TESTING FOR THE VERIFICATION OF COMPLIANCE OF POWER CONVERTER WITH :

"ANEXO III DEL PROCEDIMIENTO DE VERIFICACIÓN, VALIDACIÓN Y CERTIFICACIÓN DE LOS REQUISITOS DEL P.O. 12.3 FRENTE A LA RESPUESTA DE LAS INSTALACIONES EÓLICAS Y SOLARES ANTE HUECOS DE TENSIÓN"

(PVVC VERSIÓN 10).

Procedure: PE.T-LE-61

Test Report Number ..... : **2222 / 0122-E1 (*)**

(*) This Test Report cancels and supersedes Test Report no. 2222 / 0122, see Test Report Historical revision table in page 2.

Type ..... : Solar Inverter

Tested Model ..... : **SUN2000-40KTL-M3**

Variant Models ..... : SUN2000-36KTL-M3, SUN2000-30KTL-M3.

APPLICANT

Name ..... : **HUAWEI TECHNOLOGIES CO., LTD.**

Address ..... : Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, Guangdong, 518129, China.

TESTING LABORATORY

Name ..... : **SGS Tecnos, S.A. (Electrical Testing Laboratory)**

Address ..... : C/ Trespaderne, 29 - Edificio Barajas 1
28042 Madrid (Spain)

Conducted (tested) by ..... : Michael Tong
(Project Engineer)

Approved by ..... : Miguel Rodriguez
(Technical Reviewer)

SGS Tecnos, S.A.
Laboratorio de Ensayos E&E

Date of issue ..... : 26/04/2022

Number of pages ..... : 42

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Test Report Historical Revision:

Test Report Version	Date	Resume
2222 / 0122	13/04/2022	First issuance
2222 / 0122 – E1	26/04/2022	Editorial changes

INDEX

1 SCOPE

SGS Tecnos, S.A. (Electrical Testing Laboratory) has been contract by HUAWEI TECHNOLOGIES CO., LTD., in order to perform the testing according the following standard: Anexo III del procedimiento de verificación, validación y certificación de los requisitos del P.O. 12.3. frente a la respuesta de las instalaciones eólicas y solares ante huecos de tensión (PVVC versión 10).

2 GENERAL INFORMATION

2.1 TESTING PERIOD AND CLIMATIC CONDITIONS

The necessary testing has been performed on the 9th of April of 2022.

All the tests and checks have been performed at climatic conditions:

Temperature	25 ± 10 ºC
Relative Humidity	50 ± 20 %
Pressure	96 ± 10 kPa

SITES TEST

Name.....: Shanghai Huawei Technologies Co., Ltd.

Address.....: 901 Tanglu Road, Pudong - 201206 Shanghai (China)

2.2 EQUIPMENT UNDER TESTING

Apparatus type ..... : Three phase grid tied PV string inverter.

Installation ..... : 3 Phase / Fixed installation

Manufacturer/ Supplier/ Installer ..... : Huawei Technologies Co., Ltd

Trade mark ..... :

HUAWEI

Model ..... : **SUN2000-40KTL-M3**

Serial Number ..... : 210107548510H50V1036

Software Version ..... : V100R001D02

Rated Characteristics ..... : Refer to page 8 for details

Date of manufacturing: 2021

Test item particulars

Input ..... : DC

Output ..... : 3(N) ~ +PE

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

Degree of protection against moisture ..... : IP66

Type of connection to the main supply ..... : Three-phase – Fixed installation

Cooling group ..... : Natural convection

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 SUN2000-40KTL-M3's except the parameters of rating.

Equipment under testing:

- SUN2000-40KTL-M3

The variants models are:

- SUN2000-36KTL-M3
- SUN2000-30KTL-M3

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 rated current ± 50% of the model tested.
- Same Firmware Version.

The models of SUN2000-40KTL-M3, SUN2000-36KTL-M3 and SUN2000-30KTL-M3 are identical on topological schematic circuit diagram and control solution codes except for the type of designation, the input/output rating.

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 point (~~comma~~) is used as the decimal separator.

Equipment ratings and parameters have been provided by the manufacturer.

Following table shows the full ratings of all the models referenced in this report, marked in **bold letters** the ones subjected to testing:

Model	SUN2000-30KTL-M3	SUN2000-36KTL-M3	**SUN2000-40KTL-M3**
DC Input			
Max. Input Voltage	1100 V		
MPPT Voltage Range	200~1000 V		
Nominal PV Input Voltage	600 V (380 V_{ac},400 V_{ac}) 650 V (440 V_{ac}) 720 V (480 V_{ac})		
Max. PV Input Current	4*26 A		
Max. DC Short Circuit Current	4*40 A		
AC Output			
Rated Output Power	30 kW	36 kW	40 kW
Max. Apparent Power	33 kVA	40 kVA	44 kVA
Rated Output Voltage	220 V/380 V, 3W/N+PE 230 V/400 V, 3W/N+PE 254 V/440 V, 3W+PE 277 V/480 V, 3W+PE		
Rated Output Current	45.6 A (380V_{ac}) 43.3 A (400V_{ac}) 39.4 A (440V_{ac}) 36.1 A (480V_{ac})	54.7 A (380V_{ac}) 52.0 A (400V_{ac}) 47.3 A (440V_{ac}) 43.3 A (480V_{ac})	60.8 A (380V_{ac}) 57.8 A (400V_{ac}) 52.5 A (440V_{ac}) 48.1 A (480V_{ac})
Max. Output Current	50.4 A (380V_{ac}) 47.9 A (400V_{ac}) 43.5 A (440V_{ac}) 39.9 A (480V_{ac})	61.1 A (380V_{ac}) 58.0 A (400V_{ac}) 52.8 A (440V_{ac}) 48.4 A (480V_{ac})	67.2 A (380V_{ac}) 63.8 A (400V_{ac}) 58.0 A (440V_{ac}) 53.2 A (480V_{ac})
Rated Output Frequency	50 Hz		
Power Factor Rnage	Adjustable 0.8 leading ~ 0.8 lagging		
Operating Temperature Range	-25 ºC ~ +60 ºC		
Ingress protection	IP66		
Protective class	Class I		

2.3 REFERENCE VALUES

The values presented in the following table have been used for calculation of referenced values (p.u.; %) through the report if not otherwise indicated.

Reference Values for the EUT: SUN2000-40KTL-M3	
Rated power, **Pn** in kW	40
Maximum power, **Pmax** in kW	44
Rated apparent power, **Sn** in kVA	40
Maximum apparent power, **Smax** in kVA	44
Rated wind speed (only WT), **vn** in m/s	N/A
Rated current (determined), **In** in A	57.8
Rated output voltage, (Phase to Phase) **Un** in Vac	400
Note: In this report p.u. values are calculated as follows: -For Active & Reactive Power p.u values are reference to **Pn** -For Currents p.u values, the reference is always **In** -For Voltages p.u values, the reference is always **Un**	

2.4 TEST EQUIPMENT LIST

Owner	No.	EQUIPMENT	MARK/MODEL	S/N	CALIBRATION PERIOD
HUAWEI	1	Waveform Recorder	YOKOGAWA / DL850	91LA25621	2021/05/11 to 2022/05/10
	2	Current Sensor	HIOKI / CT6863-05	170333301	2021/12/20 to 2022/12/19
	3	Current Sensor	HIOKI / CT6862-05	170342413	2021/12/20 to 2022/12/19
	4	Current Sensor	HIOKI / CT6863-05	170333298	2021/05/15 to 2022/05/14
	5	Temperature & Humidity meter	CENTER / CENTER 313	140904974	2021/09/22 to 2022/09/21
SGS	6	Multimeter	Fluke / 289C	SHES500602	2021/06/06 to 2022/06/05
	--	Matlab function	SGS / RMS+POWER	DIE.001461-1	2019/02/15 to --
	--	Matlab function	SGS / VoltageChangeMeasures	DIE 001461-2	2019/02/15 to --
	--	Matlab function	SGS / Sequences	DIE 001461-3	2019/03/07 to --
	--	Matlab function	SGS / Static+MobileWindow	DIE 001461-4	2019/06/10 to --
	--	Matlab function	SGS / Parameter	DIE 001461-5	2019/02/14 to --
	--	Matlab function	SGS / Rise&SettlingTime	DIE 001461-6	2019/05/09 to --

Note:
1. Voltage directly measured through DL850, no voltage probes were used. All measurement equipment was used inside their corresponding calibration period. Copy of all calibration certificates are available at the laboratory for reference.
2. Since equipment referenced as '--' are mathematical functions, there is no need to establish a final calibration date.

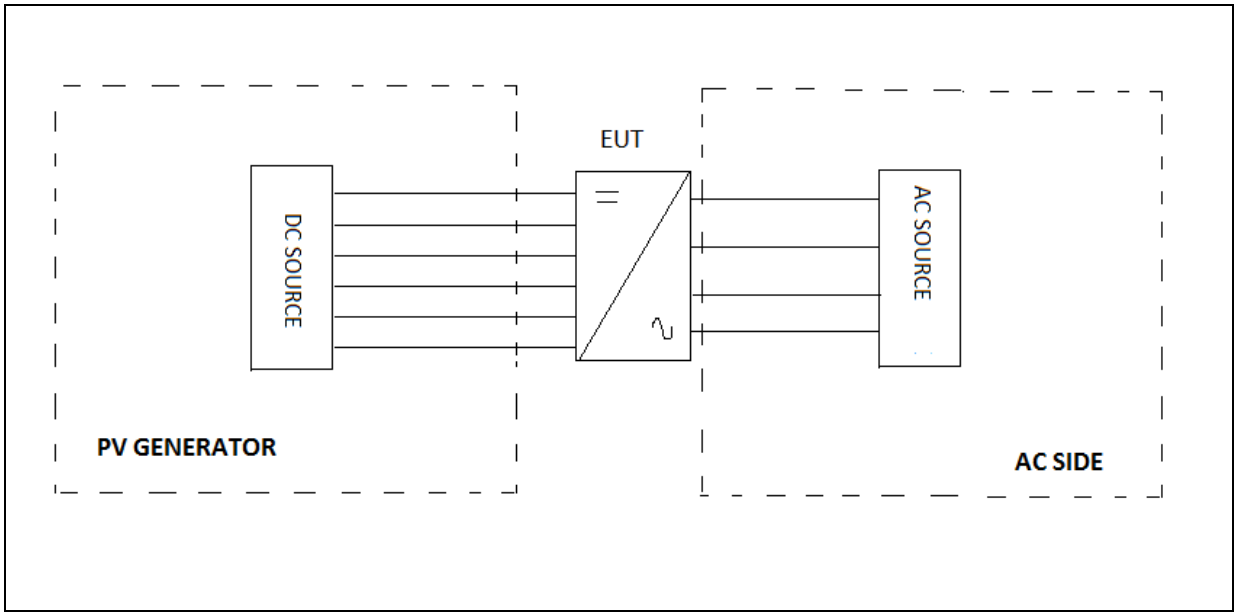
2.5 MEASUREMENT UNCERTAINTY

Associated uncertainties through measurements showed in this report are the maximum allowable uncertainties.

Magnitude	Uncertainty
Voltage measurement	±1.5 %
Current measurement	±2.0 %
Frequency measurement	±0.2 %
Time measurement	±0.2 %
Power measurement	±2.5 %
Phase Angle	±1º
Temperature	±3º C
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 petitioner. Note2: Where the standard requires lower uncertainties that those in this table. Most restrictive uncertainty has been considered and would be reported in this report.	

2.6 TEST SET UP

Below is the simplified construction of the test set up.



Different equipment has been used to take measures as it shows in chapter 2.4. Current clamps have been connected to the inverter input / output for all the tests.

All the tests described in the following pages have used this specified test setup.

