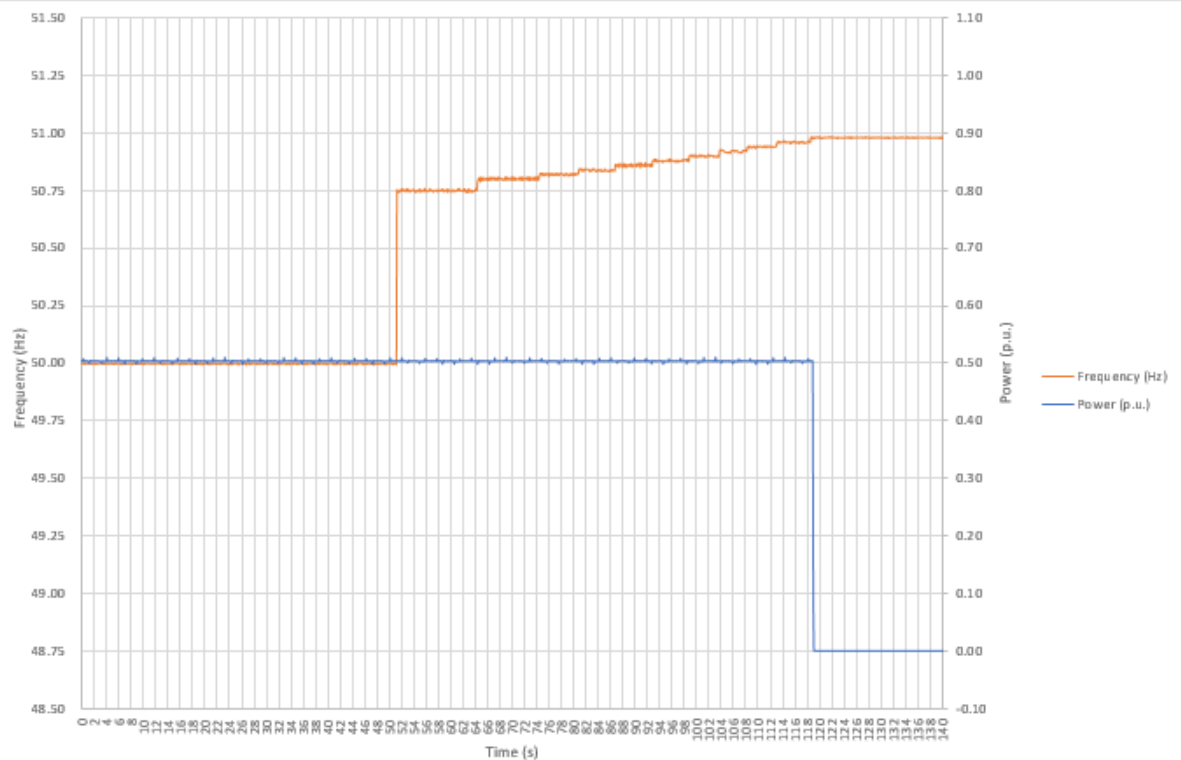
(**) For the minimum frequency limit (48Hz), the minimum disconnection time is 3.0s.

Test results are graphically shown in following pages.

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Frequency measured: 51 Hz

Trip value



Disconnection time



Agilent Technologies

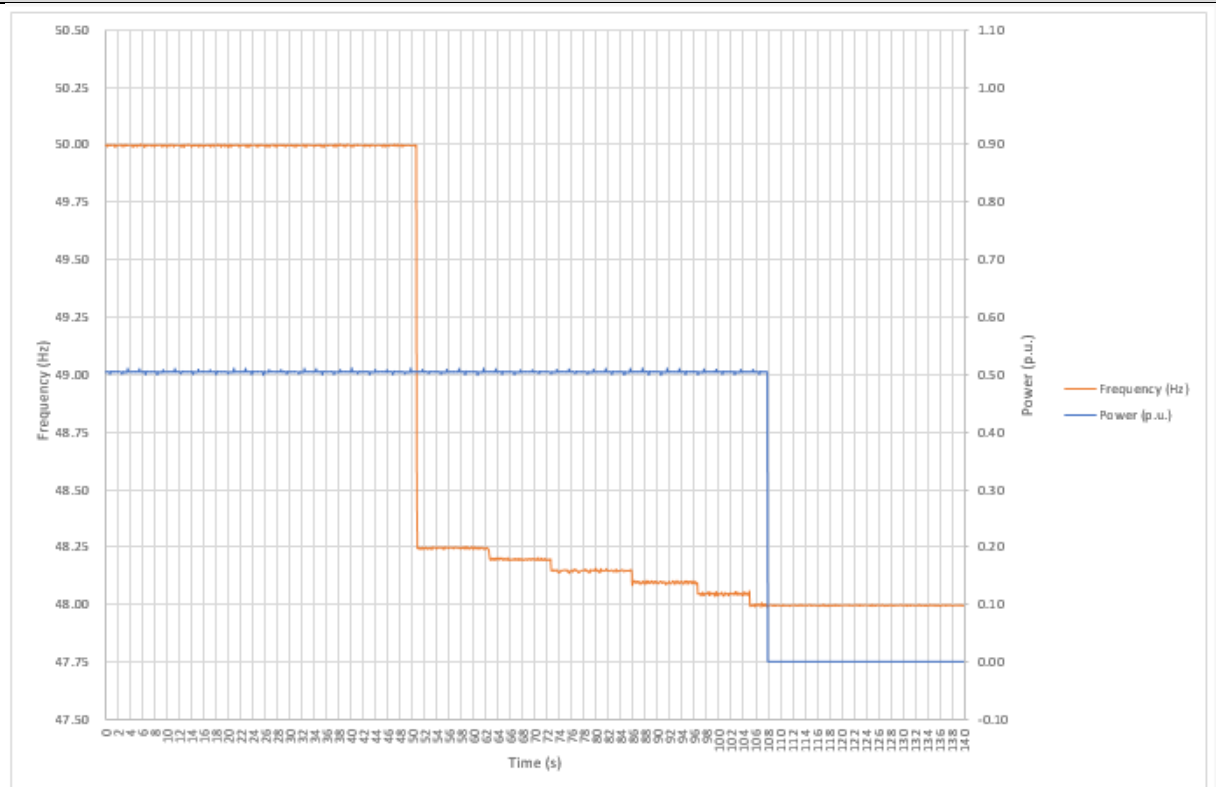
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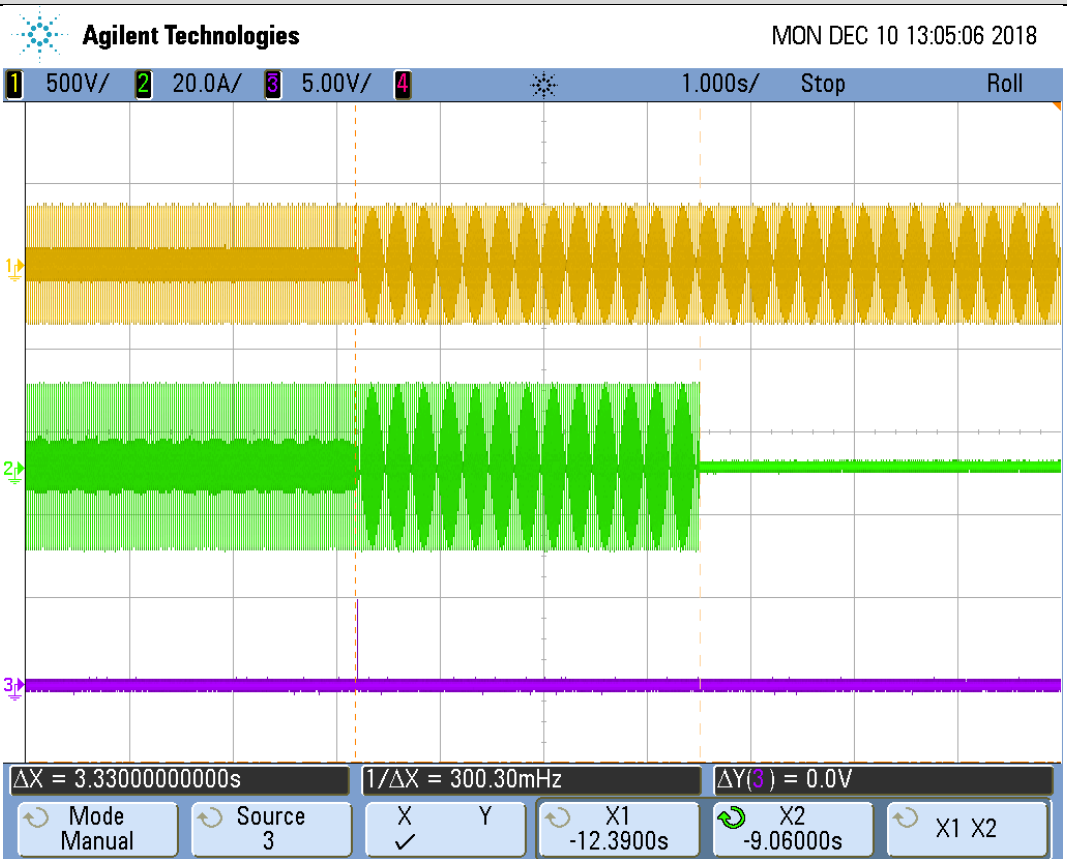
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Frequency measured: 48 Hz

Trip value



Disconnection time



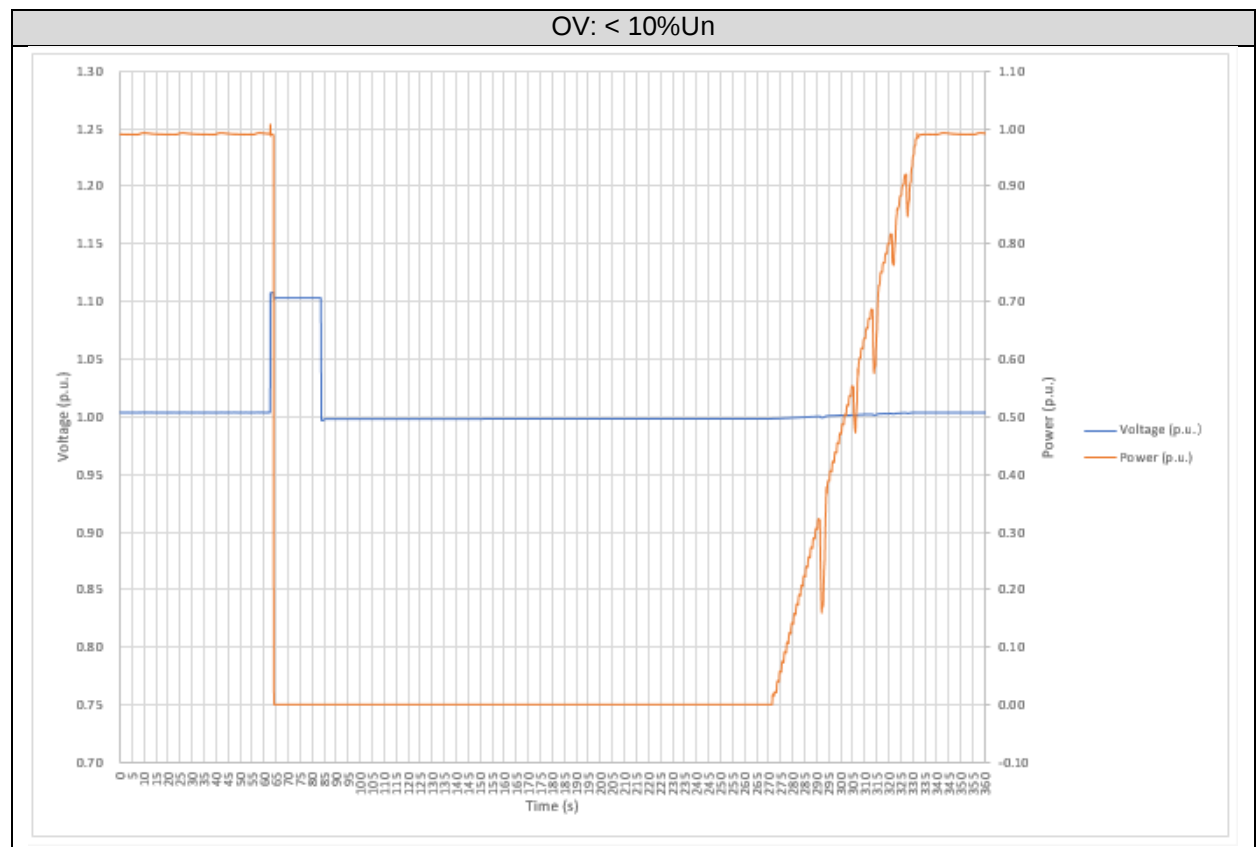
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4.5 SELF RECONNECTION

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

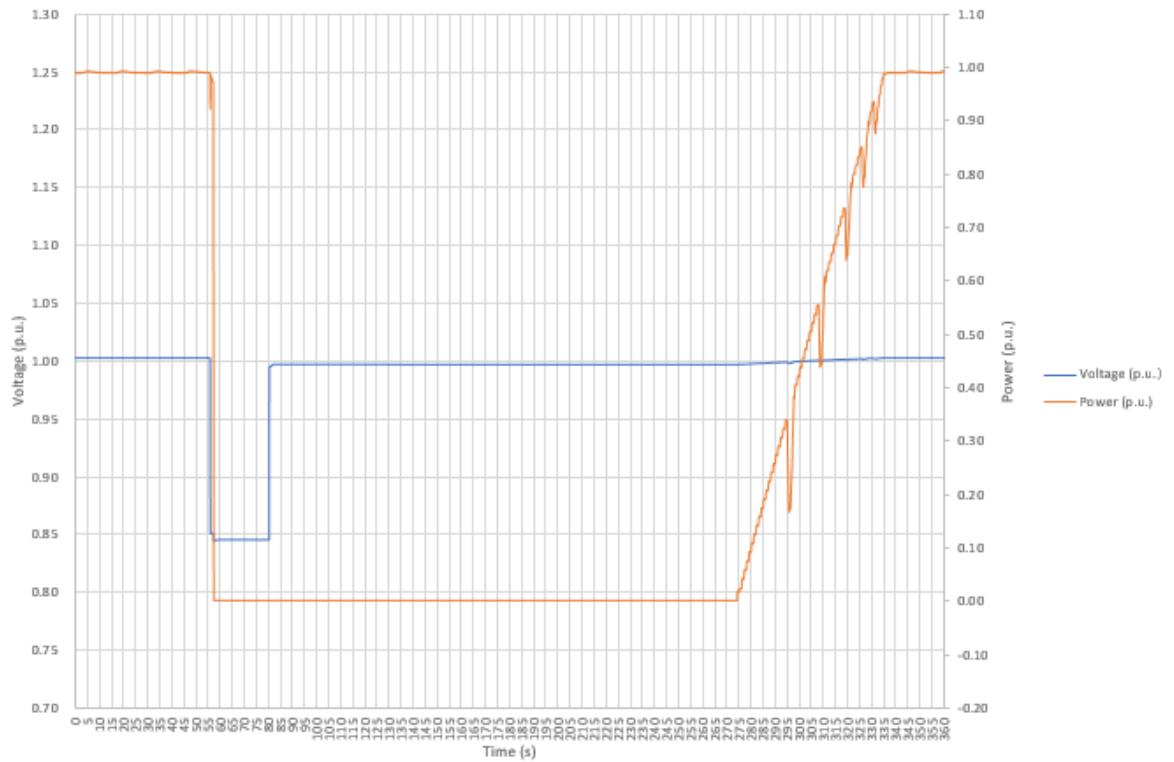
The inverter must be capable to reconnect when voltage and frequency are within the normal ranges according to standard.