The test bench used includes:

Test bench Equipment	Trademark / Model	Serial number / ID	Characteristics
DC Source	Keysight N8957APV	DE16391781	15 kW, 1500 $V_{dc\text{-}max}$
		DE16391770	
		DE16391771	
		DE16391766	
		DE16391781	
		DE16411817	
AC Source	Ametek RS90-3PI	1644A02629	90 kVA

2.7 DEFINITIONS

EUT	Equipment Under Testing	Hz	Hertz
A	Ampere	V	Volt
kVAr	Kilovolt-Ampere reactive	V_{ac}	Alternating Current Voltage
kVA	Kilovolt-Ampere	kW	Kilowatt
Un	Nominal Voltage	MW	Megawatt
In	Nominal Current	p.u	Per unit
Ir	Reactive Current	Pn	Rated Active Power
Er	Reactive Energy	ms	Millisecond
Ea	Active Energy	Itot	Total Current
LVRT	Low Voltage Ride Through	s	Second
AC	Alternating Current	P	Active Power
DC	Direct Current	Q	Reactive Power

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 Anexo III del PVVC versión 10	RESULTS
Anexo III	**Photovoltaic Installations**	**P**
4	**Verification Procedure**	**P**
4.1	Verification Procedure for PVVC	P
4.2	Verification Procedure for PVVC with FACTS	N/A
5	**Test Procedure**	**P**
5.1	Circuit test	P
5.1.1	DC power supply requirements	P
5.1.2	LVRT simulator requirements	P
5.2	SCFV test for LVRT	P
5.3	Test validation criteria	P

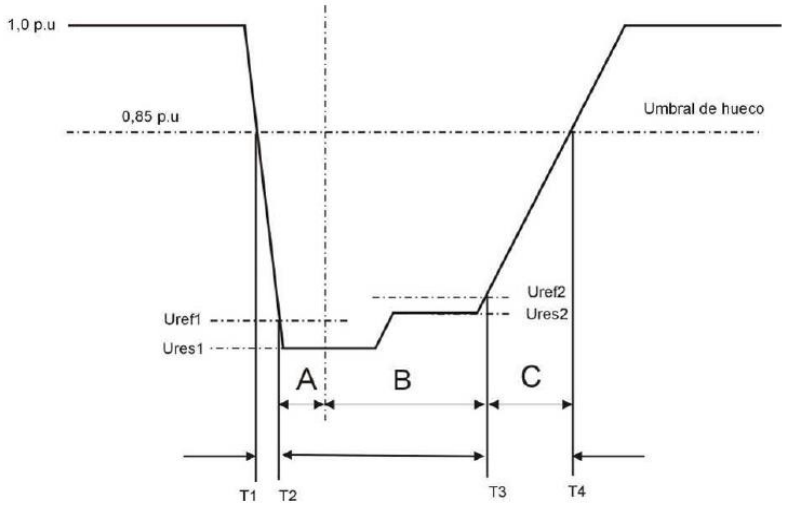
Note: Decision rule of the declaration of conformity evaluated according to the ILAC G8: 09/2019 & IEC 115 Guidelines (Proc. 2 “Accuracy Method” based on OD-5014).

Decision rule used: Binary with simple acceptance. (Safety Zone with respect to the limit w = 0).

Specific risk: Probability of False Acceptance or Rejection less than 50%, (PFA / PFR <50%). For more information see ILAC Guide G8 / 09.

4 TEST RESULTS

The LVRT test has been done according with the next figure:



Where:

U_{res1} = Minimum voltage value measured	T_1 = LVRT start instant
U_{ref1} = Minimum voltage value measured plus 3%	T_2= Instant when U is lower than U_{ref1}
U_{res2} = Voltage value measured	T_3 = Instant when U is lower than U_{ref2}
U_{ref2} = Voltage value measured plus 3%	T_4 = LVRT finish instant

U_{res2} is defined in order to considerate a variation in the voltage level inside the LVRT however the LVRT performed only have one voltage minimum level because of this in this case voltage levels U_{res1} and U_{res2} are the same levels. Same argument is applied to U_{ref1} and U_{ref2}.

- A zone: All the voltage values between T_2 and T_2 +150 ms
- B zone: All the voltages values between T_2+150 ms and T_3.
- C zone: All the voltage values between and T_4 or T_3+150 ms whichever is lower

The following codification has been used for identifying the different LVRT cases:

Test	Type	Pre-fault power	Residual voltage	Repetition	Code
1	Symmetrical (3)	100%Pn (>80%Pn)	<20%Un	1	**1.3.80-1**
				2	**1.3.80-2**
				3	**1.3.80-3**
2	Symmetrical (3)	20%Pn (10%Pn<P<30%Pn)	<20%Un	1	**2.3.20-1**
				2	**2.3.20-2**
				3	**2.3.20-3**
3	Asymmetrical (2)	100%Pn (>80%Pn)	<60%Un	1	**3.2.80-1**
				2	**3.2.80-2**
				3	**3.2.80-3**
4	Asymmetrical (2)	20%Pn (10%Pn<P<30%Pn)	<60%Un	1	**4.2.20-1**
				2	**4.2.20-2**
				3	**4.2.20-3**

4.1 LVRT SYMMETRICAL FAULTS

The test has been performed at two power levels according to the table AIII.1 from the Annex III of the PVVC. Each power level is repeated three times ensuring a voltage level lower than 20% of Un and a fault duration higher than 500 ms.

Requirements described per zone below are taken from table AIII.7 from the Annex III of the PVVC.

- Requirements for A zone:

  Q net consumption must be lower than 60% of Pn measured during 20 ms.

- Requirements for B zone:

  P consumption must be lower than 10% of Pn measured during 20 ms.
  Ir/Itot average must be higher than 90%.

- Requirements for C zone:

  Er net consumption must be lower than 60% of Pn measured during 150 ms.
  Ir net consumption must be lower than 1,5 per unit of In measured during 20 ms.

4.1.1 Test 1.3.80-1 - Active Power level > 80% Pn – 1st repetition

Test 1.3.80-1					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
> 80% Pn	101.4% Pn	< 20% Un	11.0% Un	> 500 ms	565 ms
P.O. 12.3 Requirements				**Results**	
ZONE A					
Q < 60 % Pn (20 ms)		>-0.6 p.u.		0.092 p.u.	
ZONE B					
P < 10 % Pn (20 ms)		>-0.1 p.u.		0.007 p.u.	
Ir/Itot media		>0.9 p.u.		0.992 p.u.	
ZONE C					
Er < 60 % Pn * 150 ms		>-90 ms p.u.		8 ms p.u.	
Ir < 1.5 In (20 ms)		>-1.5 p.u.		0.179 p.u.	

4.1.2 Test 1.3.80-2 - Active Power level > 80% Pn – 2nd repetition

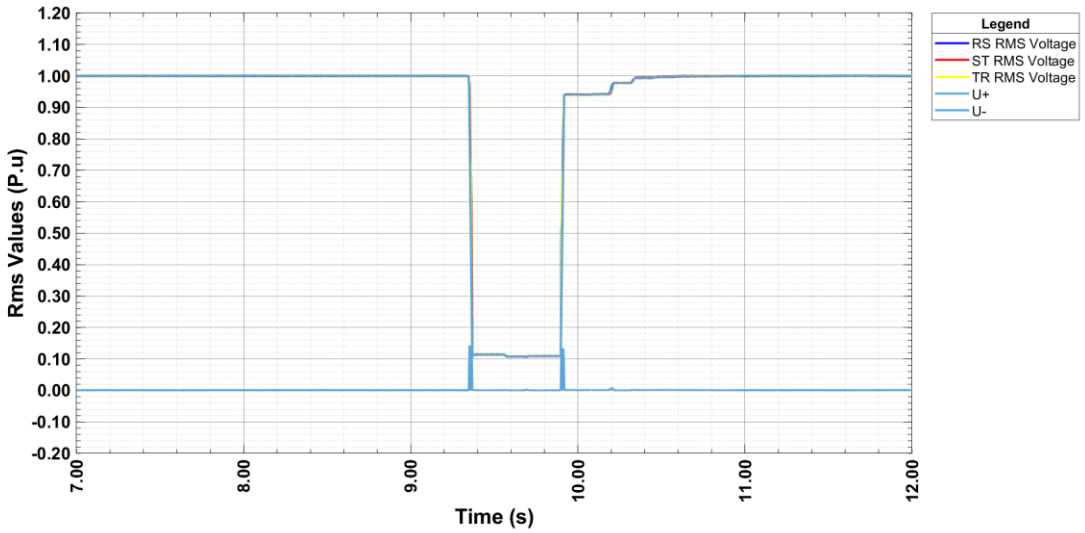
Test 1.3.80-2					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
> 80% Pn	101.3% Pn	< 20% Un	11.0% Un	> 500 ms	564 ms
P.O. 12.3 Requirements				**Results**	
ZONE A					
Q < 60 % Pn (20 ms)		>-0.6 p.u.		0.091 p.u.	
ZONE B					
P < 10 % Pn (20 ms)		>-0.1 p.u.		0.007 p.u.	
Ir/Itot media		>0.9 p.u.		0.992 p.u.	
ZONE C					
Er < 60 % Pn * 150 ms		>-90 ms p.u.		8 ms p.u.	
Ir < 1.5 In (20 ms)		>-1.5 p.u.		0.202 p.u.	

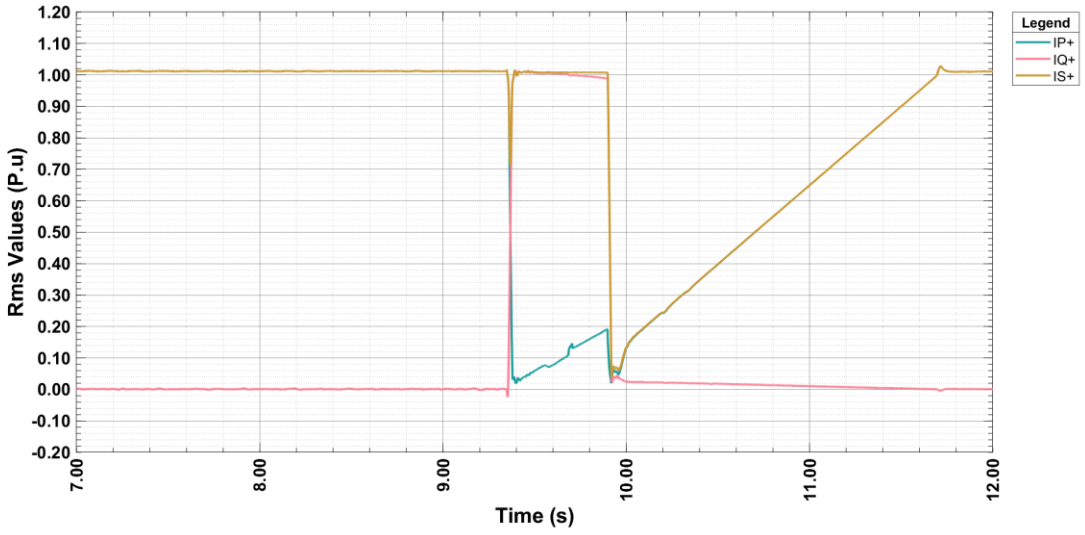
4.1.3 Test 1.3.80-3 - Active Power level > 80% Pn – 3rd repetition

Test 1.3.80-2					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
> 80% Pn	101.4% Pn	< 20% Un	11.3% Un	> 500 ms	564 ms
P.O. 12.3 Requirements				**Results**	
ZONE A					
Q < 60 % Pn (20 ms)		>-0.6 p.u.		0.090 p.u	
ZONE B					
P < 10 % Pn (20 ms)		>-0.1 p.u.		0.011 p.u.	
Ir/Itot media		>0.9 p.u.		0.986 p.u.	
ZONE C					
Er < 60 % Pn * 150 ms		>-90 ms p.u.		8 ms p.u.	
Ir < 1.5 In (20 ms)		>-1.5 p.u.		0.206 p.u.	