Type	Delay time	Time measured (s)
OV: < 10%Un	>3 min	187.7
UV: > 15%Un	>3 min	193.9
OF: < 50.5 Hz	>3 min	187.6
UF: > 48.0 Hz	>3 min	187.6

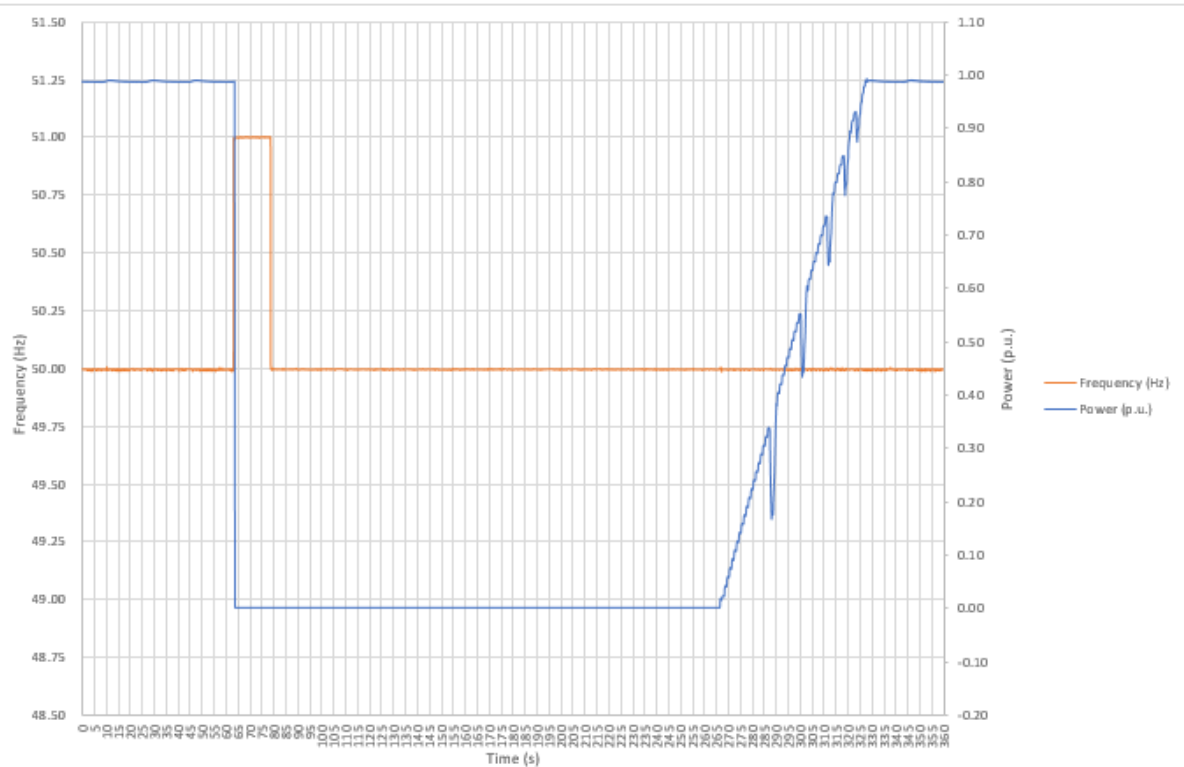


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UV: > 15%Un

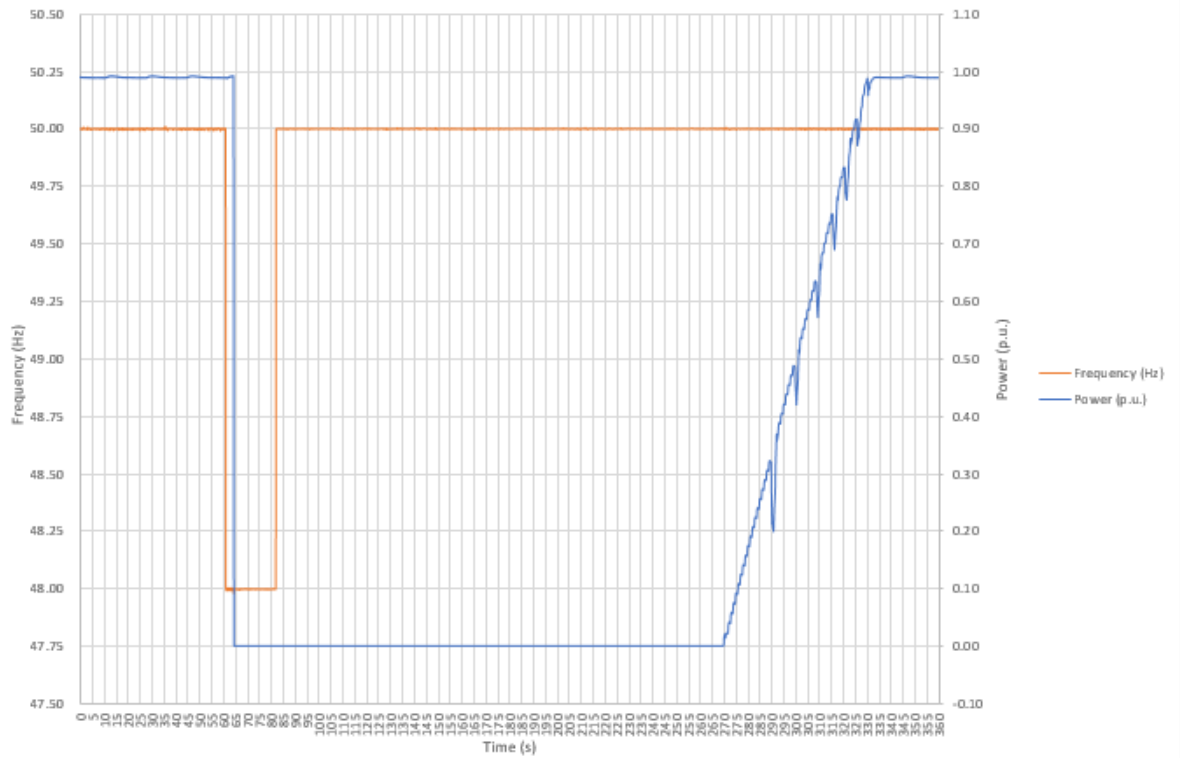


OF: < 50.5 Hz



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UF: > 48 Hz



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%P_n, Test C is at 33%P_n

As the inverter can be connected to the LV network, compliances with these requirements have been verified according to the standard UNE 206006. 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.

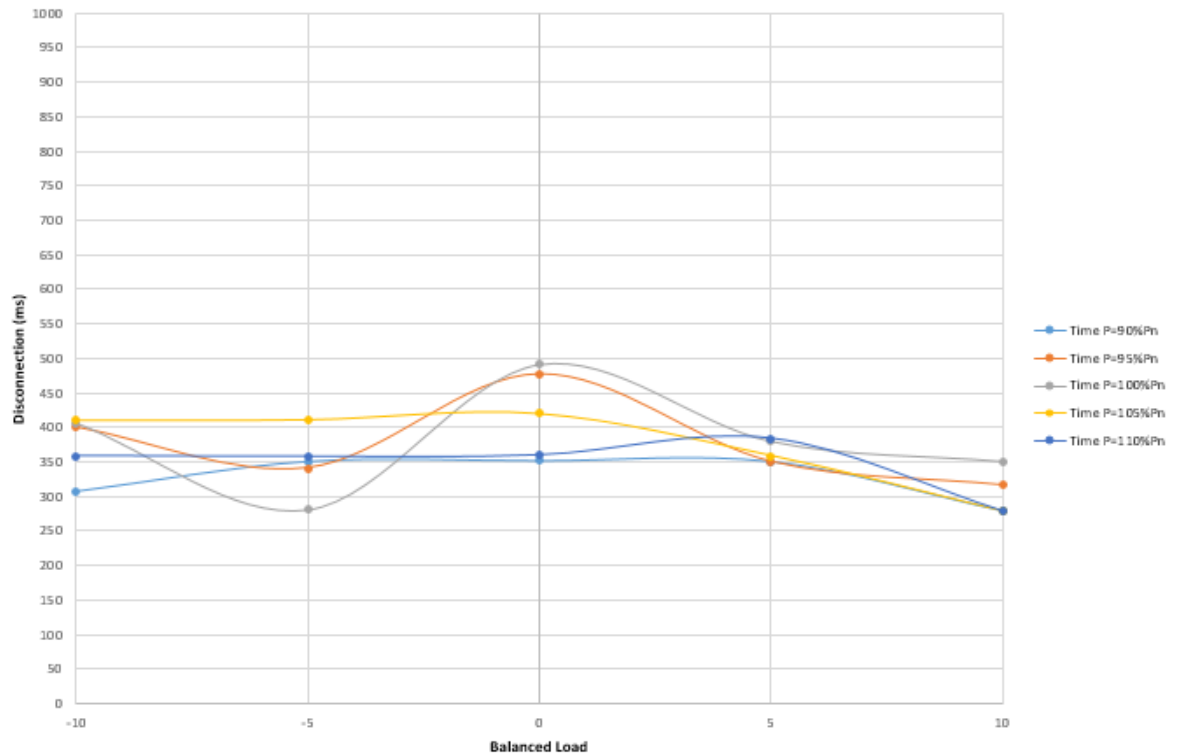
Condition 3: EUT and ESE with islanding prevention deactivated.

4.6.1 Active Power > 90% P_n. Test A

Balanced Load		Disconnection (ms) (limit at t=2s)
M (%)	N (%)	
-10	+10	280
-10	+5	351
-10	0	352
-10	-5	351
-10	-10	308
-5	+10	316
-5	+5	350
-5	0	477
-5	-5	341
-5	-10	400
0	+10	351
0	+5	380
0	0	491
0	-5	281
0	-10	407
+5	+10	278
+5	+5	359
+5	0	420
+5	-5	411
+5	-10	410
+10	+10	279
+10	+5	384
+10	0	360
+10	-5	358
+10	-10	359

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Curve for Test A



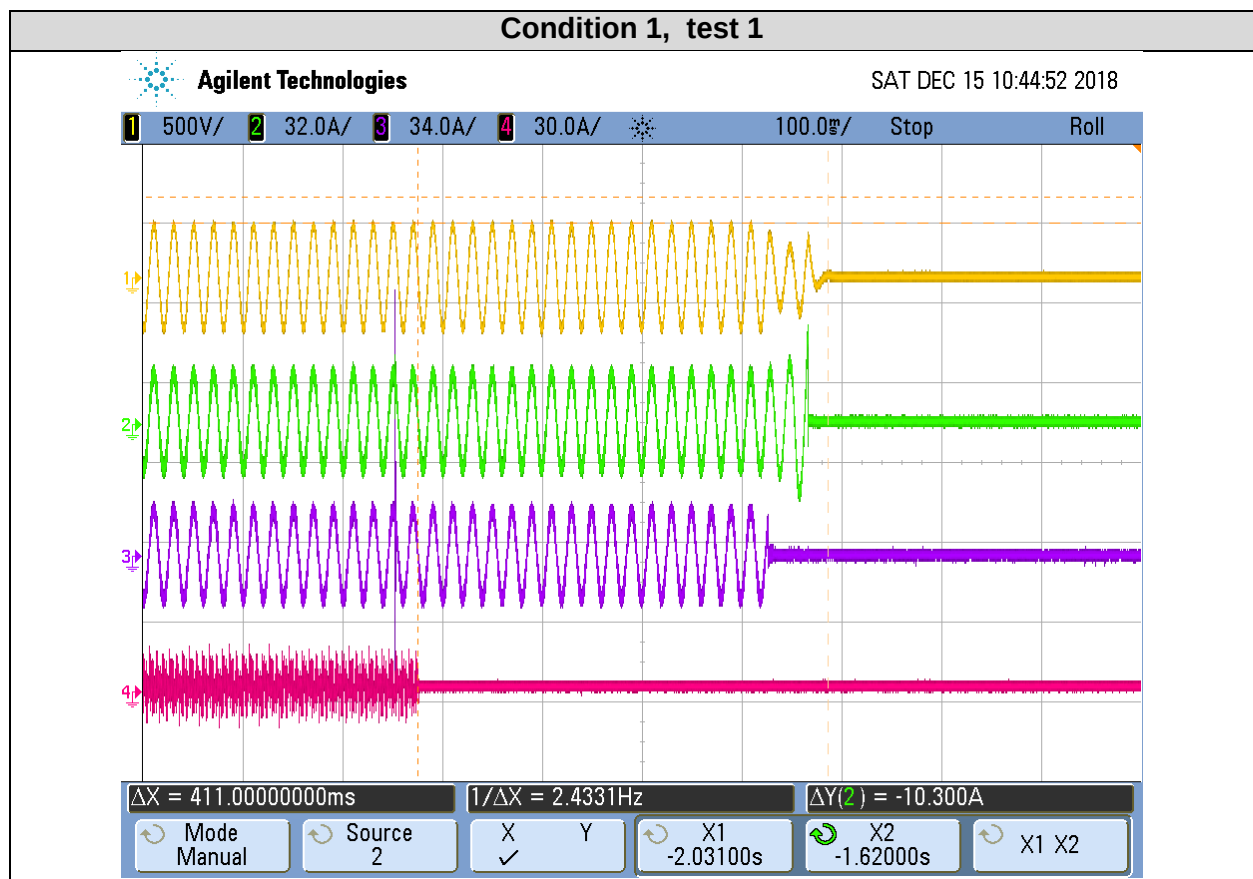
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Conditions	P (kw)	Qc(KVAr)	Ql(KVAr)	Time limit (s)	Time measured (ms)
1	5.838	6.198	6.143	<2	411
1	5.838	6.198	6.143	<2	492
2	5.838	6.198	6.143	<2	466
2	5.838	6.198	6.143	<2	412
3	5.858	6.235	6.125	--	--

Condition 1: EUT and ESE with islanding prevention activated.

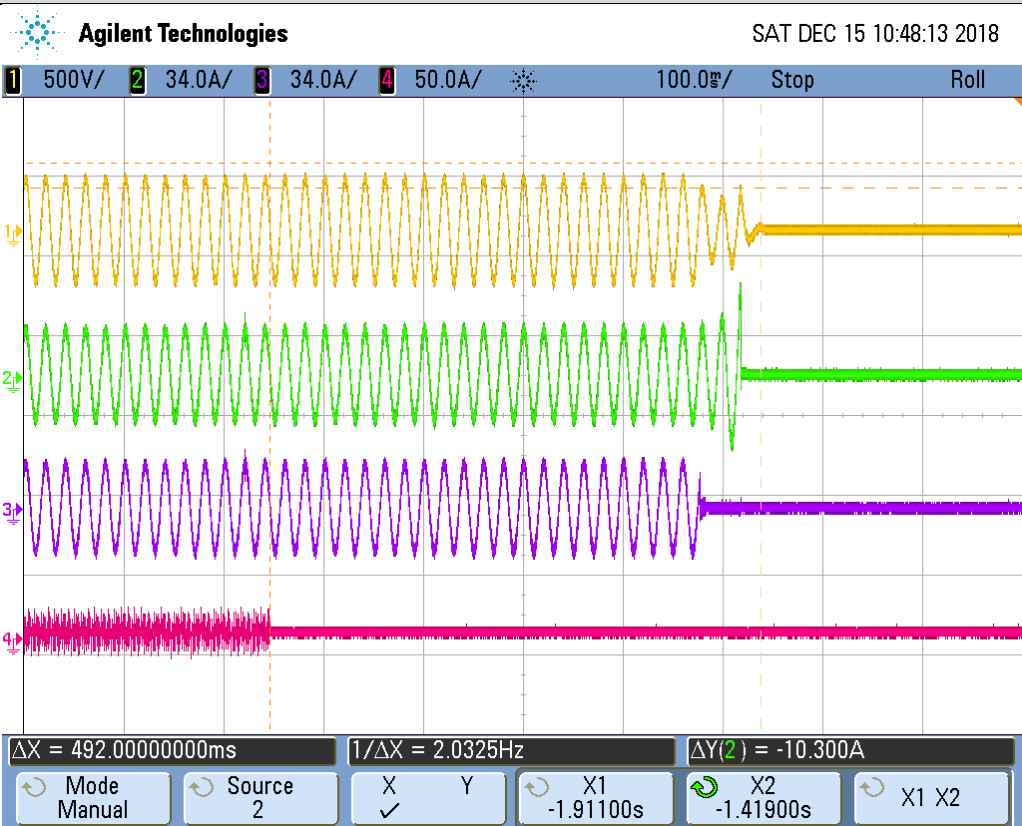
Condition 2: EUT with islanding prevention activated and ESE deactivated.

Condition 3: EUT and ESE with islanding prevention deactivated.