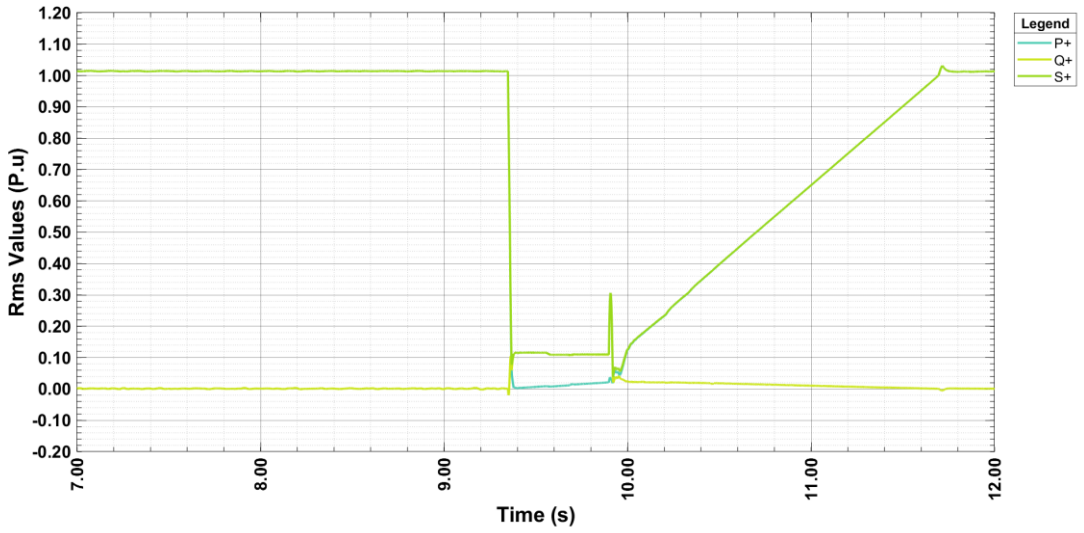
4.1.4 Graphics Test 1.3.80-1

Test 1.3.80-1



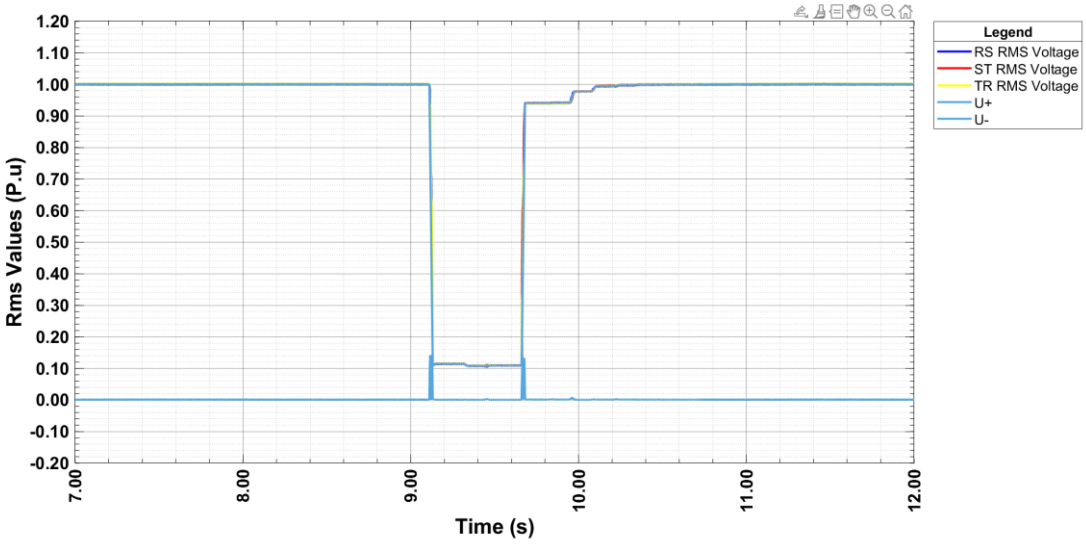


Test 1.3.80-1

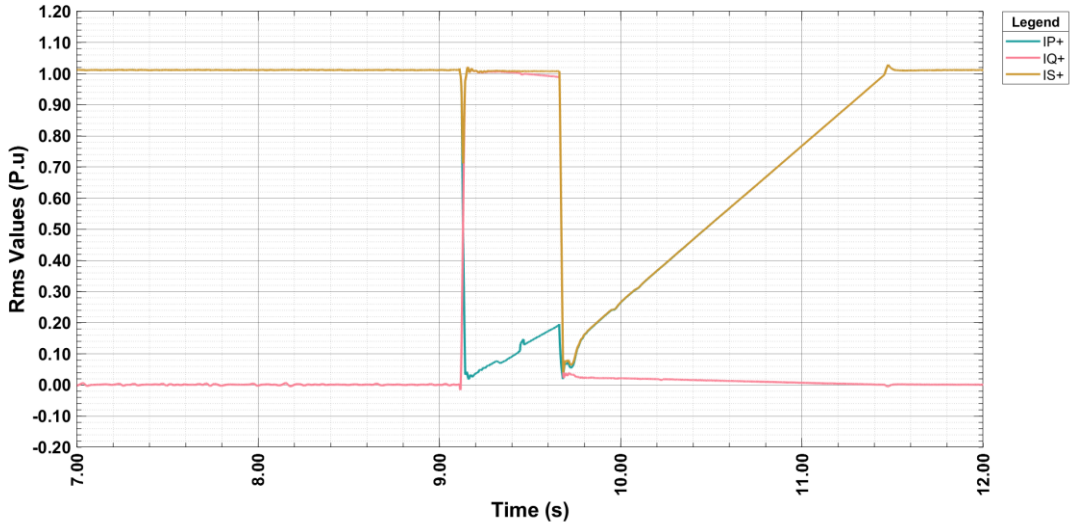


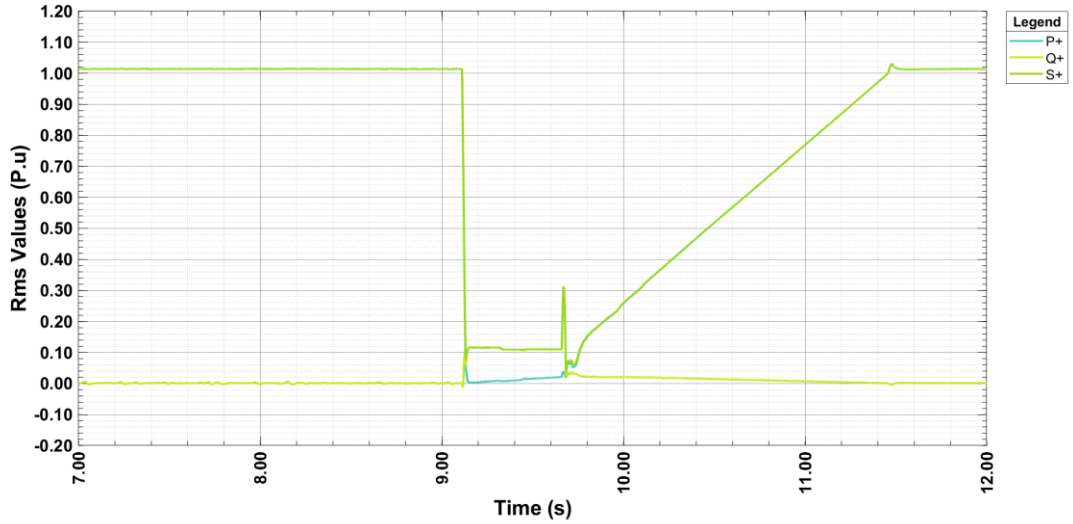
4.1.5 Graphics Test 1.3.80-2

Test 1.3.80-2



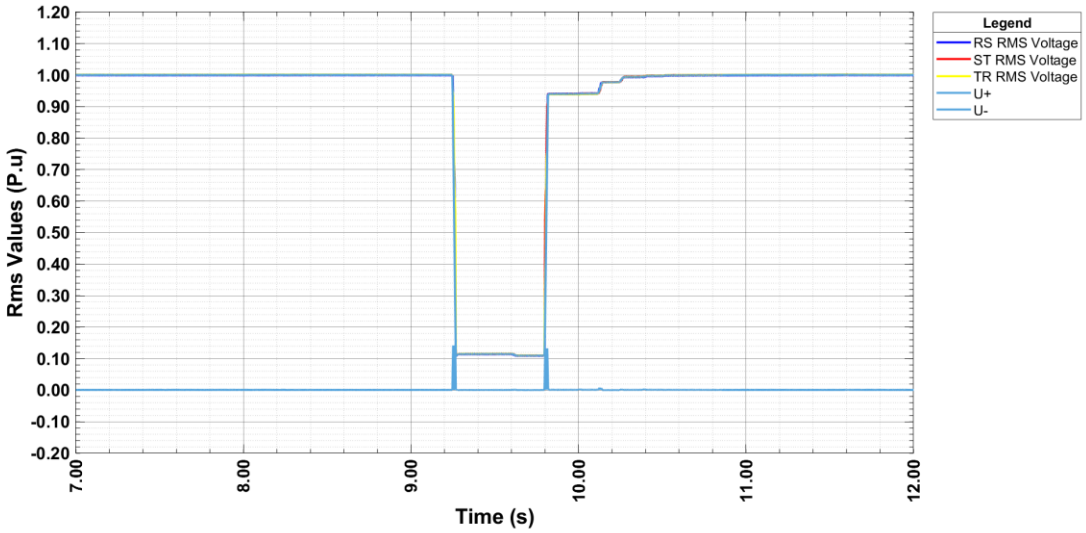
Test 1.3.80-2

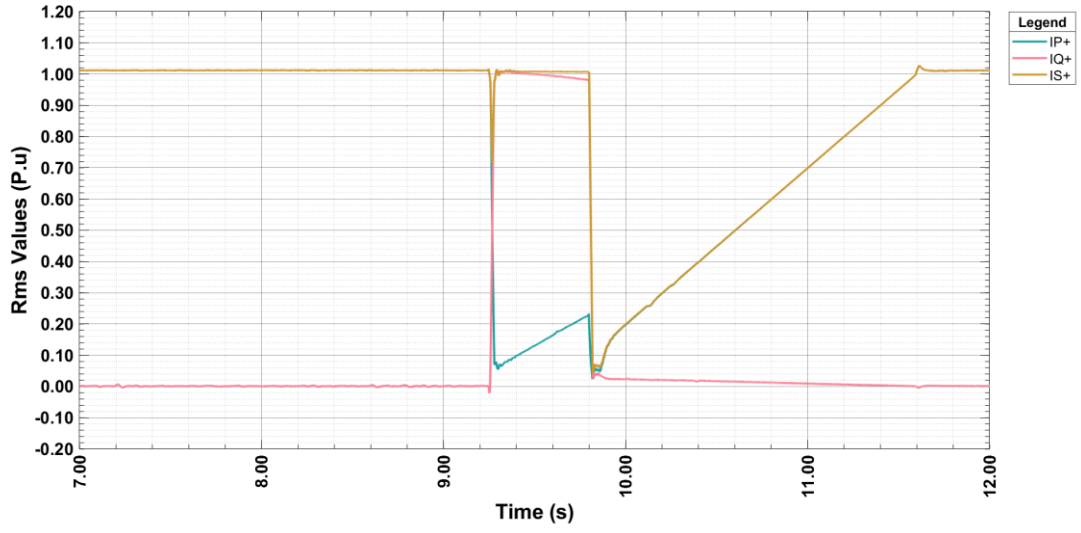

Legend
IP+
IQ+
IS+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)


Legend
P+
Q+
S+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)

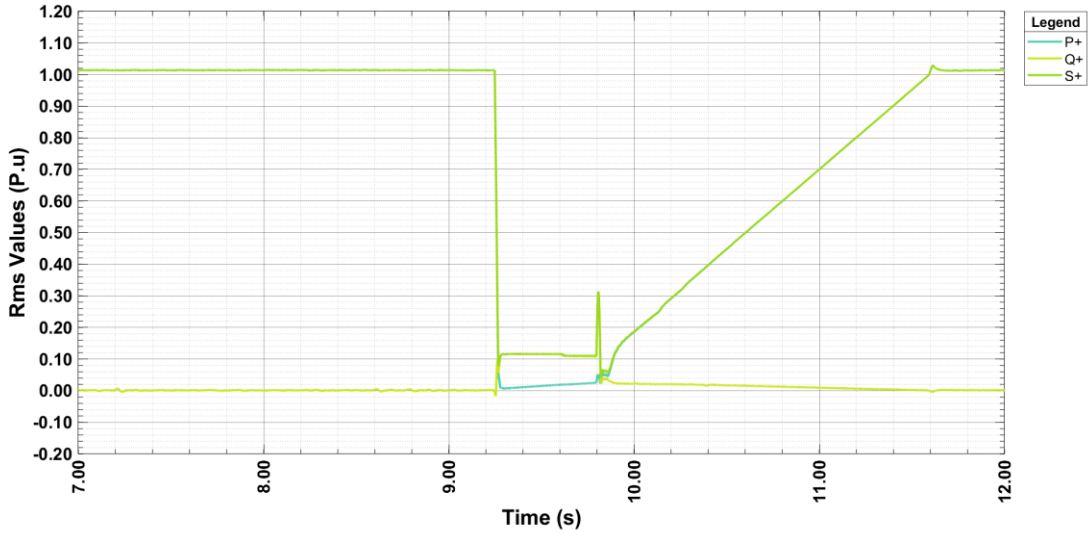
4.1.6 Graphics Test 1.3.80-3

Test 1.3.80-3





Test 1.3.80-3


Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)
Legend
P+
Q+
S+

4.1.7 Test 2.3.20-1 - Active Power level within 10% < P < 30% Pn – 1st repetition

Test 2.3.20-1					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
10%<P<30%Pn	21.1% Pn	< 20% Un	11.2% Un	> 500 ms	565 ms
P.O. 12.3 Requirements				**Results**	
ZONE A					
Q < 60 % Pn (20 ms)		>-0.6 p.u.		0.080 p.u.	
ZONE B					
P < 10 % Pn (20 ms)		>-0.1 p.u.		0.016 p.u.	
Ir/Itot media		>0.9 p.u.		0.979 p.u.	
ZONE C					
Er < 60 % Pn * 150 ms		>-90 ms p.u.		8 ms p.u.	
Ir < 1.5 In (20 ms)		>-1.5 p.u.		0.160 p.u.	

4.1.8 Test 2.3.20-2 - Active Power level within 10% < P < 30% Pn – 2nd repetition

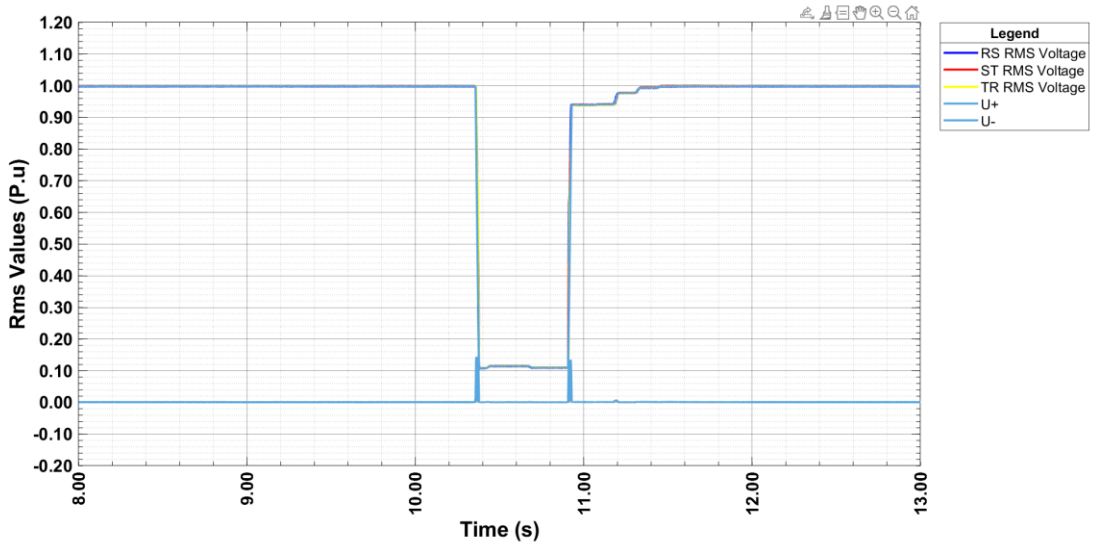
Test 2.3.20-2					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
10%<P<30%Pn	21.1% Pn	< 20% Un	11.2% Un	> 500 ms	564 ms
P.O. 12.3 Requirements				**Results**	
ZONE A					
Q < 60 % Pn (20 ms)		>-0.6 p.u.		0.072 p.u.	
ZONE B					
P < 10 % Pn (20 ms)		>-0.1 p.u.		0.013 p.u.	
Ir/Itot media		>0.9 p.u.		0.980 p.u.	
ZONE C					
Er < 60 % Pn * 150 ms		>-90 ms p.u.		8 ms p.u.	
Ir < 1.5 In (20 ms)		>-1.5 p.u.		0.199 p.u.	

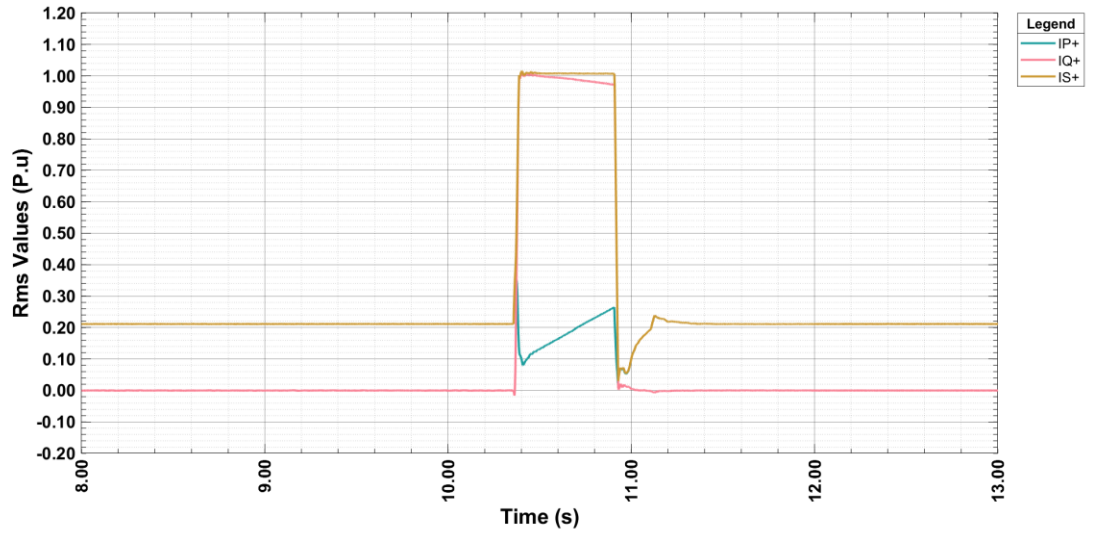
4.1.9 Test 2.3.20-3 - Active Power level within 10% < P < 30% Pn – 3rd repetition

Test 2.3.20-3					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
10%<P<30%Pn	21.1% Pn	< 20% Un	11.2% Un	> 500 ms	565 ms
P.O. 12.3 Requirements				**Results**	
ZONE A					
Q < 60 % Pn (20 ms)		>-0.6 p.u.		0.080 p.u.	
ZONE B					
P < 10 % Pn (20 ms)		>-0.1 p.u.		0.013 p.u.	
Ir/Itot media		>0.9 p.u.		0.984 p.u.	
ZONE C					
Er < 60 % Pn * 150 ms		>-90 ms p.u.		8 ms p.u.	
Ir < 1.5 In (20 ms)		>-1.5 p.u.		0.173 p.u.	