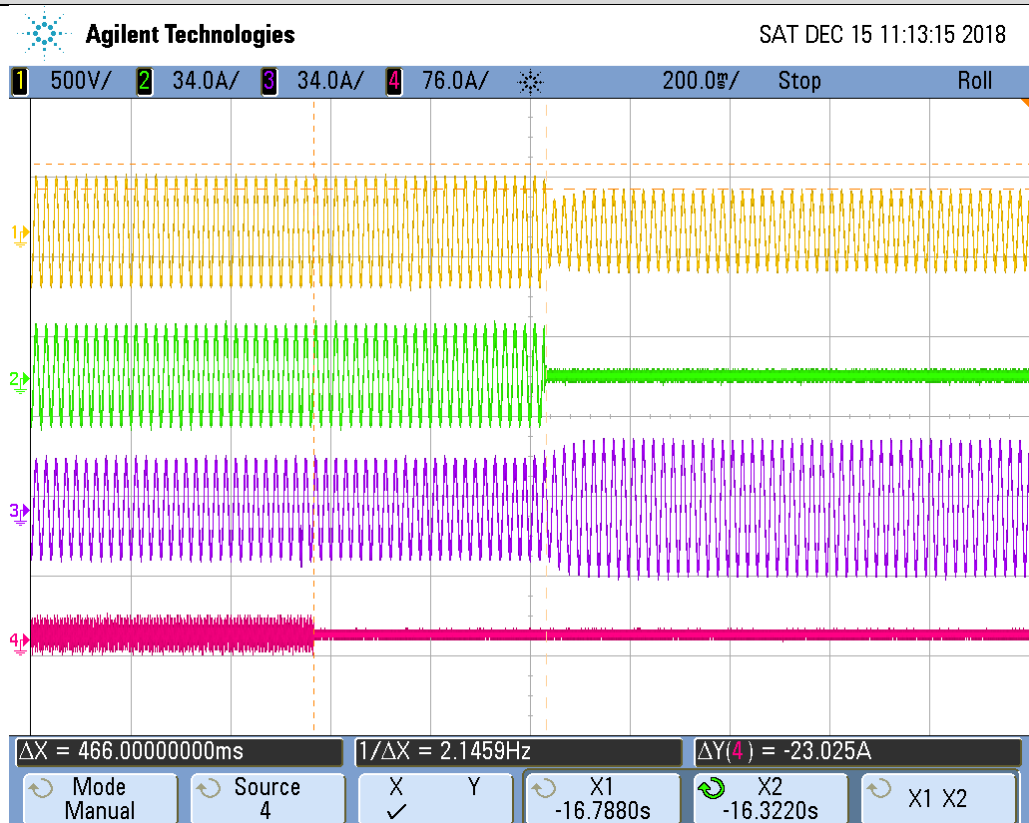


UNE 206 007-1 IN

Condition 1, test 2

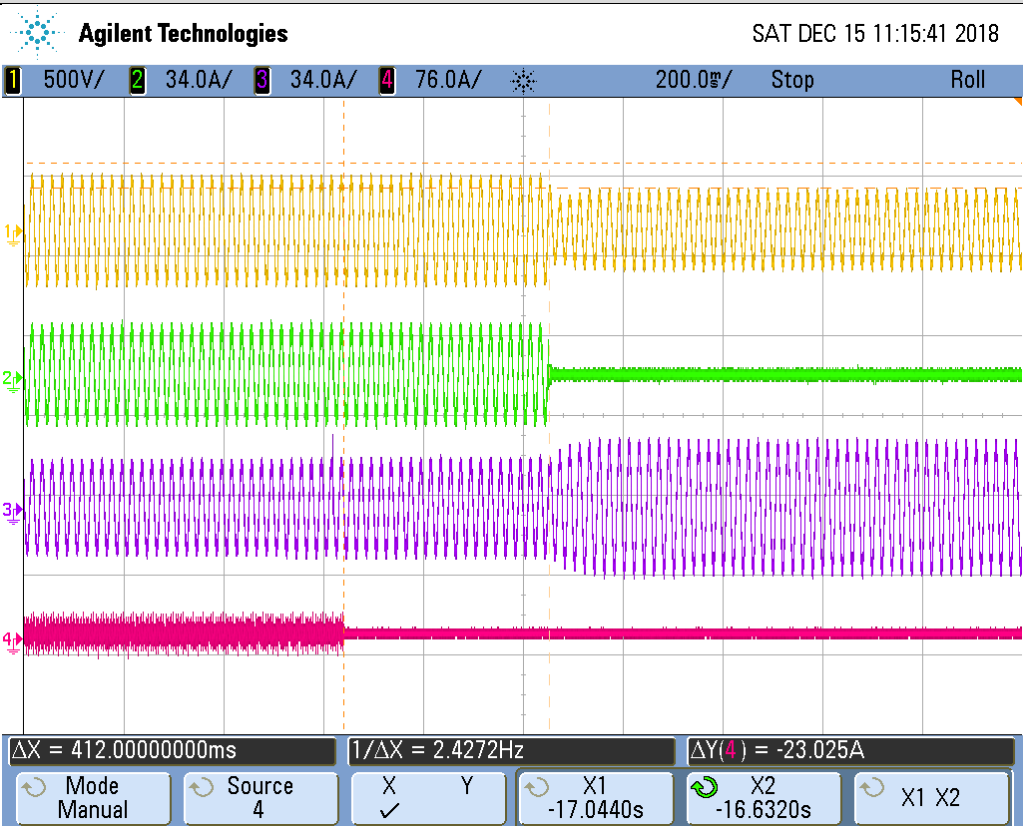


Condition 2, Test 1

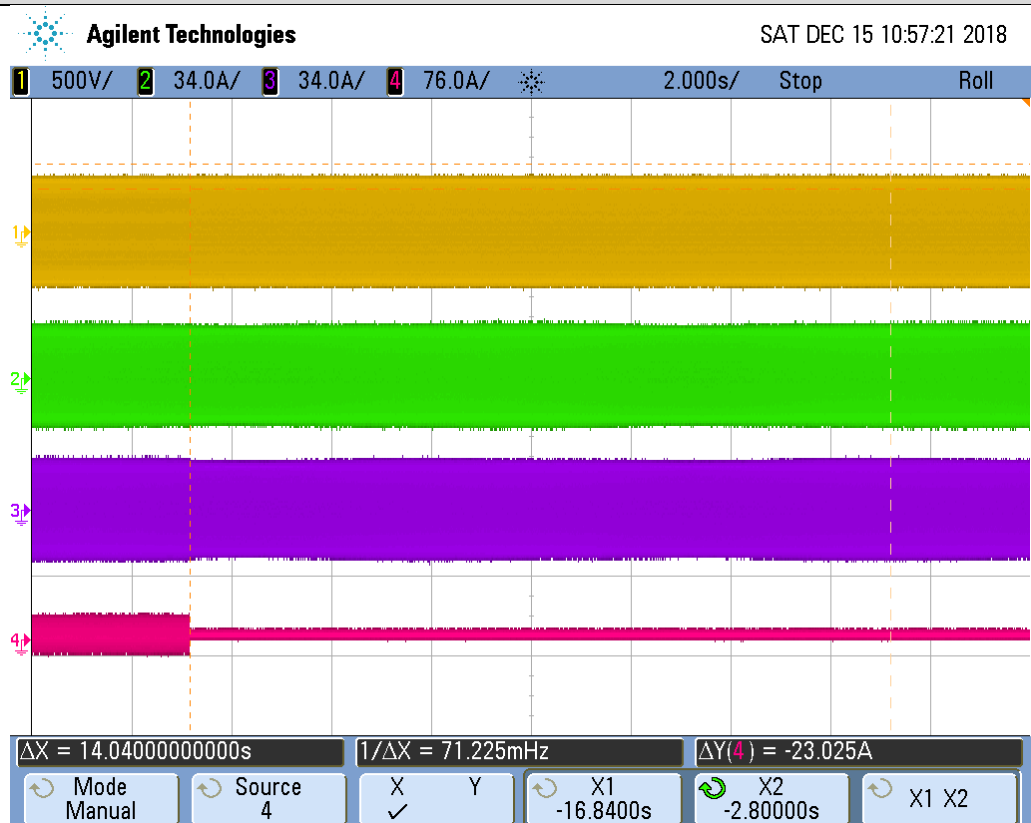


UNE 206 007-1 IN

Condition 2, Test 2



Condition 3

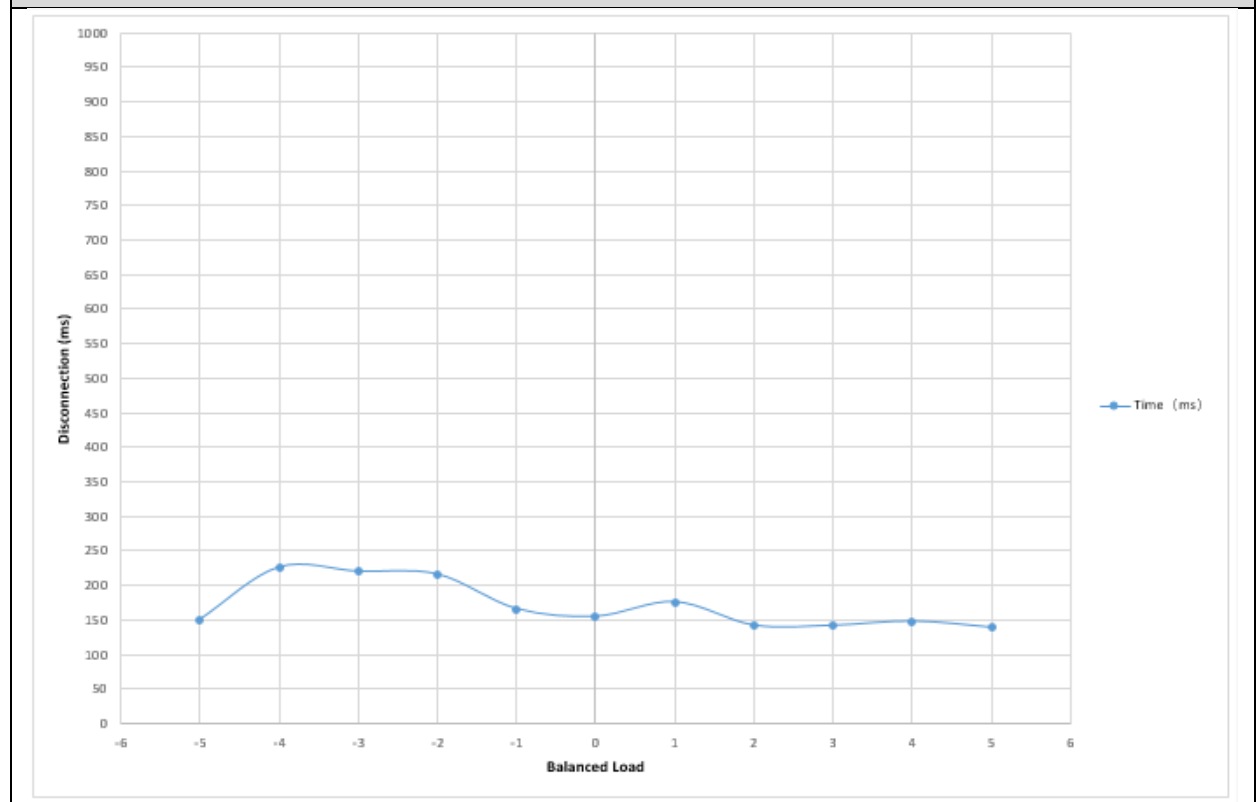


UNE 206 007-1 IN

4.6.2 Active Power 50-66% Pn. Test B

Balanced Load		
M (%)	N (%)	Disconnection (ms) (limit at t=2s)
0	-5	150
0	-4	226
0	-3	220
0	-2	216
0	-1	166
0	0	155
0	1	176
0	2	142
0	3	142
0	4	148
0	5	139

Curve for Test B



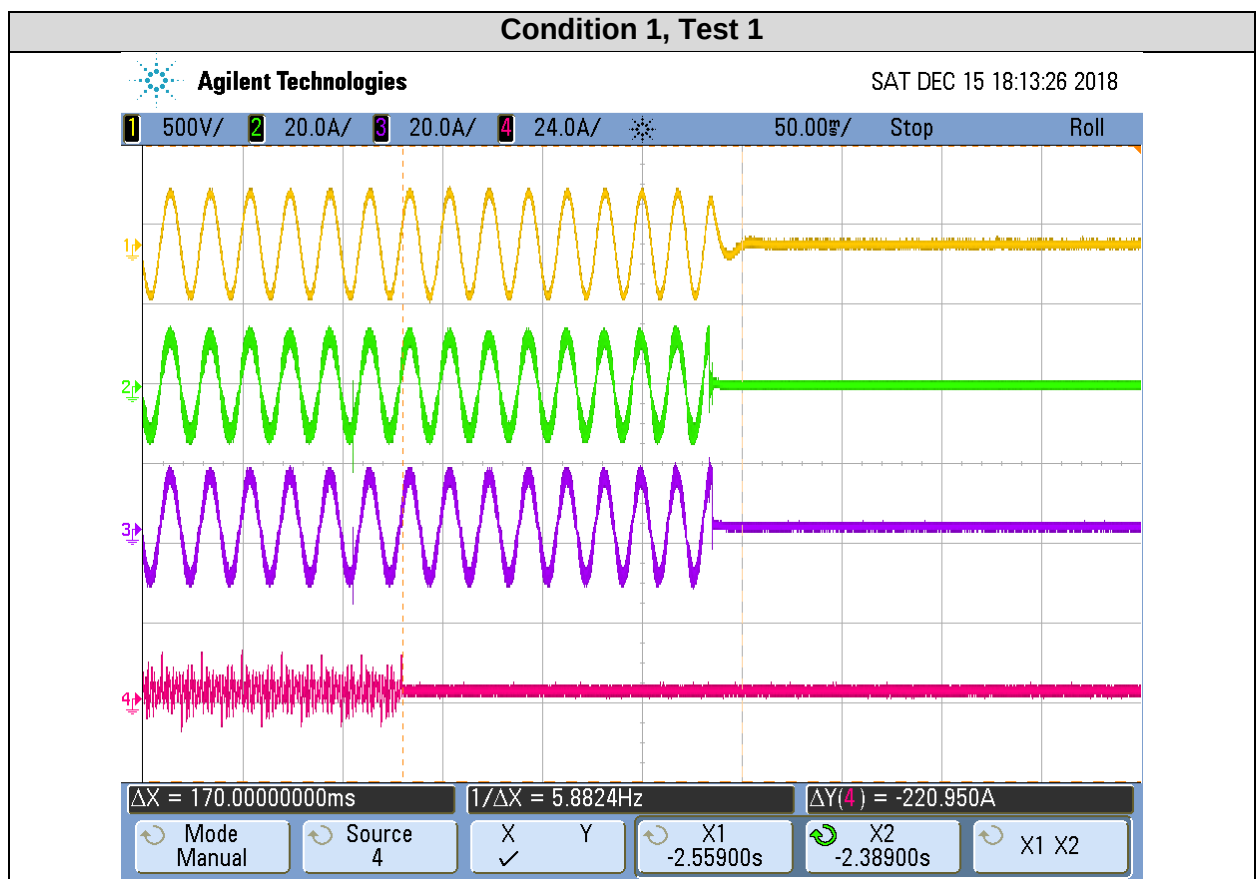
UNE 206 007-1 IN

Conditions	P (kw)	Qc(KVAr)	Ql(KVAr)	Time limit (s)	Time measured (ms)
1	3.843	4.105	4.045	<2	170
1	3.843	4.105	4.045	<2	155
2	3.843	4.105	4.045	<2	335
2	3.843	4.105	4.045	<2	512
3	3.843	4.105	4.045	- -	- -

Condition 1: EUT and ESE with islanding prevention activated.