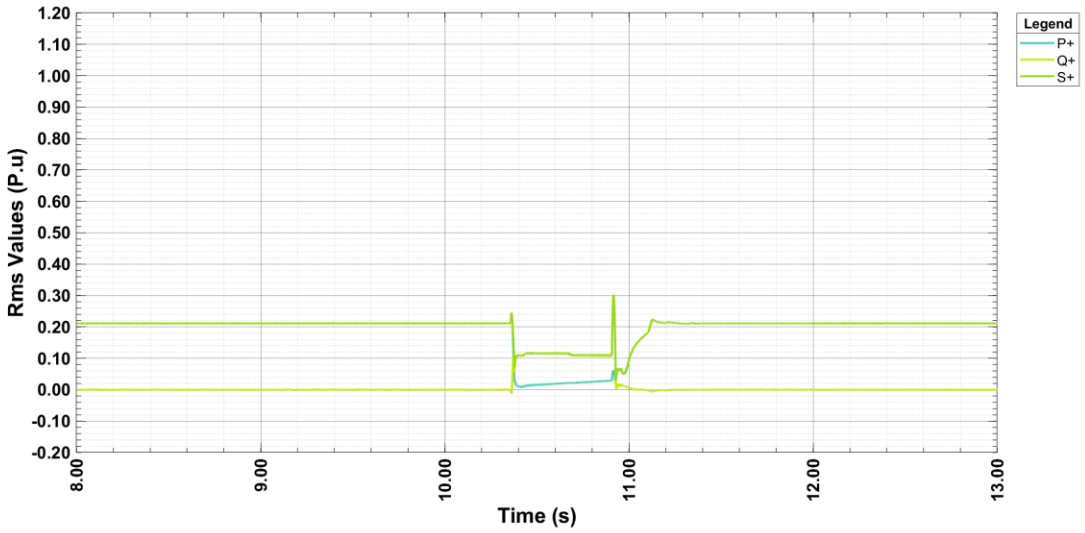
4.1.10 Graphics Test 2.3.20-1

Test 2.3.20-1



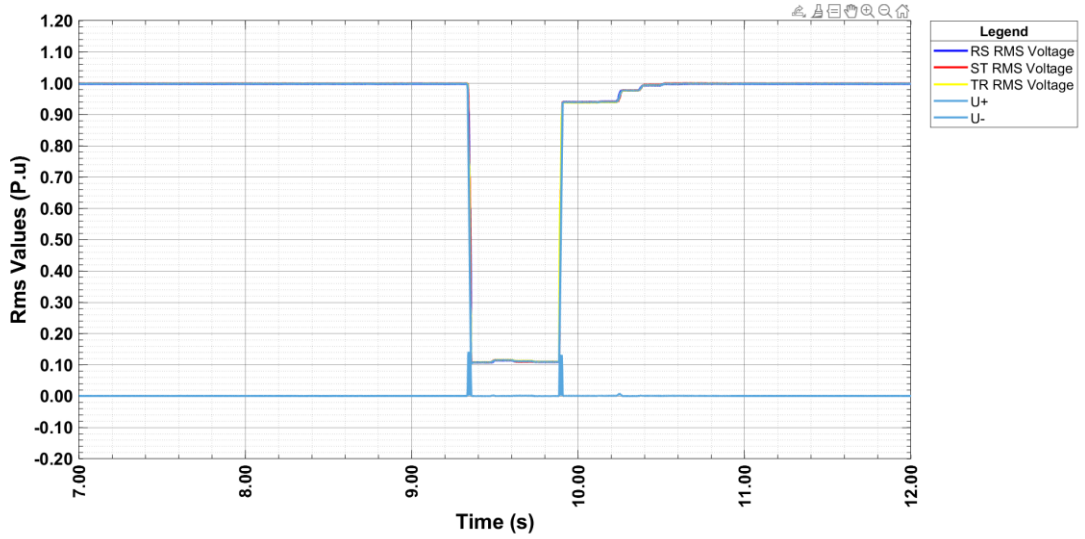


Test 2.3.20-1

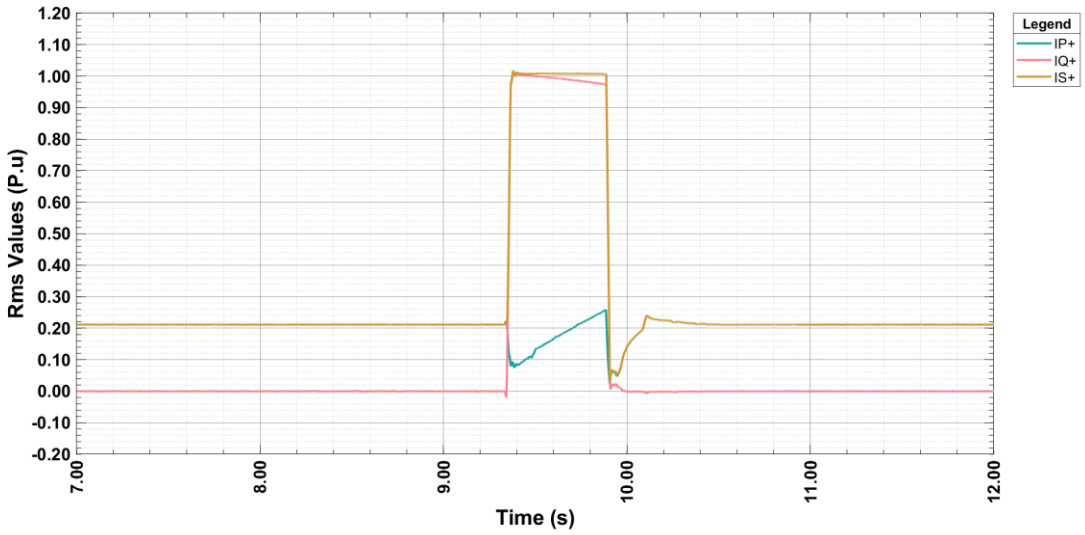


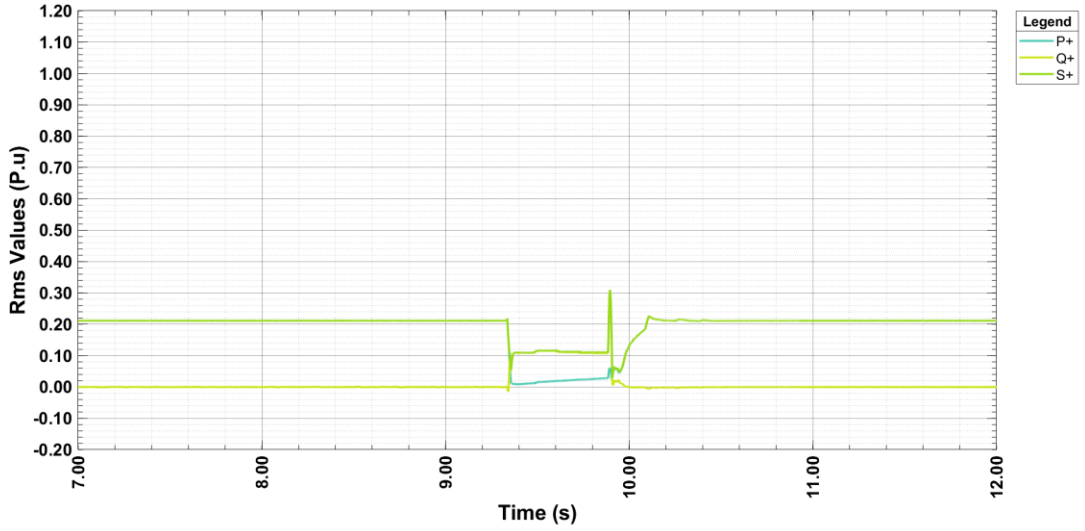
4.1.11 Graphics Test 2.3.20-2

Test 2.3.20-2



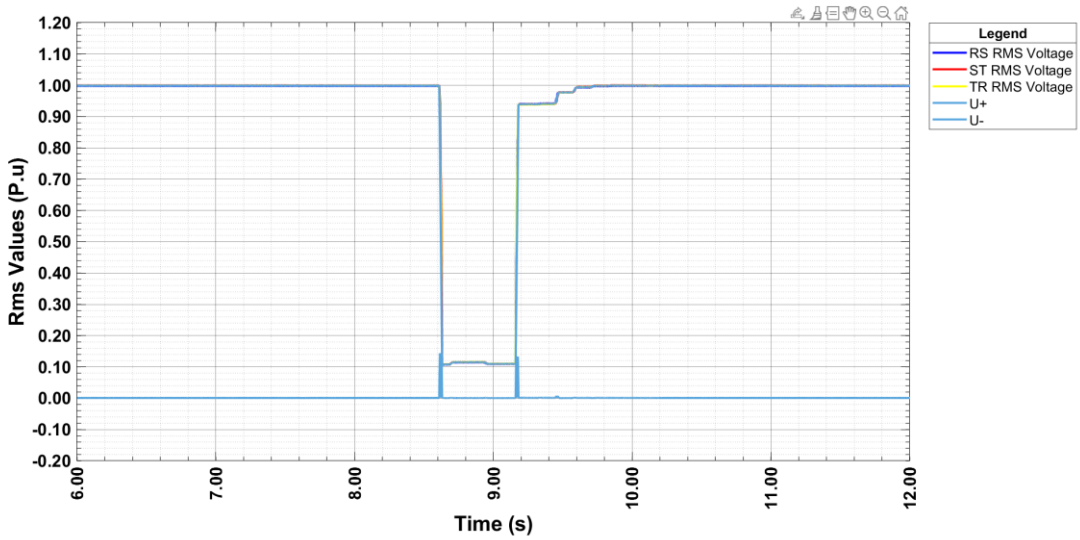
Test 2.3.20-2

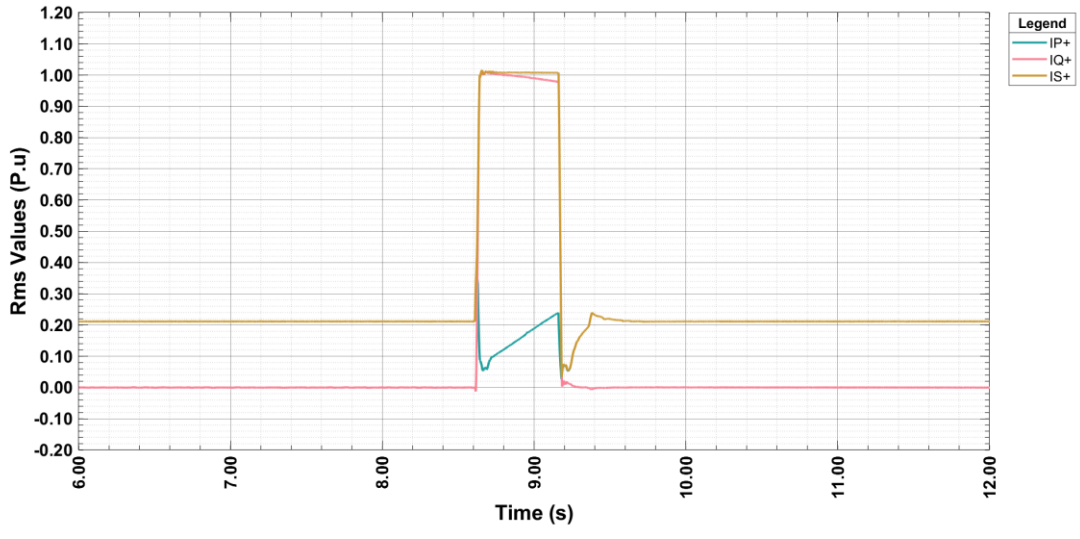

Legend
IP+
IQ+
IS+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)


Legend
P+
Q+
S+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)

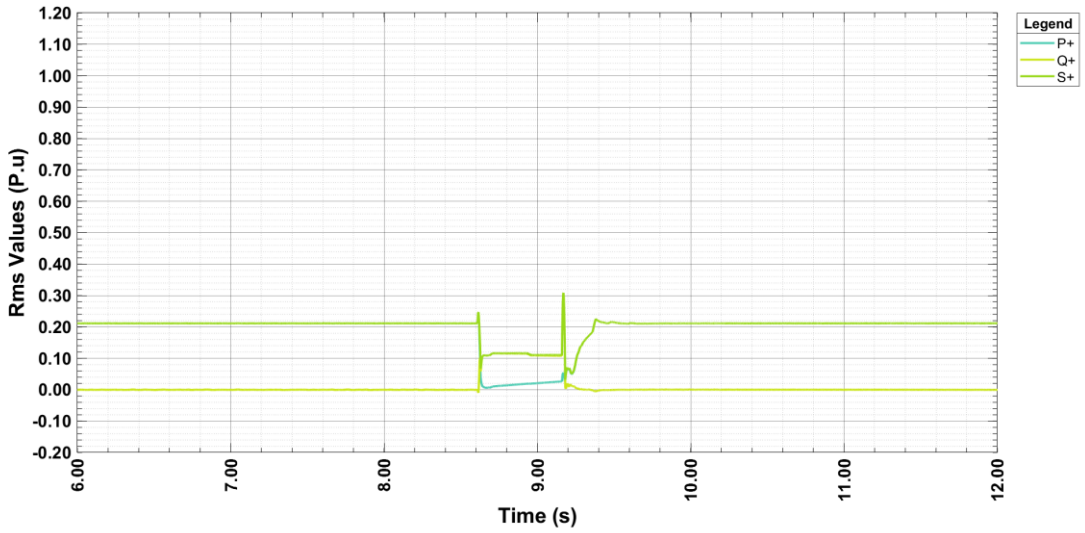
4.1.12 Graphics Test 2.3.20-3

Test 2.3.20-3





Test 2.3.20-3


Legend
P+
Q+
S+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
6.00
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)

4.2 LVRT ASYMMETRICAL FAULTS

The test has been performed at two power levels. Each power level is repeated three times ensuring a voltage level lower than 60% of Un and a fault duration higher than 500 ms.

- Requirements for A zone: No requirements.
- Requirements for B zone:

  Er consumption must be lower than 40% of Pn measured during 100 ms.
  Q consumption must be lower than 40% of Pn measured during 20 ms.
  Ea consumption must be lower than 45% of Pn measured during 100 ms.
  P consumption must be lower than 10% of Pn measured during 20 ms.

- Requirements for C zone: No requirements.

4.2.1 Test 3.2.80-1 - Active Power level > 80% Pn – 1st repetition

Test 3.2.80-1					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
> 80% Pn	101.6% Pn	< 60% Un	50.5% Un	> 500 ms	558 ms
P.O. 12.3 Requirements				**Results**	
ZONE B					
Er < 40 % Pn * 100 ms		>-40 ms p.u.		157 ms p.u.	
Q < 40 % Pn (20 ms)		>-0.4 p.u.		0.400 p.u.	
Ea < 45 % Pn * 100 ms		>-45 ms p.u.		213 ms p.u.	
P < 30 % Pn (20 ms)		>-0.3 p.u.		0.542 p.u.	