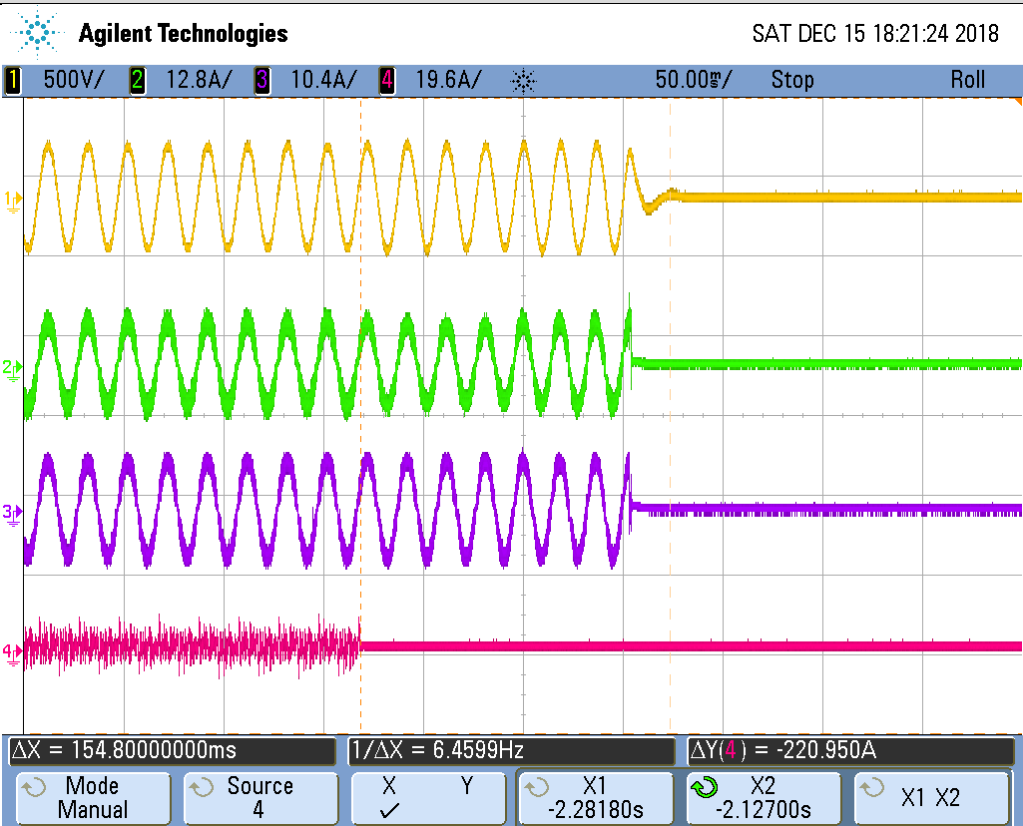
Condition 2: EUT with islanding prevention activated and ESE deactivated.

Condition 3: EUT and ESE with islanding prevention deactivated.

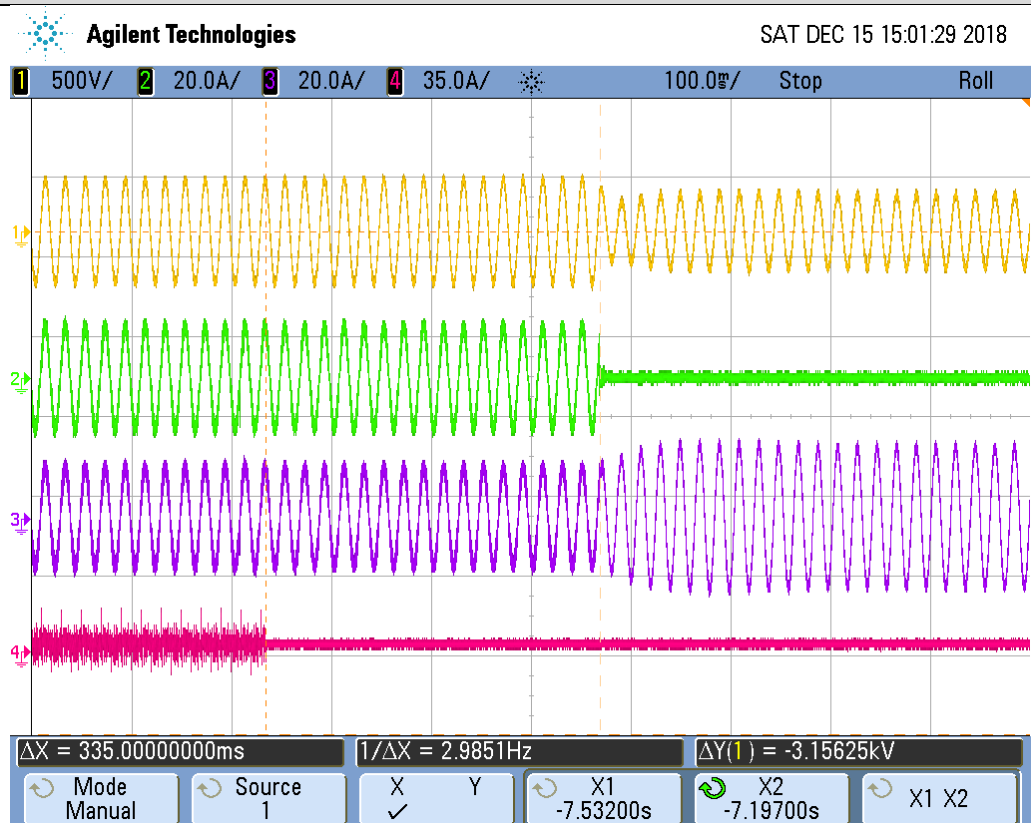


UNE 206 007-1 IN

Condition 1, Test 2

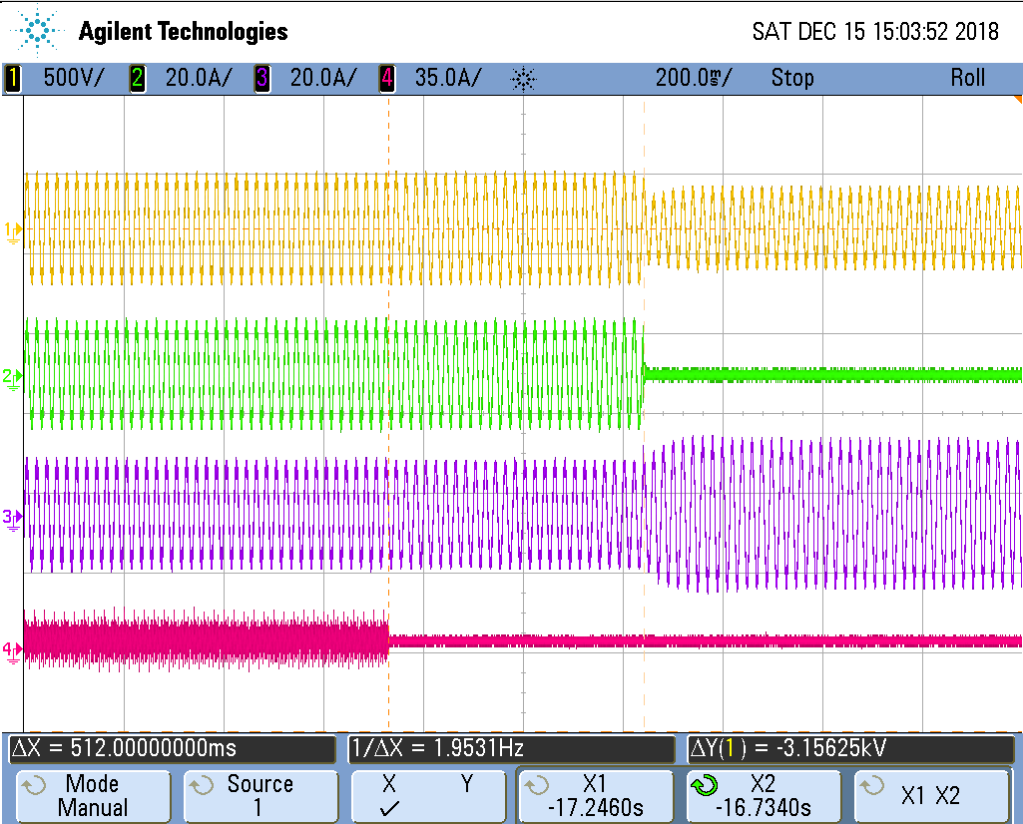


Condition 2, Test 1

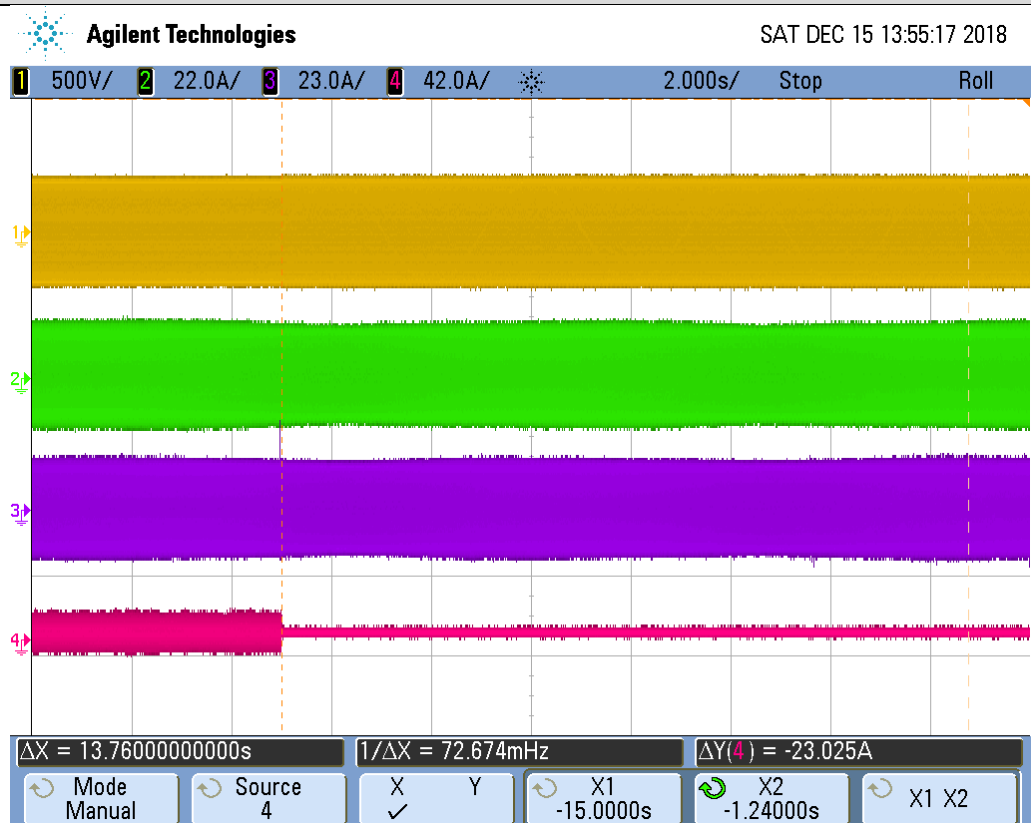


UNE 206 007-1 IN

Condition 2, Test 2



Condition 3

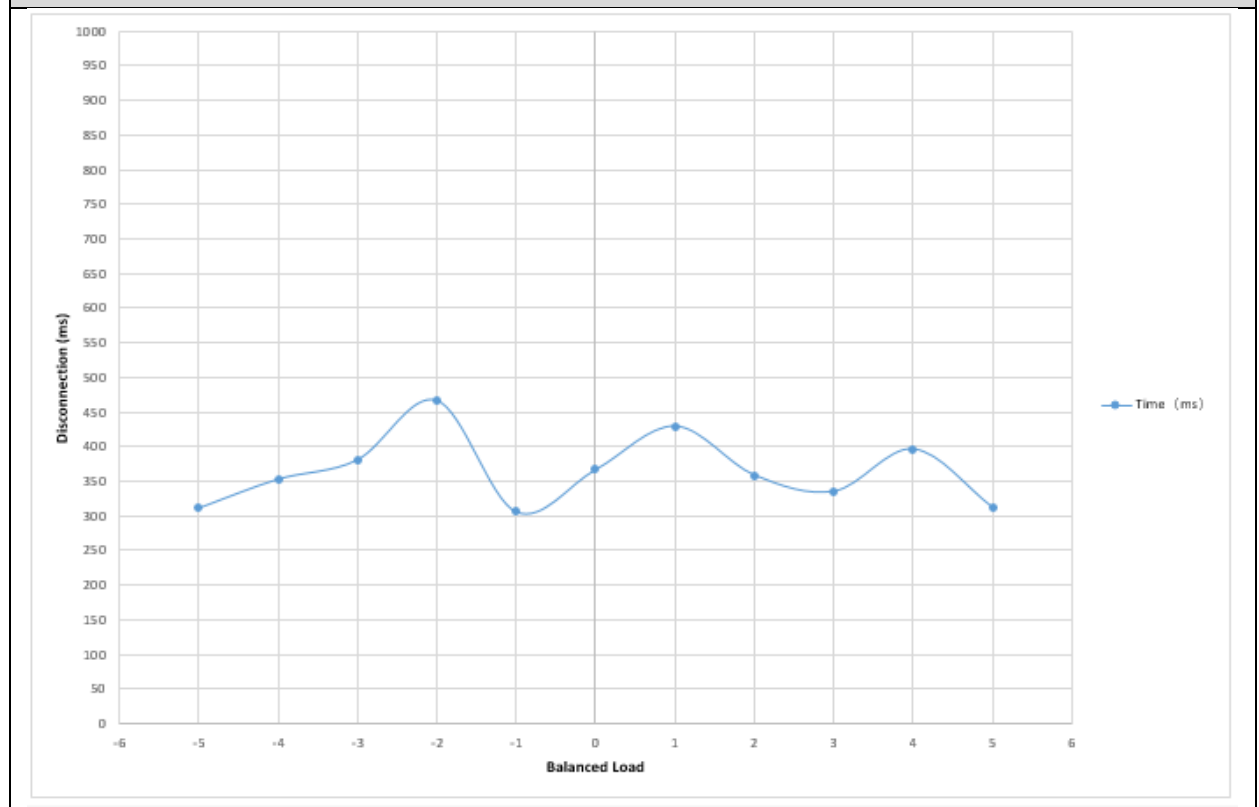


UNE 206 007-1 IN

4.6.3 Active Power 25 - 33% P_n. Test C

Balanced Load		
M (%)	N (%)	Disconnection (ms) (limit at t=2s)
0	-5	311
0	-4	353
0	-3	381
0	-2	467
0	-1	306
0	0	367
0	1	430
0	2	359
0	3	336
0	4	397
0	5	312

Curve for Test C



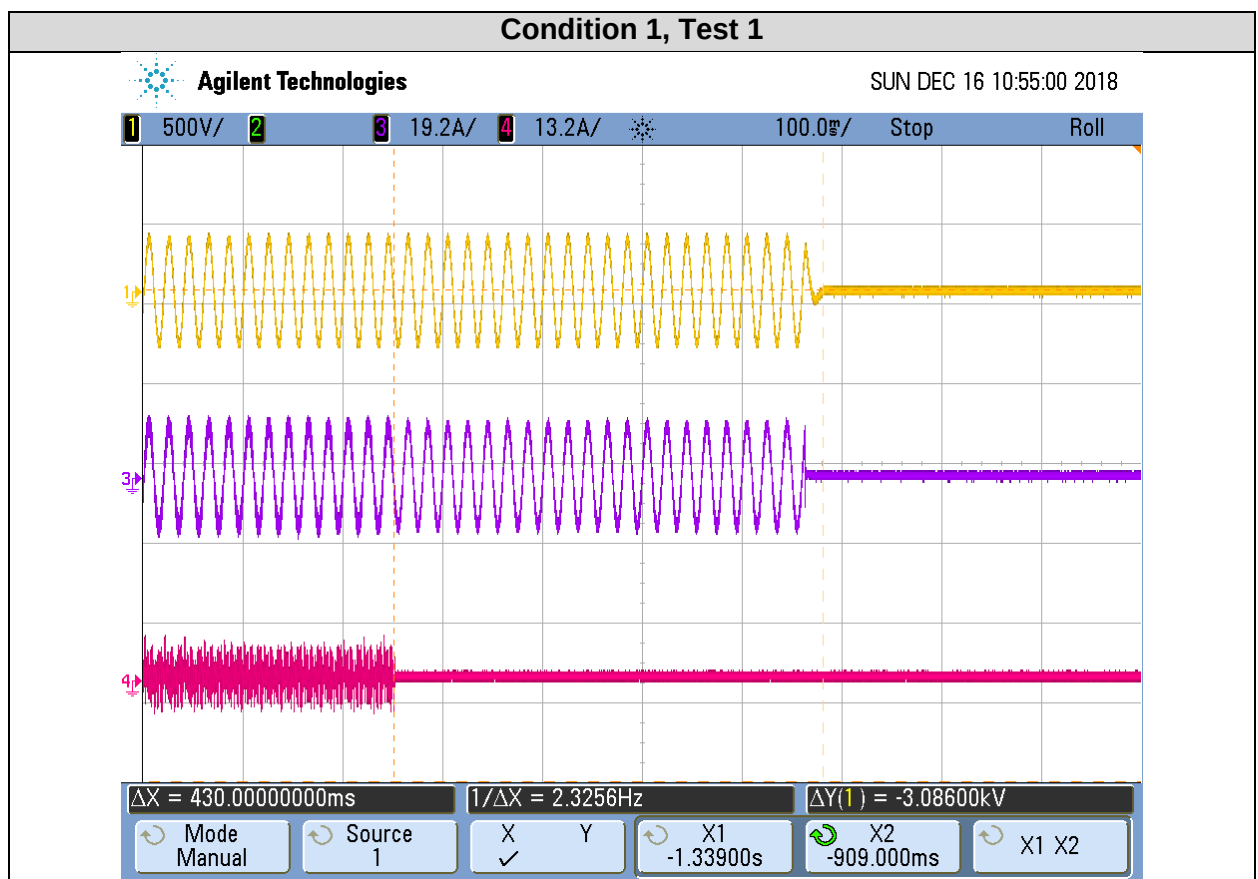
UNE 206 007-1 IN

Conditions	P (kw)	Qc(KVAr)	Ql(KVAr)	Time limit (s)	Time measured (ms)
1	1.973	2.123	2.092	<2	367
1	1.973	2.123	2.092	<2	430
2	1.973	2.123	2.092	<2	472
2	1.973	2.123	2.092	<2	510
3	1.973	2.123	2.092	- -	- -

Condition 1: EUT and ESE with islanding prevention activated.