4.2.2 Test 3.2.80-2 - Active Power level > 80% Pn – 2nd repetition

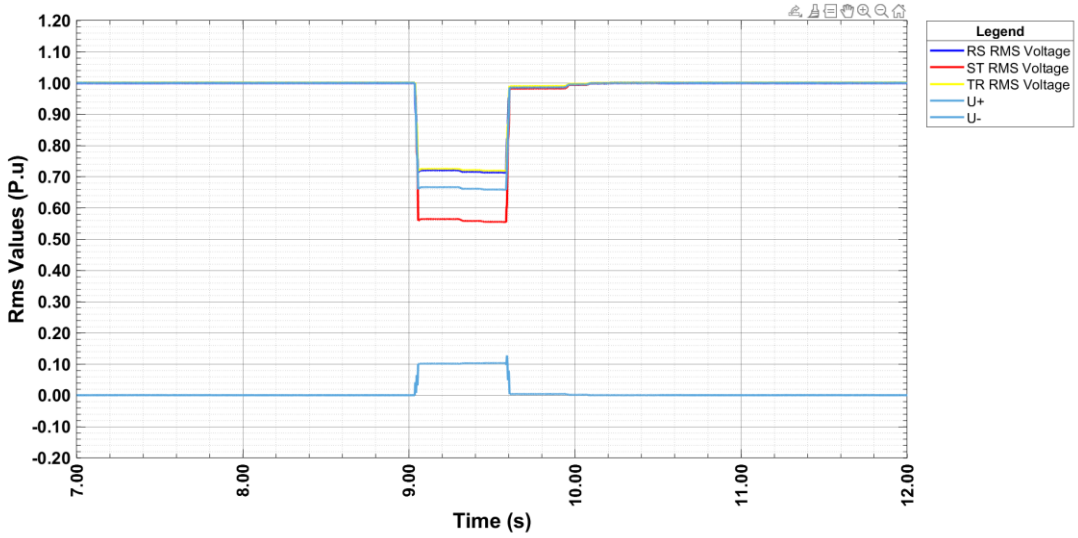
Test 3.2.80-2					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
> 80% Pn	101.6% Pn	< 60% Un	50.7% Un	> 500 ms	558 ms
P.O. 12.3 Requirements				**Results**	
ZONE B					
Er < 40 % Pn * 100 ms		>-40 ms p.u.		157 ms p.u.	
Q < 40 % Pn (20 ms)		>-0.4 p.u.		0.400 p.u.	
Ea < 45 % Pn * 100 ms		>-45 ms p.u.		213 ms p.u.	
P < 30 % Pn (20 ms)		>-0.3 p.u.		0.543 p.u.	

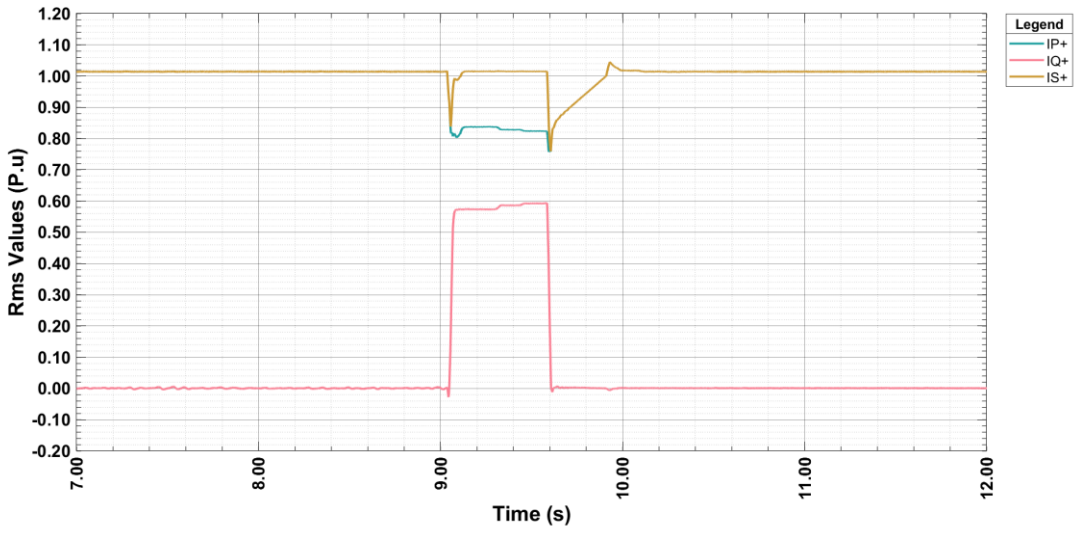
4.2.3 Test 3.2.80-3 - Active Power level > 80% Pn – 3rd repetition

Test 3.2.80-3					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
> 80% Pn	101.6% Pn	< 60% Un	50.7% Un	> 500 ms	561 ms
P.O. 12.3 Requirements				**Results**	
ZONE B					
Er < 40 % Pn * 100 ms		>-40 ms p.u.		158 ms p.u.	
Q < 40 % Pn (20 ms)		>-0.4 p.u.		0.400 p.u.	
Ea < 45 % Pn * 100 ms		>-45 ms p.u.		215 ms p.u.	
P < 30 % Pn (20 ms)		>-0.3 p.u.		0.543 p.u.	