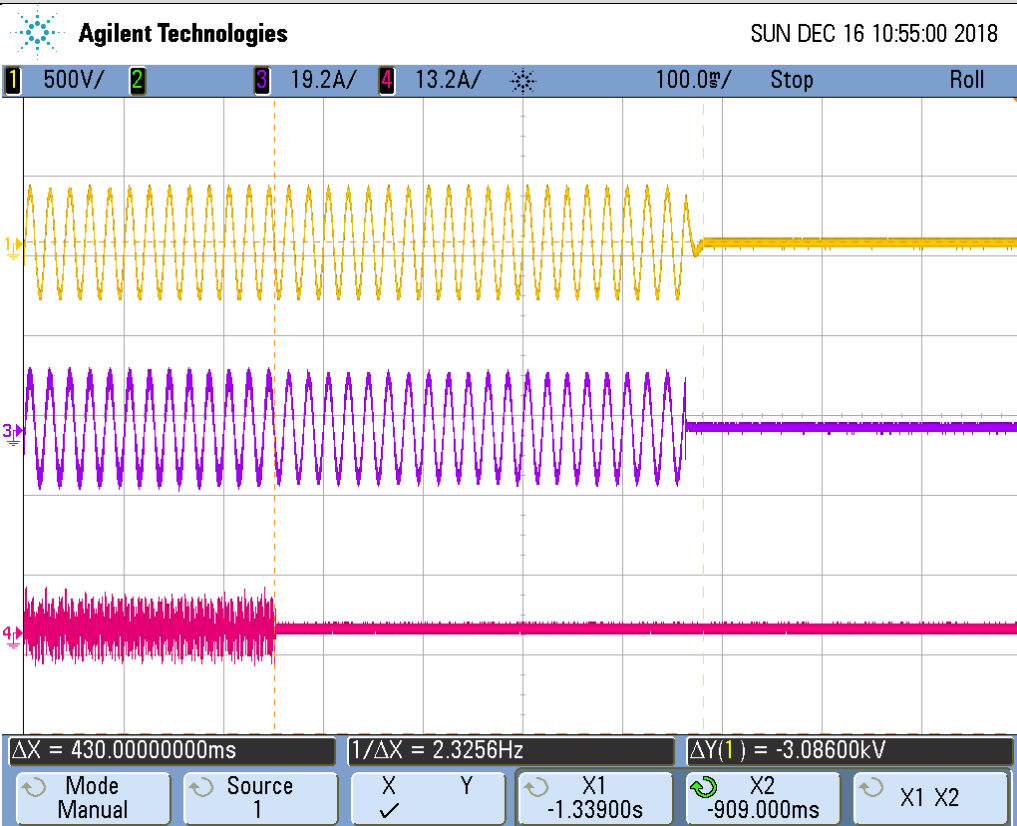
Condition 2: EUT with islanding prevention activated and ESE deactivated.

Condition 3: EUT and ESE with islanding prevention deactivated.

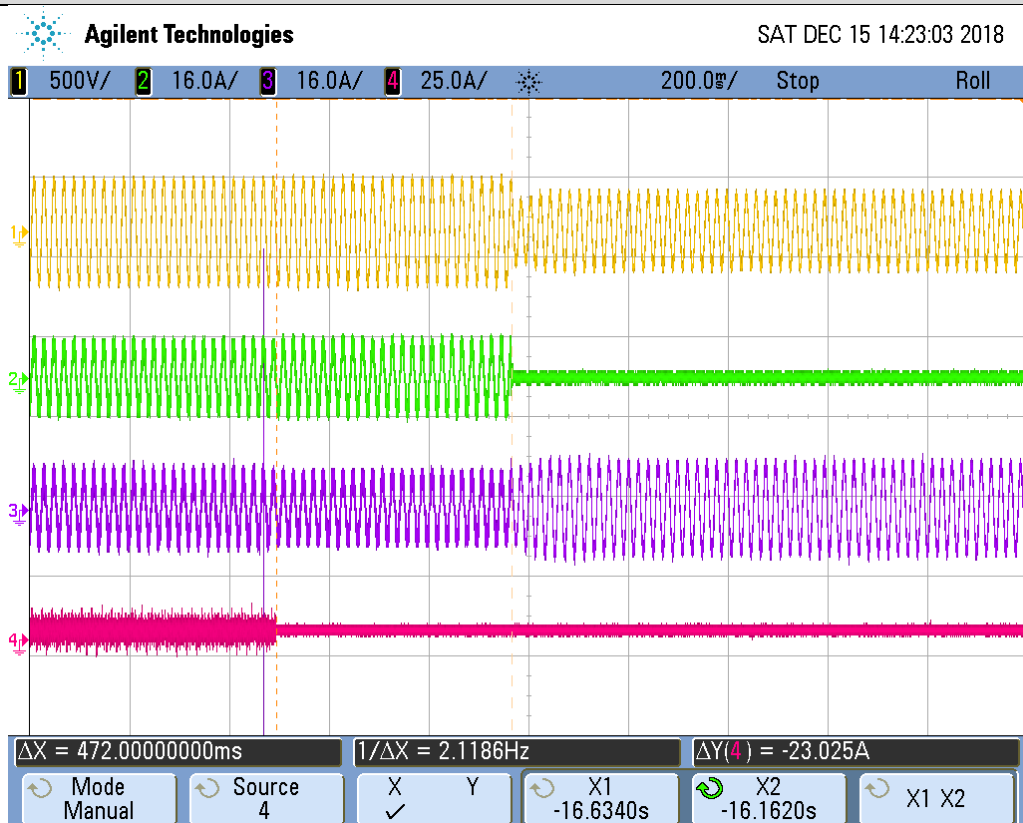


UNE 206 007-1 IN

Condition 1, Test 2

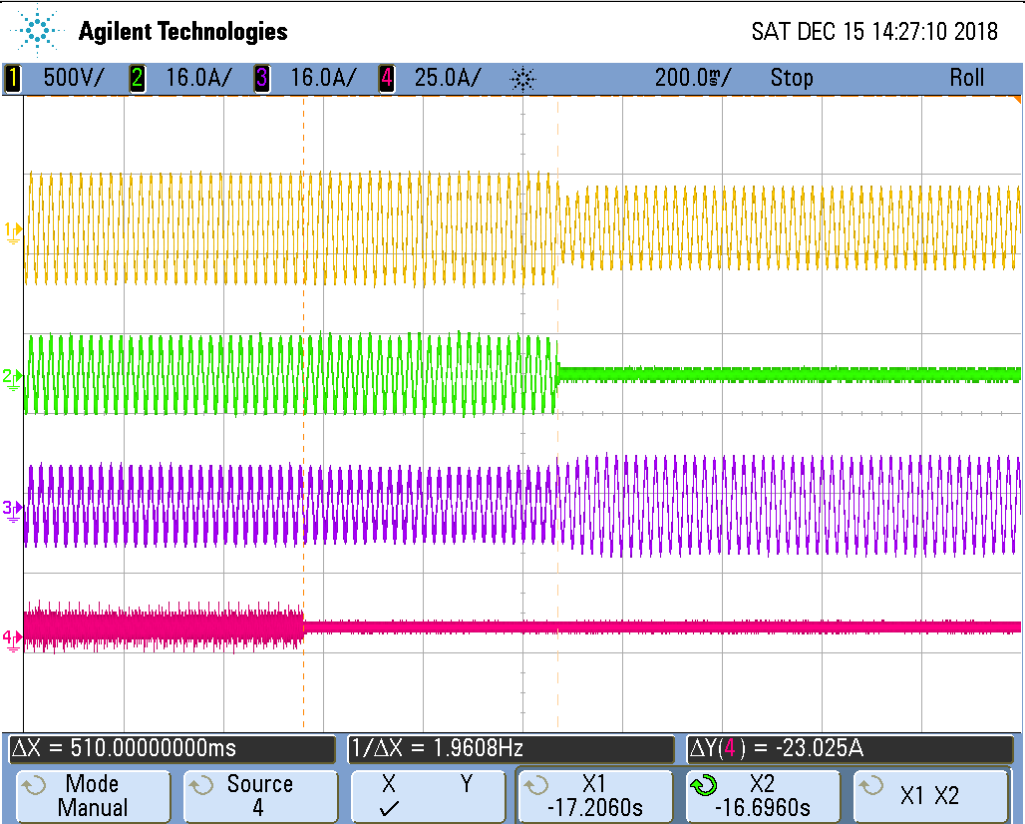


Condition 2, Test 1

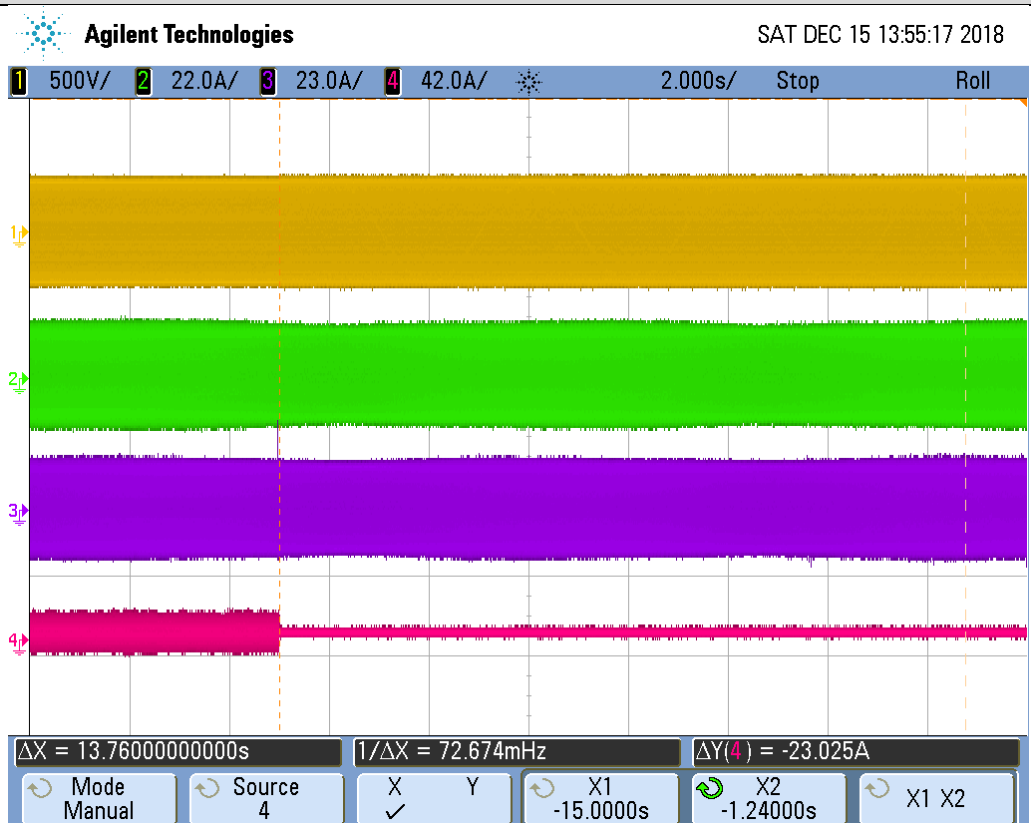


UNE 206 007-1 IN

Condition 2, Test 2



Condition 3



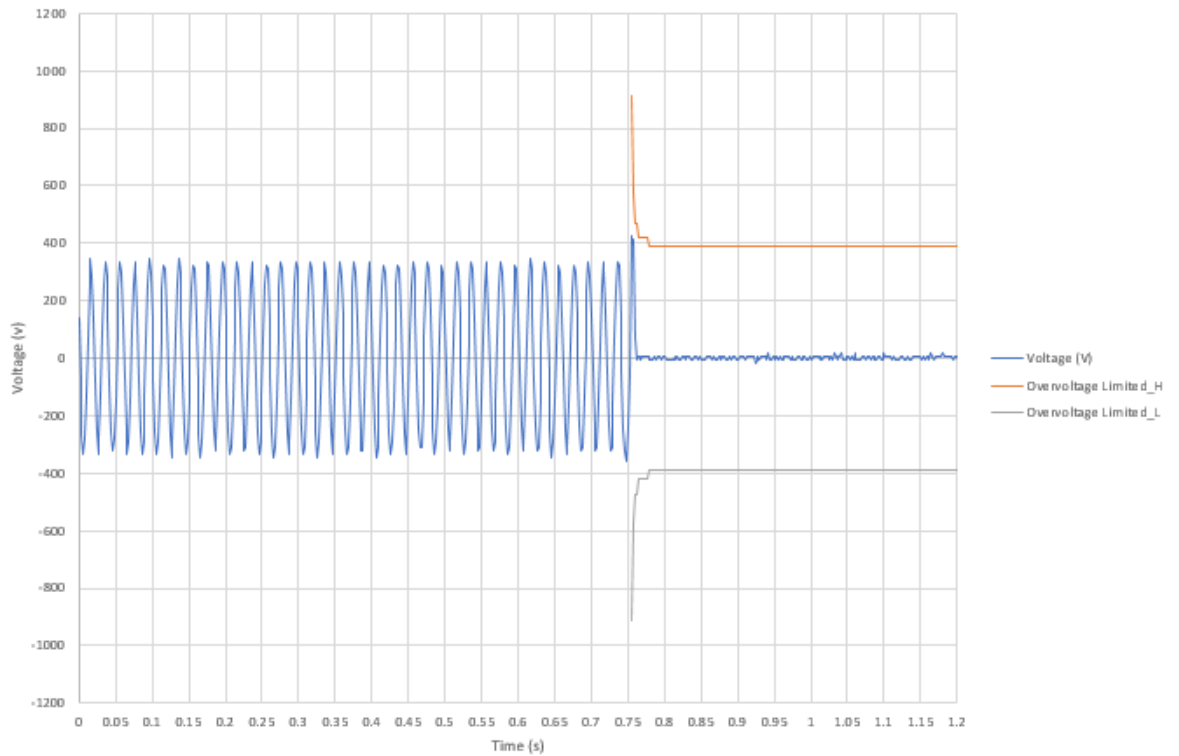
4.7 OVERVOLTAGE GENERATION

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.

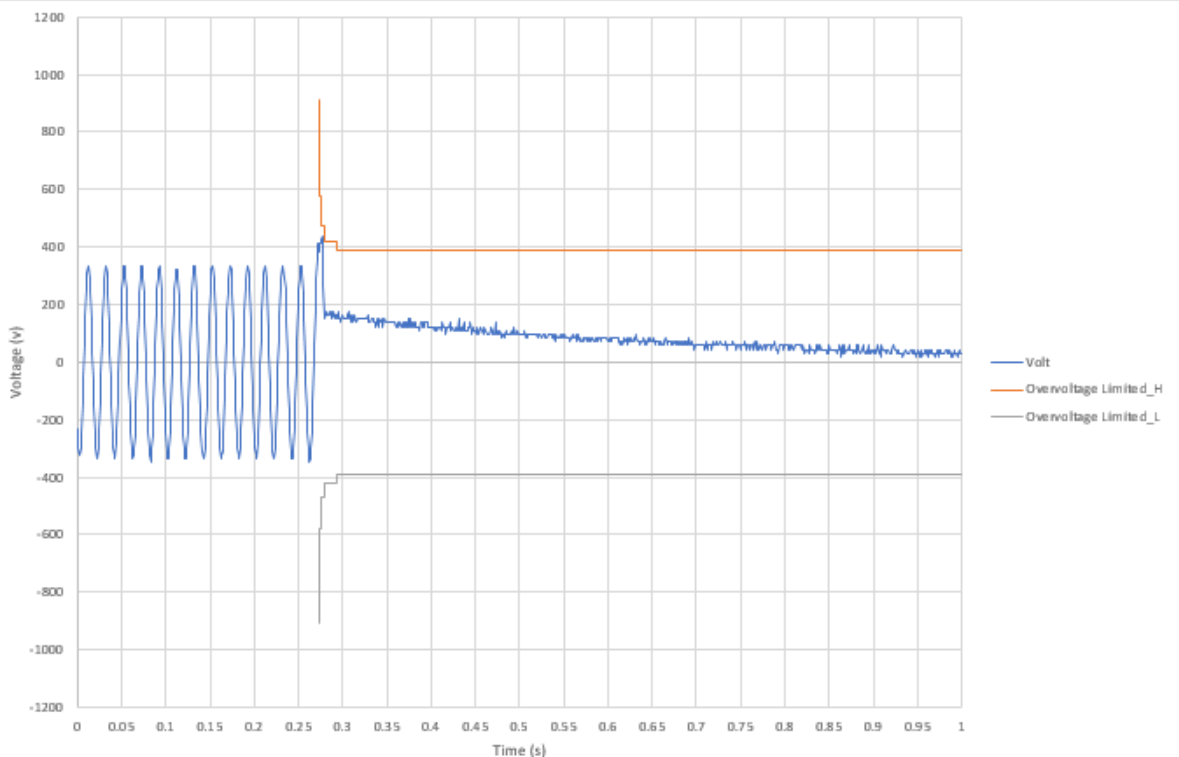
Overvoltage duration (s)	Overvoltage limit value (%Un)	Overvoltage value measured (%Un) at 100% Pn	Overvoltage value measured (%Un) at 75% Pn	Overvoltage value measured (%Un) at 50% Pn
0.0002	±280	123	124	126
0.0006	±218	126	126	128
0.002	±178	129	131	129
0.006	±145	65	57	42
0.02	±129	10	57	42
0.06	±120	10	55	40
0.2	±120	10	45	34
0.6	±120	10	24	21

UNE 206 007-1 IN

100 % Pn_

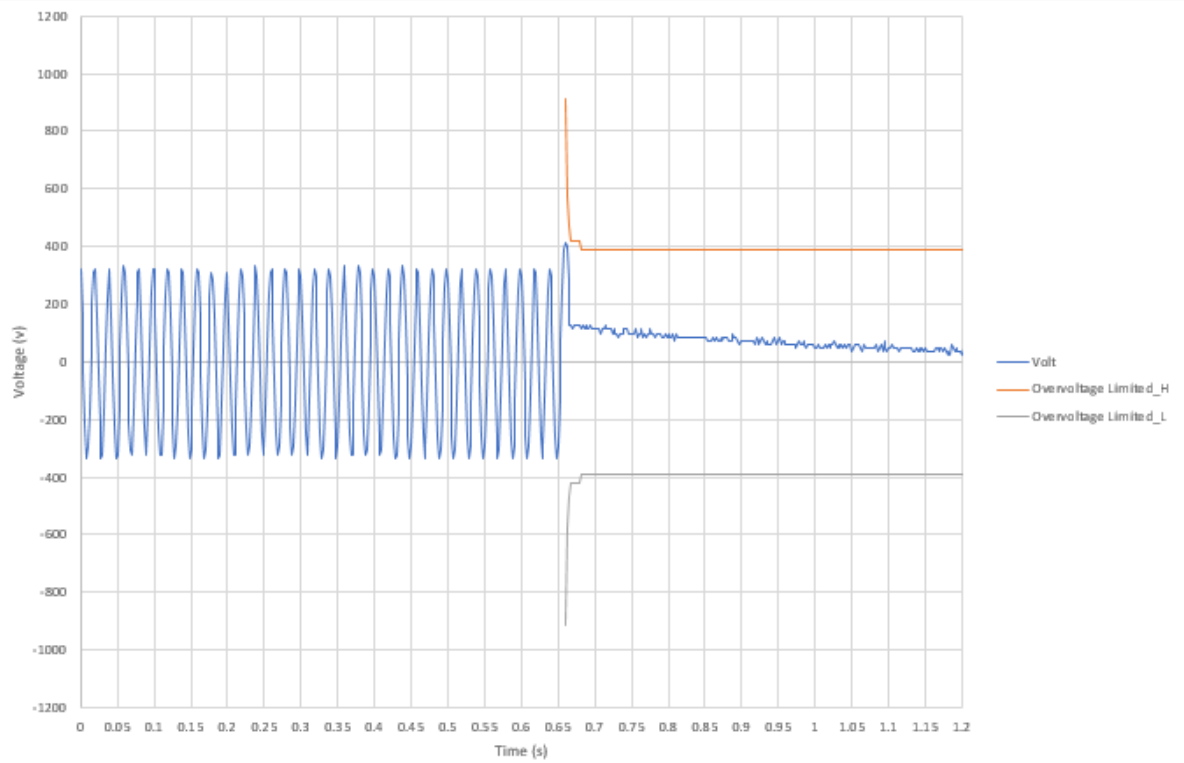


75 % Pn_



UNE 206 007-1 IN

50 % Pn_



4.8 GRID QUALITY

4.8.1 Harmonics

The tests should be based on the limits of the EN 61000-3-2 for less than 16A and on EN 61000-3-12 for more than 16A.

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

- CEI 0-21: Test Report no. 18TH0539-CEI 0-21_0 on 2018/11/26 which issued by Bureau Veritas Consumer Products Services Germany GmbH.

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.

Starting operation and Stopping operation				
P _{bin} (%)	Limit	33 %	66 %	100 %
PST	≤ 1	0.08	0.09	0.10
PLT	≤ 0.65	0.04	0.05	0.06
dc	≤ 3.30%	0.23%	0.46%	0.59%
dmax	4%	0.29%	0.62%	0.75%

As it can be seen in the next screenshots, 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.

UNE 206 007-1 IN

Starting operation and Stopping operation 33% Pn

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

Count 2/2
Interval 10m00s/10m00s
Element 1
Volt Range 300V/60Hz Element1 Judgement: Pass
Un (U1) 230.072 V Total Judgement: Pass
Freq(U1) 49.999 Hz (Element1)

	dc[%]	dmax[%]	d(t)[ms]	Pst	Plt
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.23 Pass	0.29 Pass	0 Pass	0.08 Pass	
2	0.16 Pass	0.25 Pass	0 Pass	0.08 Pass	
Result	Pass	Pass	Pass	Pass	0.04 Pass

Update 600

2018/12/12 17:34:14

Starting operation and Stopping operation 66% Pn

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

Count 2/2
Interval 10m00s/10m00s
Element 1
Volt Range 300V/60Hz Element1 Judgement: Pass
Un (U1) 230.510 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:12
No. 1	0.46 Pass	0.62 Pass	0 Pass	0.09 Pass	
2	0.39 Pass	0.57 Pass	0 Pass	0.09 Pass	
Result	Pass	Pass	Pass	Pass	0.05

Flicker Form
Measurement

Flicker dmax

Initialize
Exec

Start

Reset

Flicker
Settings

Update 600

2018/12/12 18:21:19

UNE 206 007-1 IN

Starting operation and Stopping operation 100% Pn						
Flicker Mode		Uover: ■ ■ ■ ■		Flicker:Complete 0:20:		YOKOGAWA ◆
		Iover: ■ ■ ■ ■				Flicker Form
Count		2/2				Measurement
Interval		10m00s/10m00s				Flicker dmax
Element 1						Initialize Exec
Volt Range 300V/60Hz		Element1 Judgement: Pass				Start
Un (U1) 230.911 V		Total Judgement: Pass				
Freq(U1) 50.000 Hz		(Element1)				
	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t	Reset
Limit	3.30	4.00	500	1.00	0.65	
			3.30(%)		N:12	
No. 1	0.59 Pass	0.74 Pass	0 Pass	0.10 Pass		
2	0.59 Pass	0.75 Pass	0 Pass	0.10 Pass		
Result	Pass	Pass	Pass	Pass	0.06	Flicker Settings
Update 600		2018/12/12 18:50:43				

UNE 206 007-1 IN

Running operation				
P _{bin} (%)	Limit	33 %	66 %	100 %
PST	≤ 1	0.07	0.10	0.09
PLT	≤ 0.65	0.07	0.09	0.09
dc	≤ 3.30%	0.21%	0.39%	0.14%
dmax	4%	0.28%	0.49%	0.28%

As it can be seen in the next screenshots is running operation. The values took of Pst and Plt are the most unfavorable of the twelve steps of 10 minutes each one.

Running operation 33% Pn					
Flicker Mode		Uover: ■ ■ ■ ■		YOKOGAWA ◆	
		Iover: ■ ■ ■ ■		Flicker: Complete 2:00:00	
Count		Interval		12/12	
				10m00s/10m00s	
Element 1				Element1 Judgement: Pass	
Volt Range 300V/60Hz				Total Judgement: Pass	
Un (U1) 230.226 V				(Element1)	
Freq(U1) 50.000 Hz					
	dc[%]	dmax[%]	d(t)[ms]	Pst	Plt
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.16 Pass	0.26 Pass	0 Pass	0.07 Pass	
2	0.16 Pass	0.21 Pass	0 Pass	0.07 Pass	
3	0.17 Pass	0.22 Pass	0 Pass	0.07 Pass	
4	0.19 Pass	0.27 Pass	0 Pass	0.07 Pass	
5	0.21 Pass	0.28 Pass	0 Pass	0.07 Pass	
6	0.16 Pass	0.25 Pass	0 Pass	0.07 Pass	
7	0.14 Pass	0.23 Pass	0 Pass	0.07 Pass	
8	0.14 Pass	0.22 Pass	0 Pass	0.07 Pass	
9	0.14 Pass	0.23 Pass	0 Pass	0.07 Pass	
10	0.13 Pass	0.22 Pass	0 Pass	0.07 Pass	
11	0.15 Pass	0.23 Pass	0 Pass	0.07 Pass	
12	0.15 Pass	0.23 Pass	0 Pass	0.07 Pass	
Result	Pass	Pass	Pass	Pass	0.07 Pass
Update 3600					
2018/12/13 18:43:45					

UNE 206 007-1 IN

Running operation 66% Pn

Flicker Mode Uover: ■ ■ ■ I2 : 30A YOKOGAWA ◆
Iover: ■ ■ ■ Flicker:Complete 2:00: Flicker Form

Count 12/12
Interval 10m00s/10m00s Measurement

Element 1
Volt Range 300V/60Hz Element1 Judgement: Pass
Un (U1) 230.591 V Total Judgement: Pass
Freq(U1) 49.999 Hz (Element1)

Initialize Exec

	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.39 Pass	0.49 Pass	0 Pass	0.10 Pass	
2	0.08 Pass	0.11 Pass	0 Pass	0.07 Pass	
3	0.35 Pass	0.43 Pass	0 Pass	0.08 Pass	
4	0.35 Pass	0.44 Pass	0 Pass	0.09 Pass	
5	0.35 Pass	0.48 Pass	0 Pass	0.08 Pass	
6	0.33 Pass	0.45 Pass	0 Pass	0.08 Pass	
7	0.35 Pass	0.45 Pass	0 Pass	0.08 Pass	
8	0.35 Pass	0.47 Pass	0 Pass	0.08 Pass	
9	0.35 Pass	0.47 Pass	0 Pass	0.08 Pass	
10	0.35 Pass	0.42 Pass	0 Pass	0.08 Pass	
11	0.34 Pass	0.42 Pass	0 Pass	0.09 Pass	
12	0.33 Pass	0.43 Pass	0 Pass	0.09 Pass	
Result	Pass	Pass	Pass	Pass	0.09

Start

Reset

Flicker Settings

Update 3600 2018/12/14 10:39:51

Running operation 100% Pn

Flicker Mode Uover: ■ ■ ■ I1 : 30A YOKOGAWA ◆
Iover: ■ ■ ■ Flicker:Complete 2:00:00

Count 12/12
Interval 10m00s/10m00s

Element 1
Volt Range 300V/50Hz Element1 Judgement: Pass
Un (U1) 231.021 V Total Judgement: Pass
Freq(U1) 50.001 Hz (Element1)

	dc[%]	dmax[%]	d(t)[ms]	Pst	P1t
Limit	3.30	4.00	500 3.30(%)	1.00	0.65 N:12
No. 1	0.14 Pass	0.28 Pass	0 Pass	0.09 Pass	
2	0.12 Pass	0.27 Pass	0 Pass	0.09 Pass	
3	0.12 Pass	0.28 Pass	0 Pass	0.09 Pass	
4	0.14 Pass	0.26 Pass	0 Pass	0.09 Pass	
5	0.11 Pass	0.26 Pass	0 Pass	0.09 Pass	
6	0.14 Pass	0.28 Pass	0 Pass	0.09 Pass	
7	0.13 Pass	0.26 Pass	0 Pass	0.09 Pass	
8	0.11 Pass	0.25 Pass	0 Pass	0.09 Pass	
9	0.14 Pass	0.26 Pass	0 Pass	0.09 Pass	
10	0.14 Pass	0.25 Pass	0 Pass	0.09 Pass	
11	0.11 Pass	0.25 Pass	0 Pass	0.09 Pass	
12	0.11 Pass	0.27 Pass	0 Pass	0.09 Pass	
Result	Pass	Pass	Pass	Pass	0.09 Pass

Update 3600 2018/12/18 08:05:14

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4.9 RECONNECTION OUT OF SYNCHRONISM

- Setoff	Angle before the setoff	Angle after the setoff	Current 20 ms before the setoff	Current 200 ms after the setoff
90°	0°	90°	25.96A	24.25A
180°	0°	180°	25.66 ^a	10.52