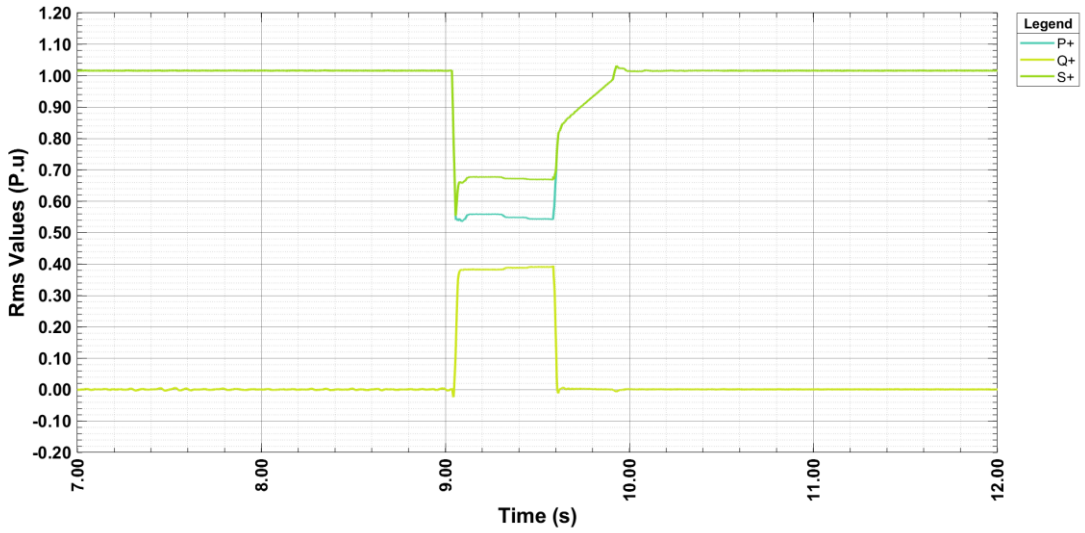
4.2.4 Graphics Test 3.2.80-1

Test 3.2.80-1



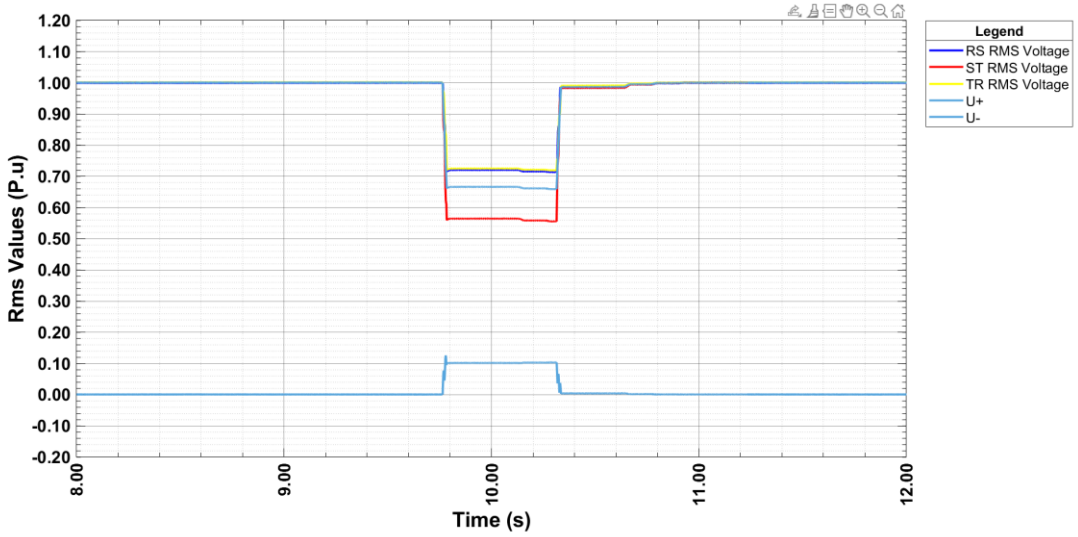


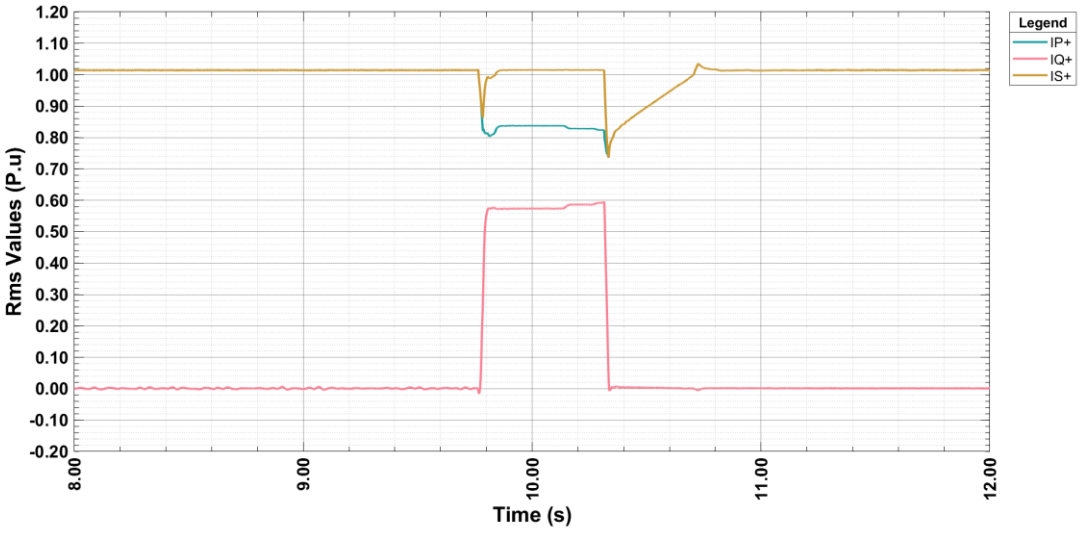
Test 3.2.80-1


Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)
Legend
P+
Q+
S+

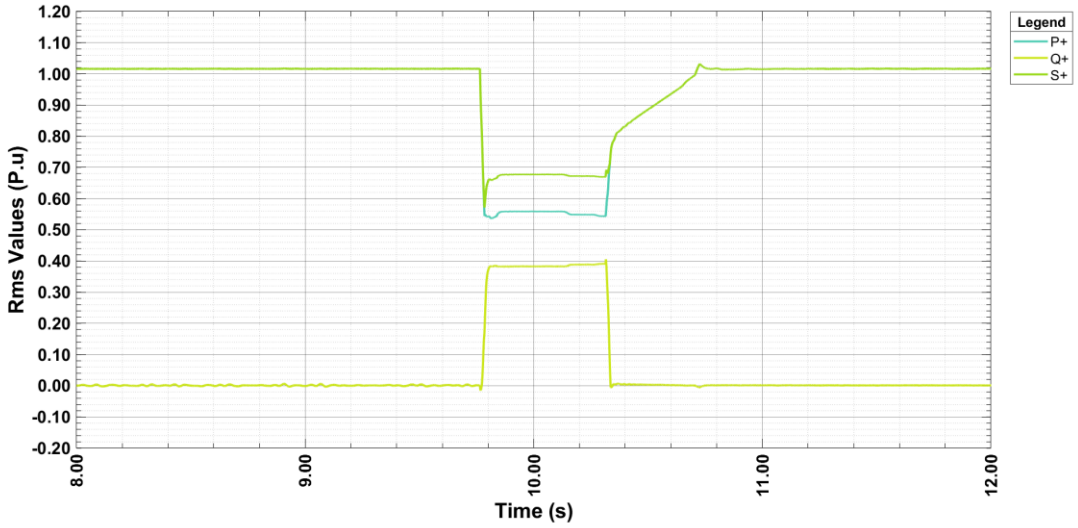
4.2.5 Graphics Test 3.2.80-2

Test 3.2.80-2



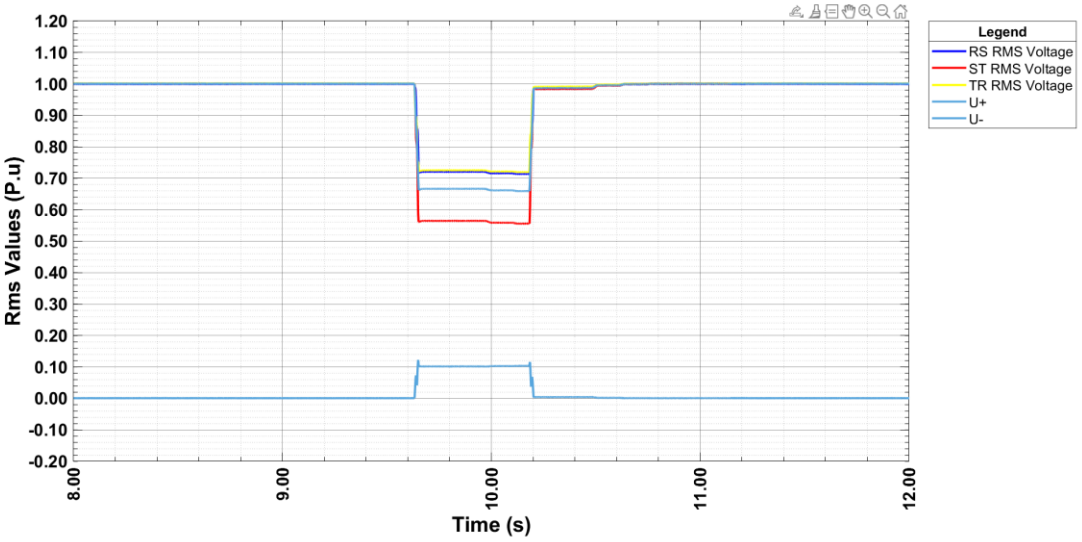


Test 3.2.80-2

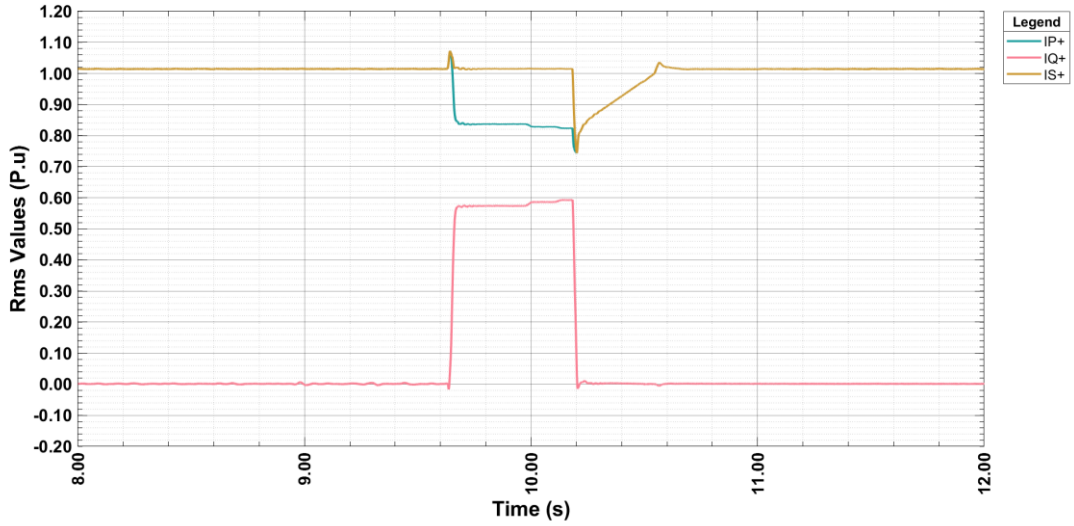


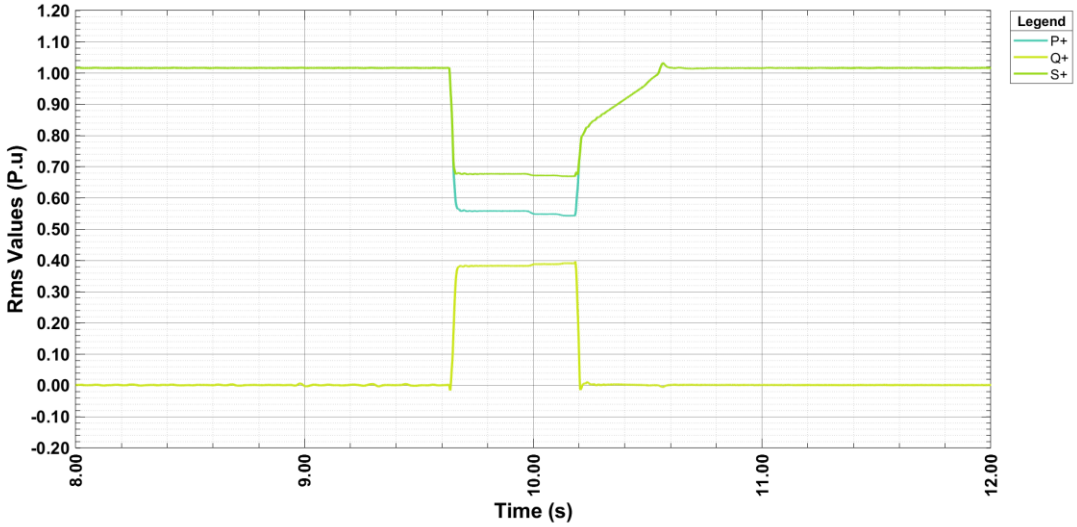
4.2.6 Graphics Test 3.2.80-3

Test 3.2.80-3



Test 3.2.80-3


Legend
IP+
IQ+
IS+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
8.00
9.00
10.00
11.00
12.00
Time (s)


Legend
P+
Q+
S+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
8.00
9.00
10.00
11.00
12.00
Time (s)

4.2.7 Test 4.2.20-1 - Active Power level within 10% < P < 30% Pn – 1st repetition

Test 4.2.20-1					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
10%<P<30%Pn	21.1% Pn	< 60% Un	50.6% Un	> 500 ms	562 ms
P.O. 12.3 Requirements				**Results**	
ZONE B					
Er < 40 % Pn * 100 ms		>-40 ms p.u.		159 ms p.u.	
Q < 40 % Pn (20 ms)		>-0.4 p.u.		0.402 p.u.	
Ea < 45 % Pn * 100 ms		>-45 ms p.u.		116 ms p.u.	
P < 30 % Pn (20 ms)		>-0.3 p.u.		0.292 p.u.	

4.2.8 Test 4.2.20-2 - Active Power level within 10% < P < 30% Pn – 2nd repetition

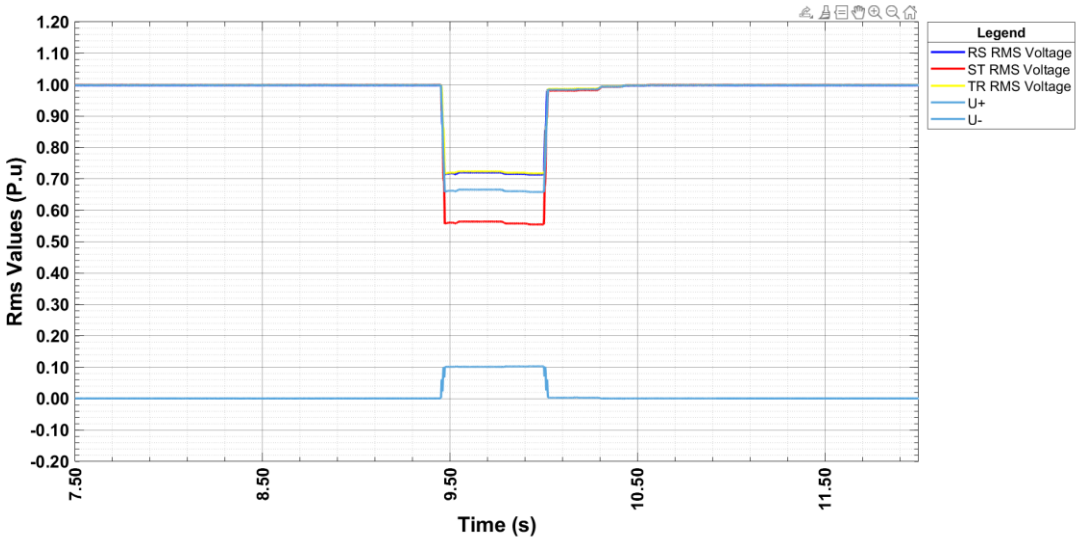
Test 4.2.20-2					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
10%<P<30%Pn	21.1% Pn	< 60% Un	50.6% Un	> 500 ms	561 ms
P.O. 12.3 Requirements				**Results**	
ZONE B					
Er < 40 % Pn * 100 ms		>-40 ms p.u.		158 ms p.u.	
Q < 40 % Pn (20 ms)		>-0.4 p.u.		0.402 p.u.	
Ea < 45 % Pn * 100 ms		>-45 ms p.u.		115 ms p.u.	
P < 30 % Pn (20 ms)		>-0.3 p.u.		0.291 p.u.	

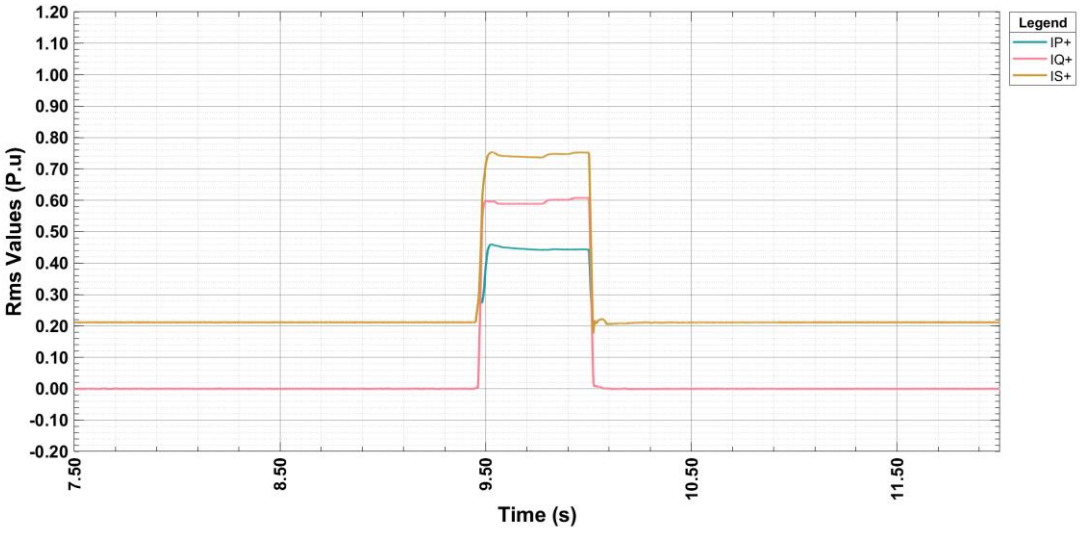
4.2.9 Test 4.2.20-3 - Active Power level within 10% < P < 30% Pn – 3rd repetition

Test 4.2.20-3					
Power Desired / Measured		Voltage Level Desired / Measured		Time Desired / Measured	
10%<P<30%Pn	21.1% Pn	< 60% Un	50.6% Un	> 500 ms	562 ms
P.O. 12.3 Requirements				**Results**	
ZONE B					
Er < 40 % Pn * 100 ms		>-40 ms p.u.		159 ms p.u.	
Q < 40 % Pn (20 ms)		>-0.4 p.u.		0.402 p.u.	
Ea < 45 % Pn * 100 ms		>-45 ms p.u.		115 ms p.u.	
P < 30 % Pn (20 ms)		>-0.3 p.u.		0.292 p.u.	