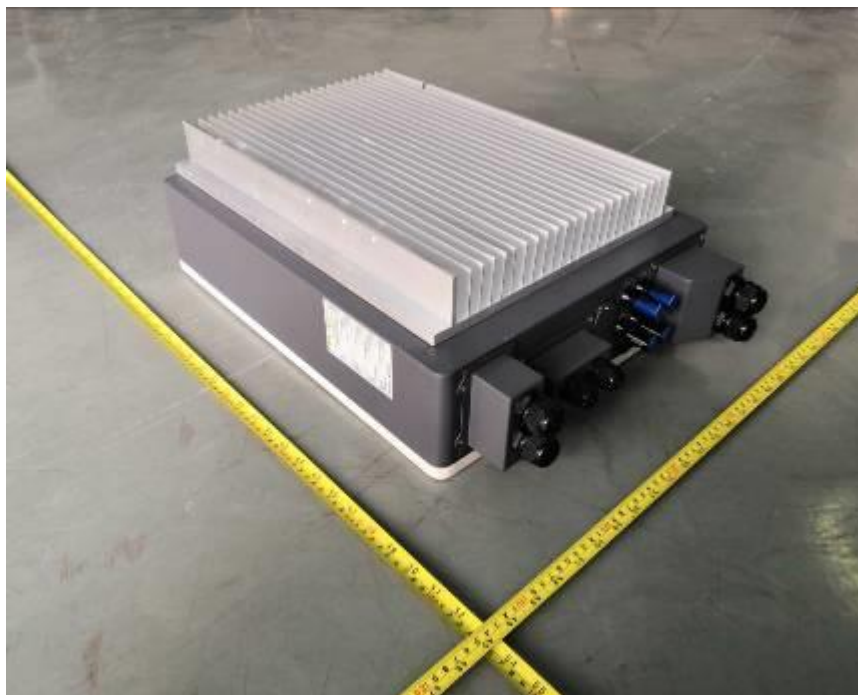
UNE 206 007-1 IN

5 PICTURES

General view



General view



UNE 206 007-1 IN

Front view



Back view

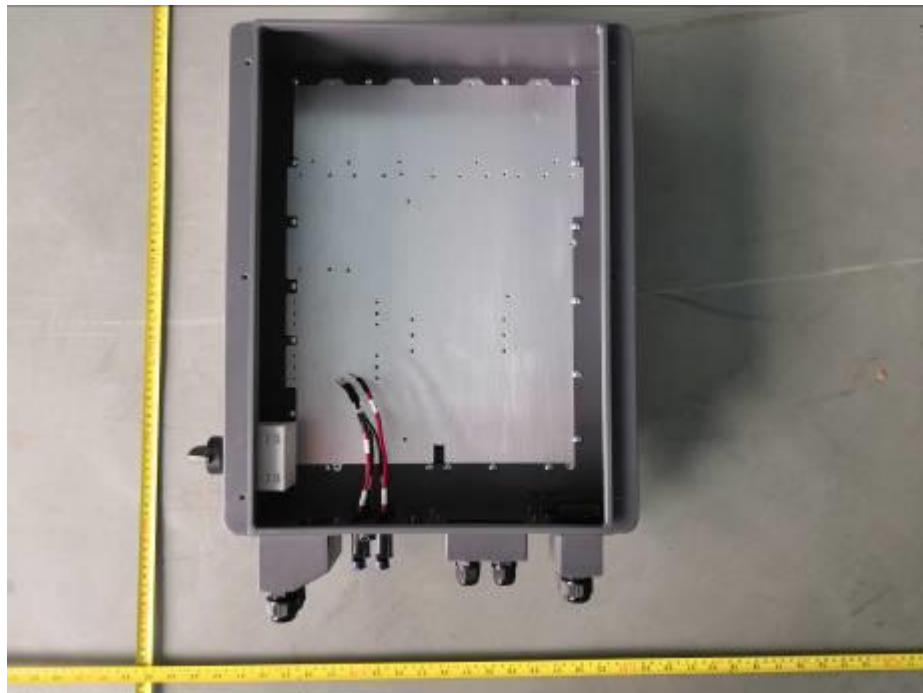


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Side View



Internal view of enclosure



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Top View

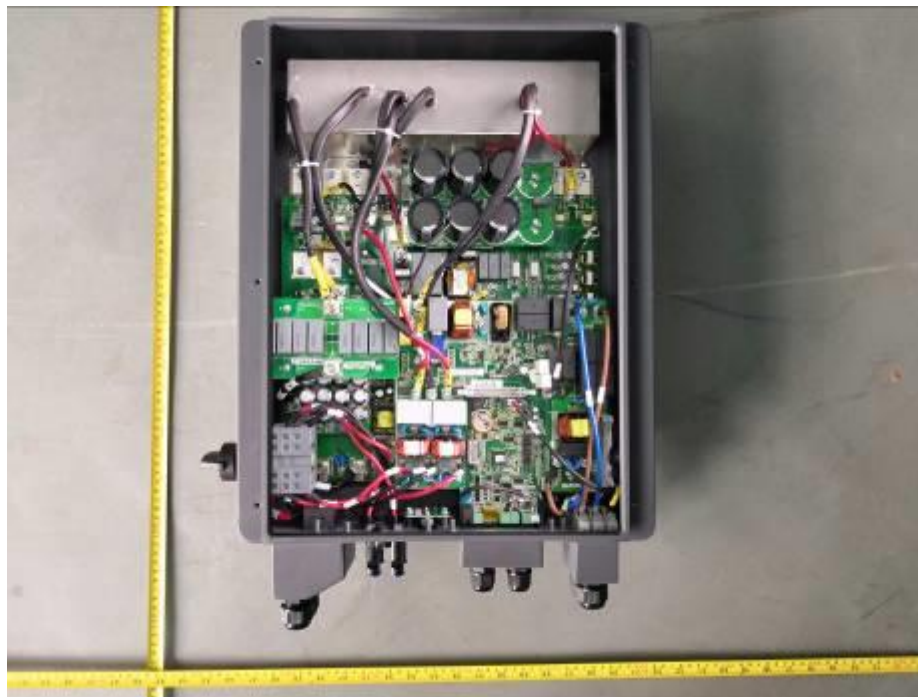


Internal View of Model HYD 5000-ES, HYD 6000-ES



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Internal View of Model HYD 3000-ES, HYD 3600-ES, HYD 4000-ES

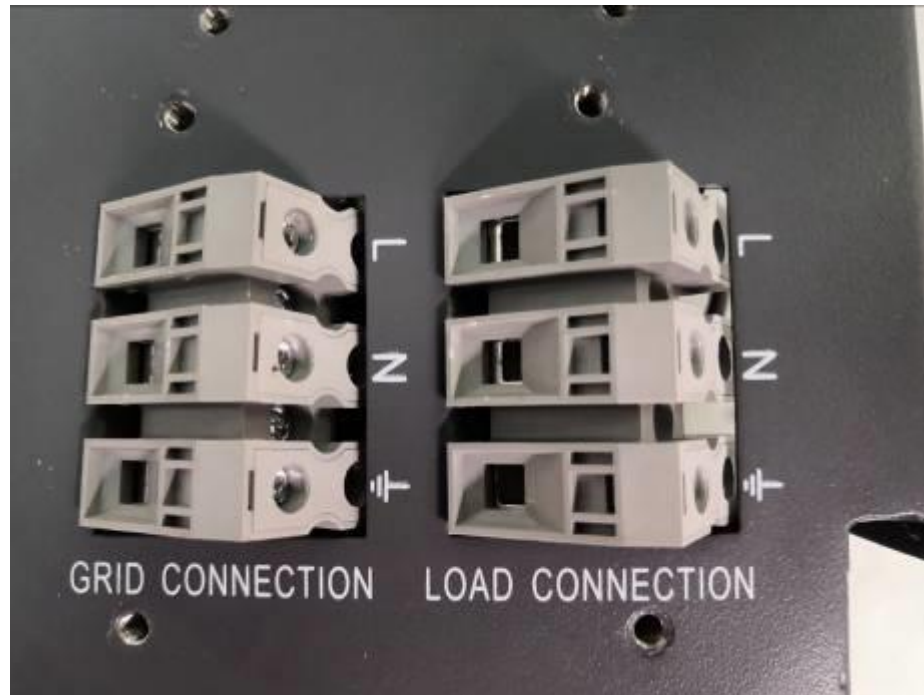


Grounding

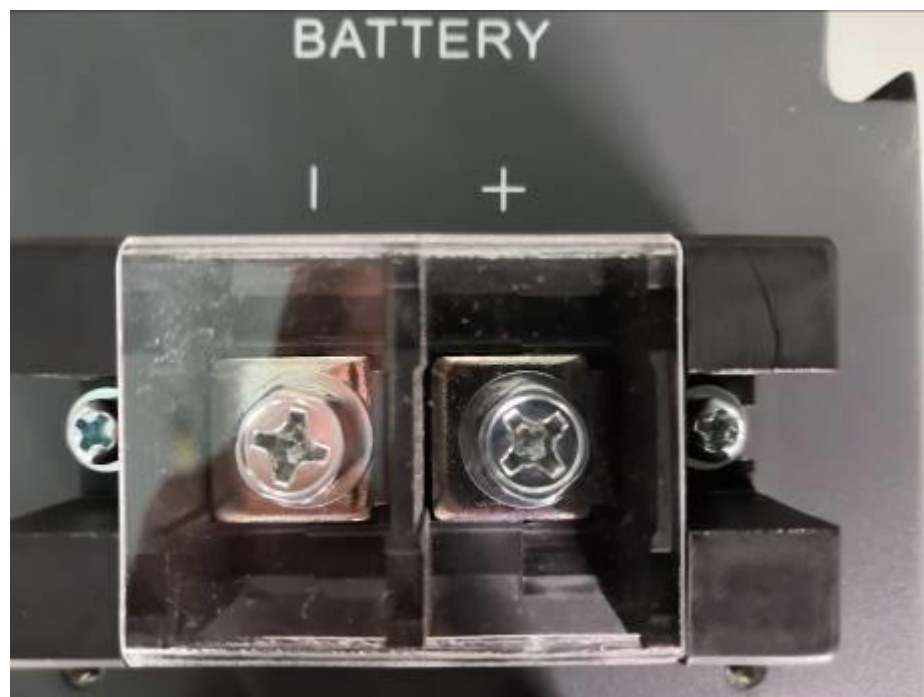


UNE 206 007-1 IN

AC Ternimals



DC Ternimals

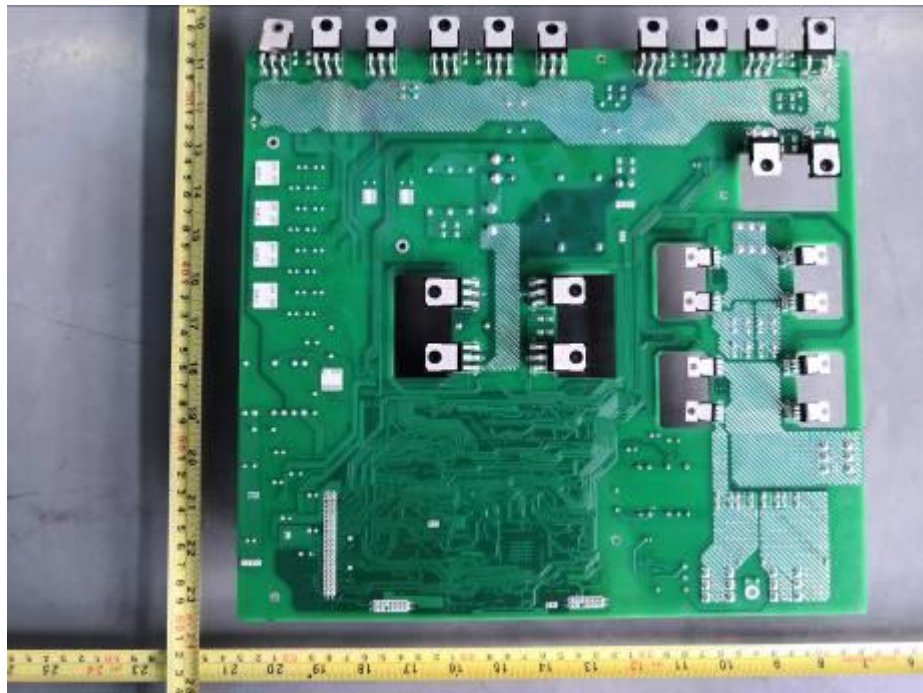


UNE 206 007-1 IN

Front View of Power board

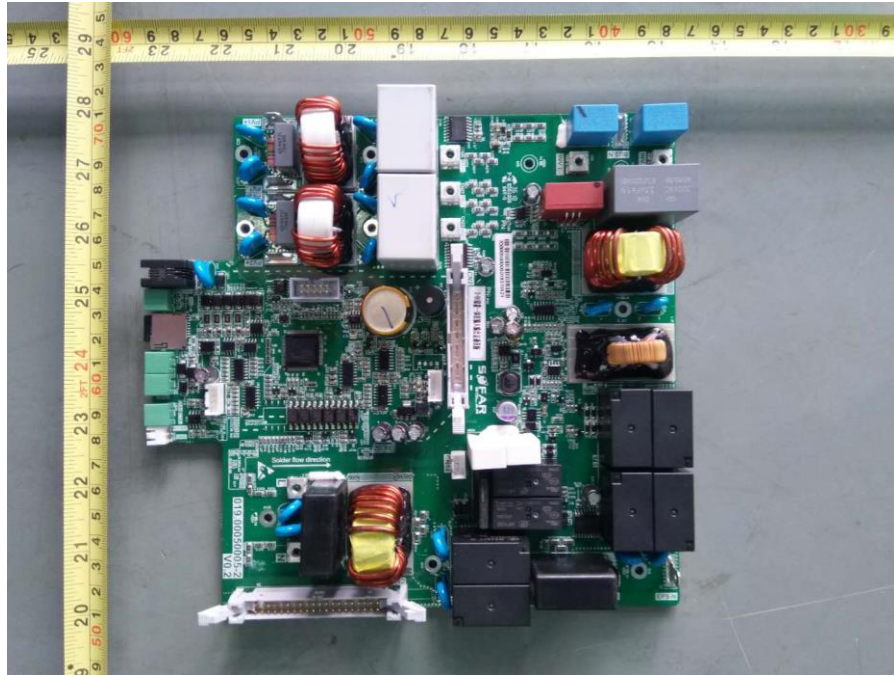


Back View of Power board

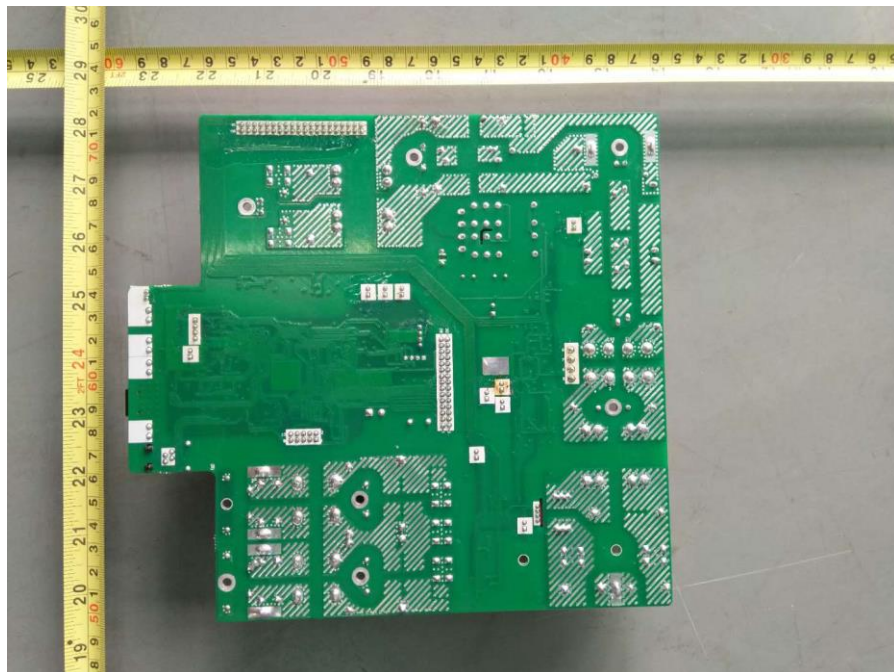


UNE 206 007-1 IN

Front View of Input,output and communication board



Back View of Input,output and communication board

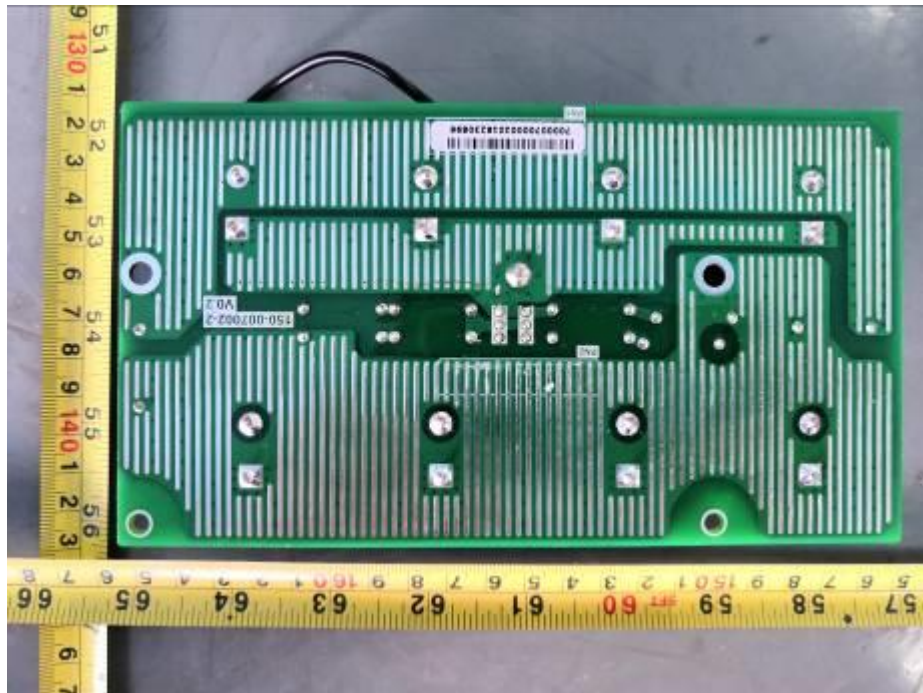


UNE 206 007-1 IN

Front View of HYD 5000-ES, HYD 6000-ES Cap. board



Back View of HYD 5000-ES, HYD 6000-ES Cap. board

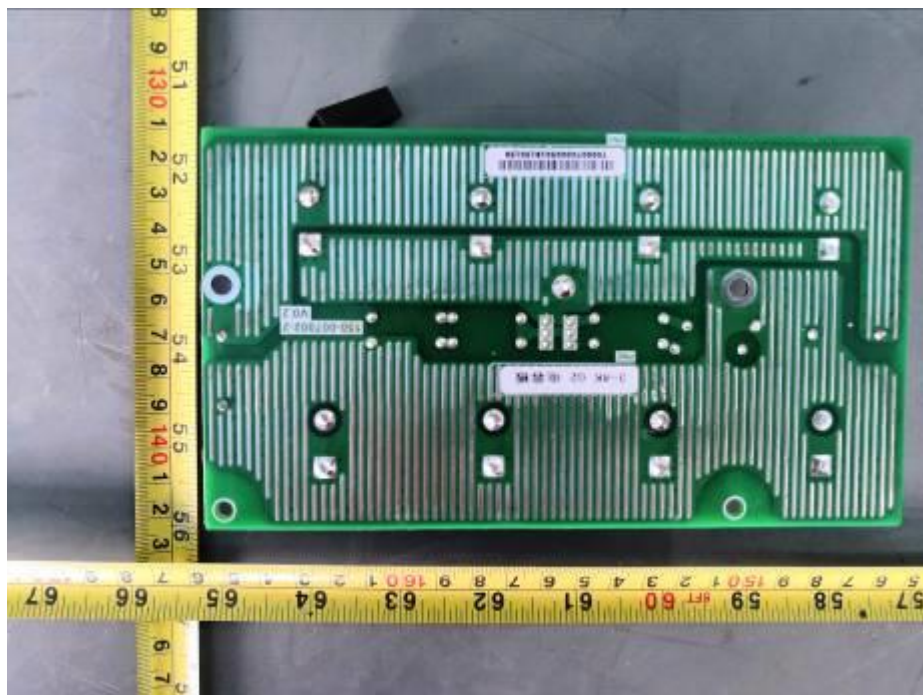


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Front View of HYD 3000-ES, HYD 3600-ES, HYD 4000-ES Cap. board



Back View of HYD 3000-ES, HYD 3600-ES, HYD 4000-ES Cap. board

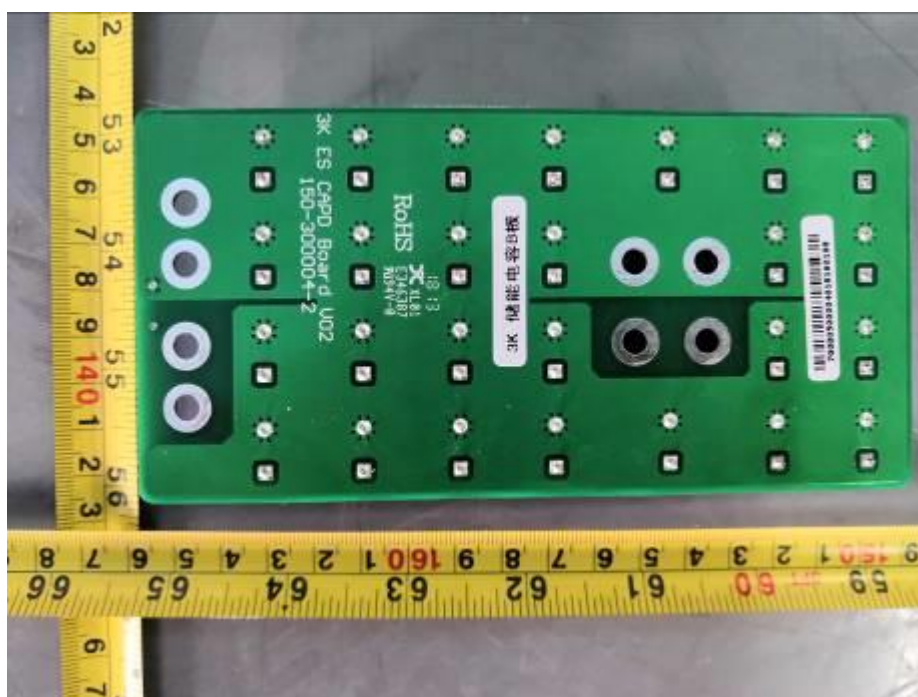


UNE 206 007-1 IN

Front View of Cap board B



Back View of Cap board B

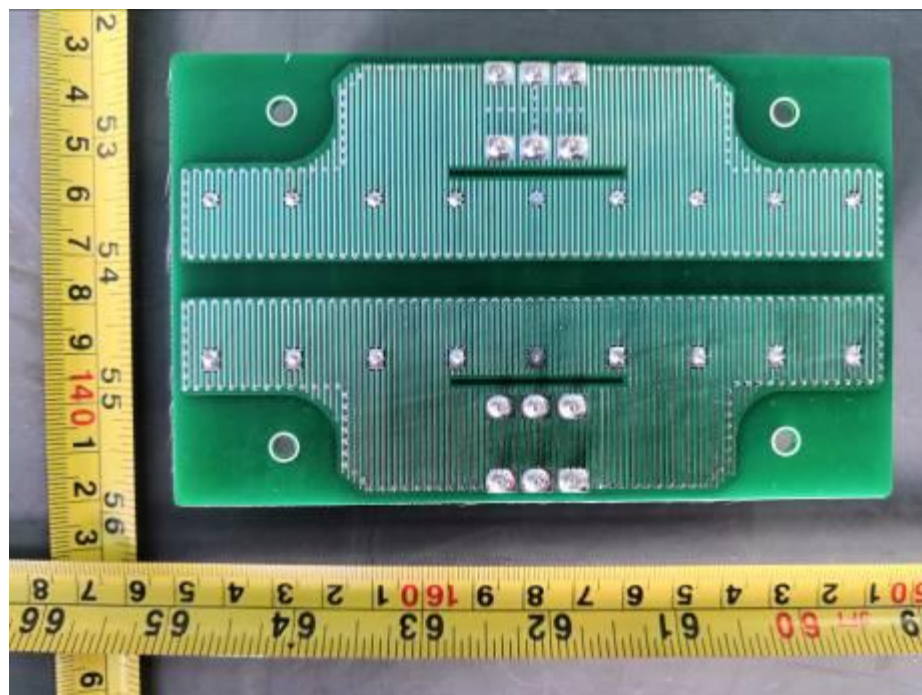


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Front View of Cap board A



Back View of Cap board A

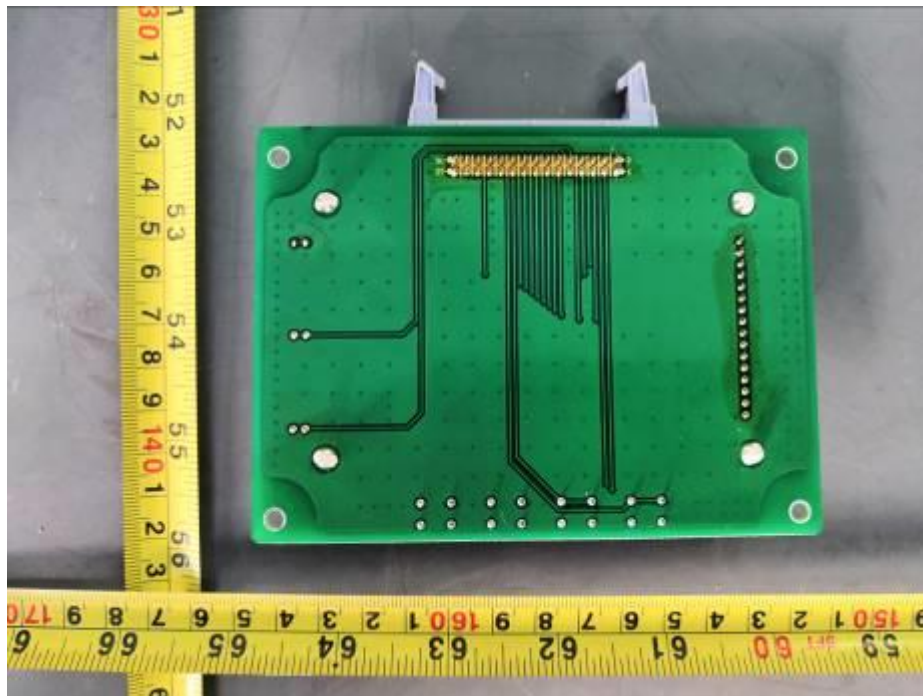


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Front view of LED board



Back view of LED board



UNE 206 007-1 IN

Front view of RS 232 board

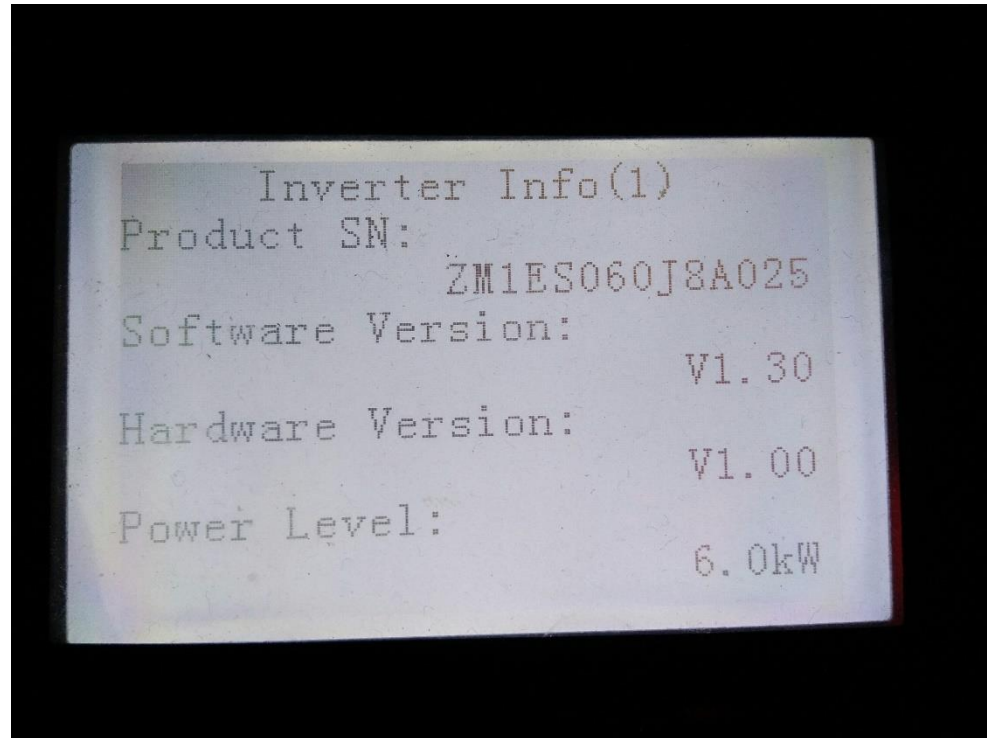


Back view of RS 232 board

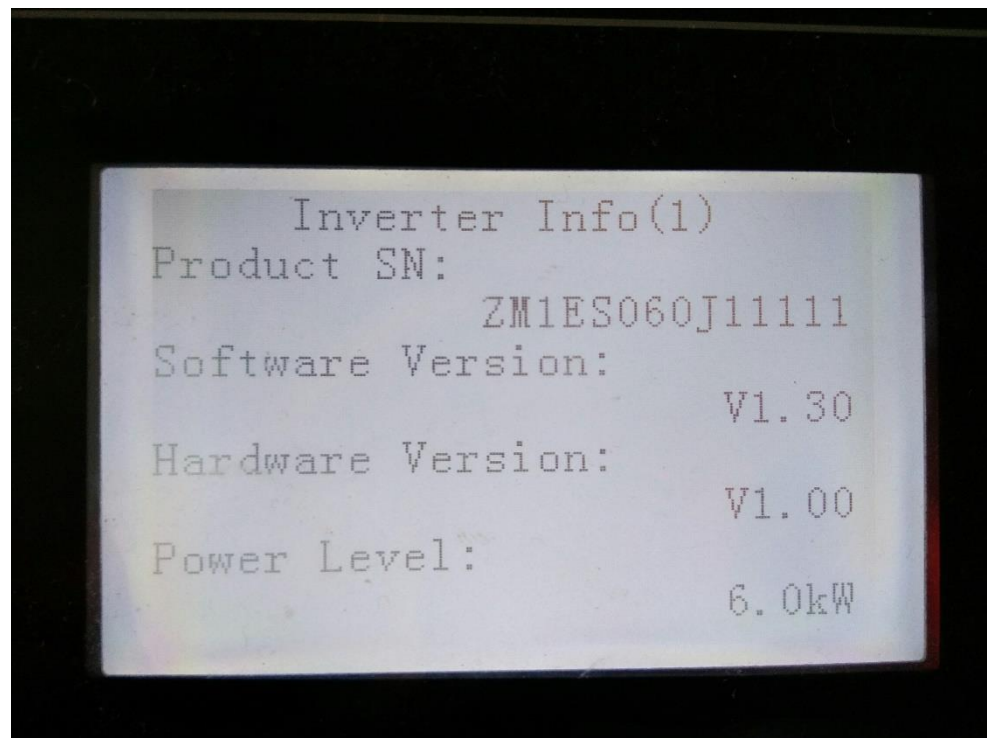


UNE 206 007-1 IN

Serial Number: ZM1ES060J8A025 and Software Version

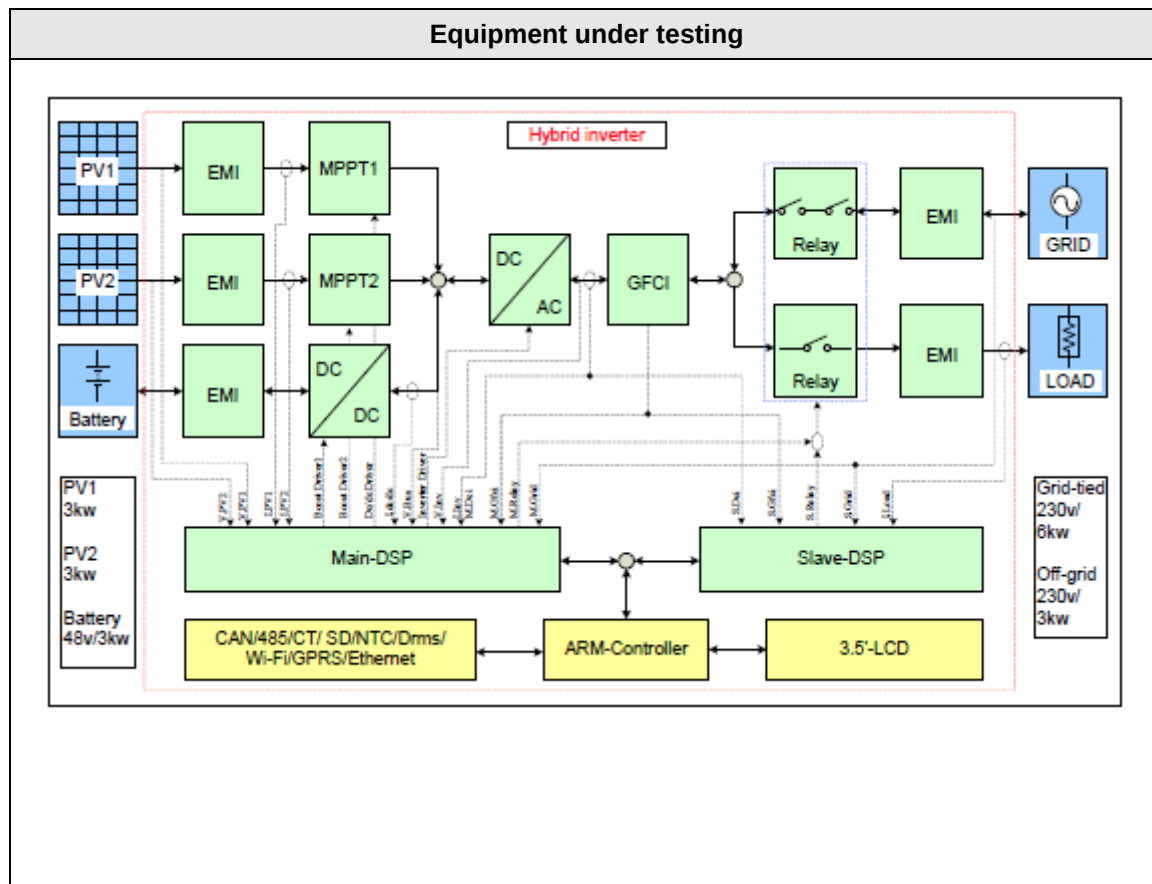


Serial Number: ZM1ES060J11111 and Software Version



UNE 206 007-1 IN

6 ELECTRICAL SCHEME



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