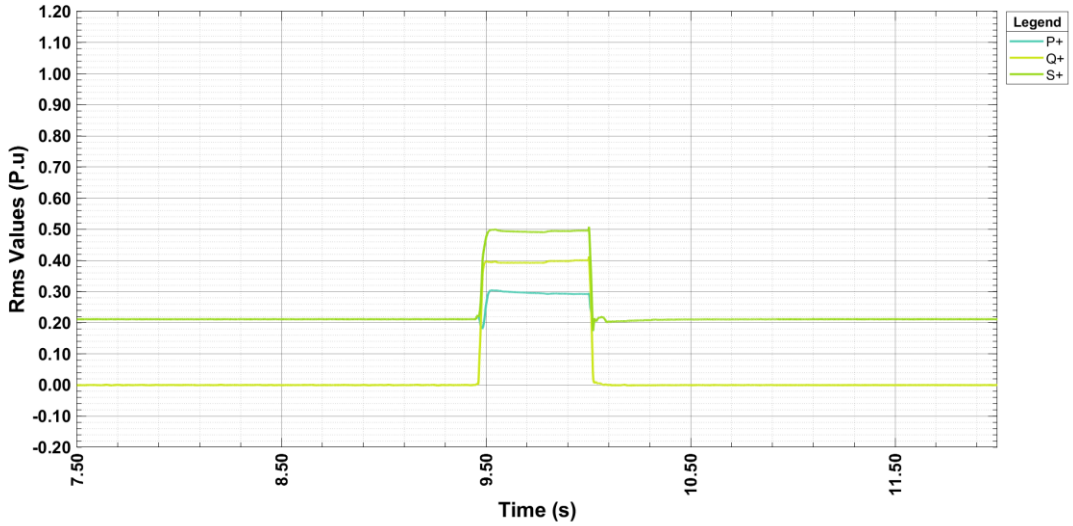
4.2.10 Graphics Test 4.2.20-1

Test 4.2.20-1



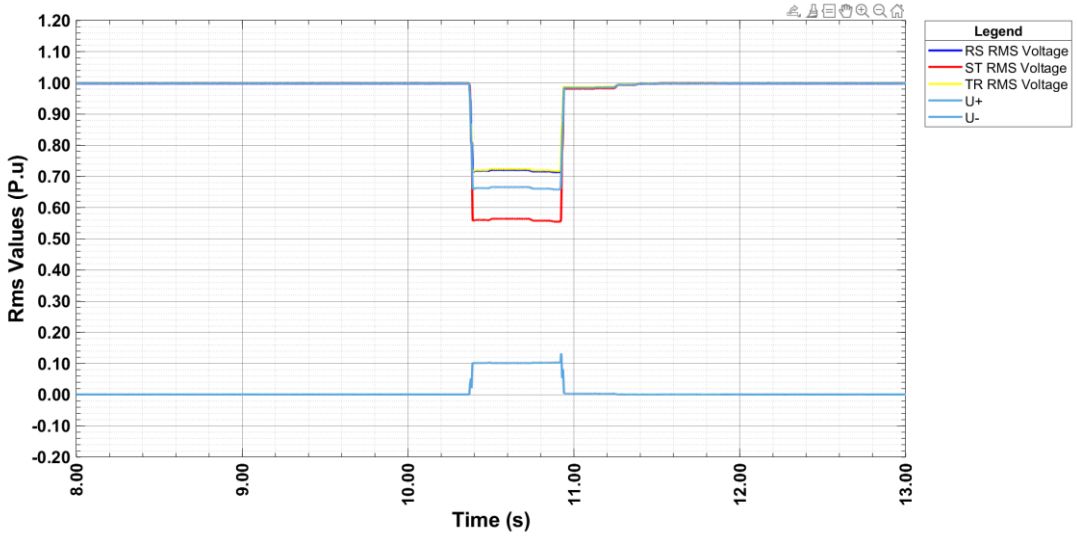


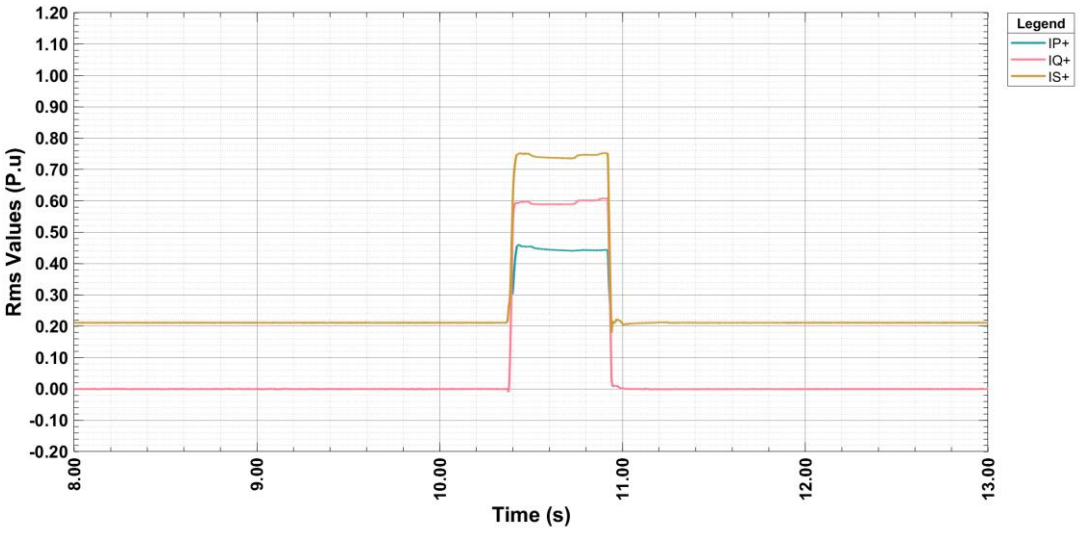
Test 4.2.20-1


Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.50
8.50
9.50
10.50
11.50
Time (s)
Legend
P+
Q+
S+

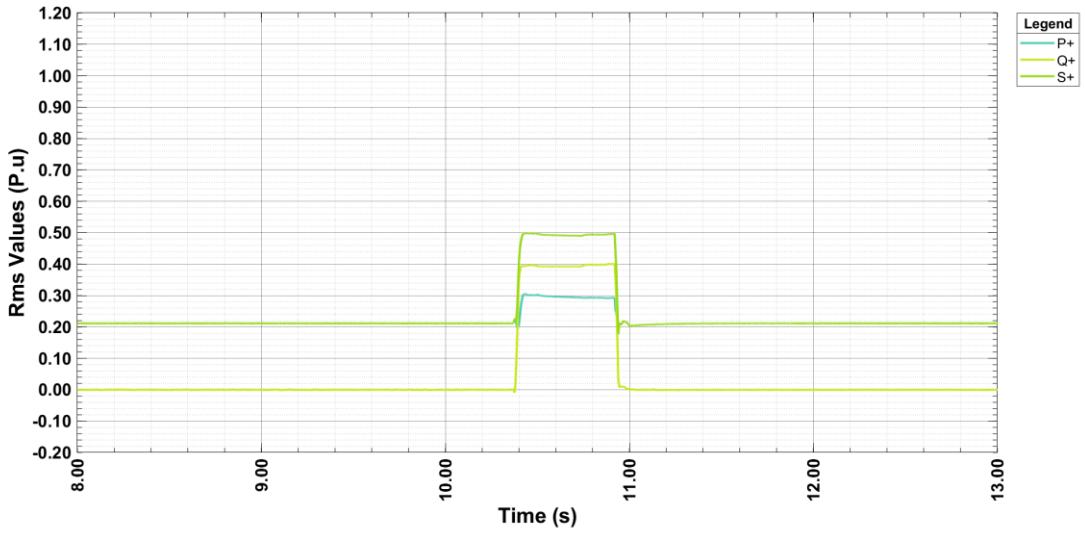
4.2.11 Graphics Test 4.2.20-2

Test 4.2.20-2



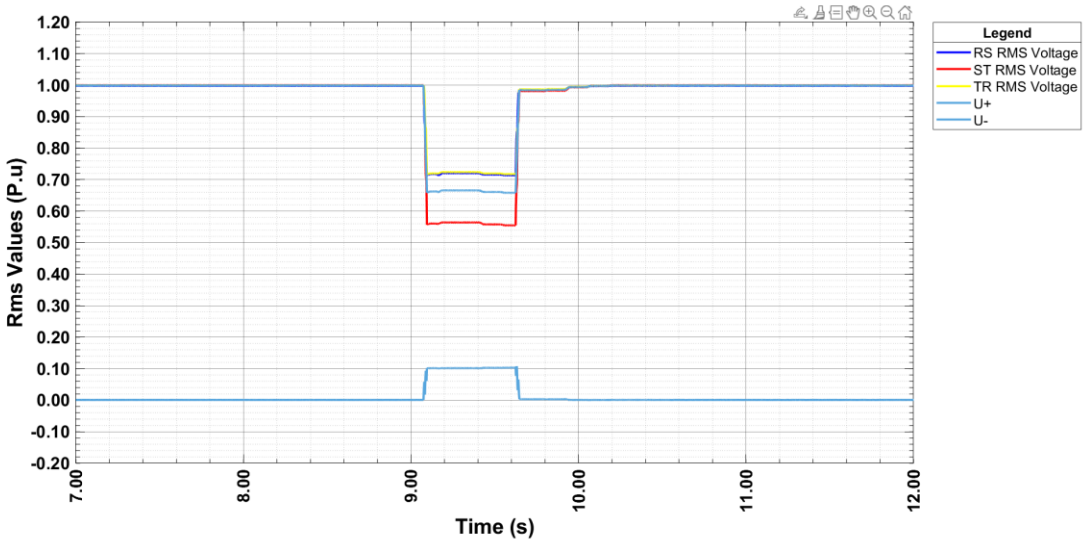


Test 4.2.20-2

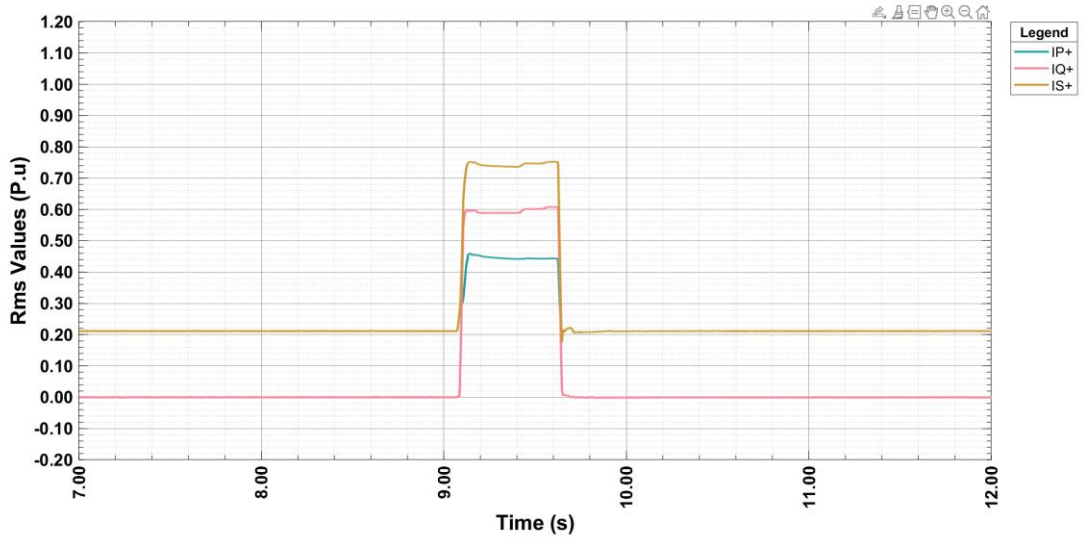


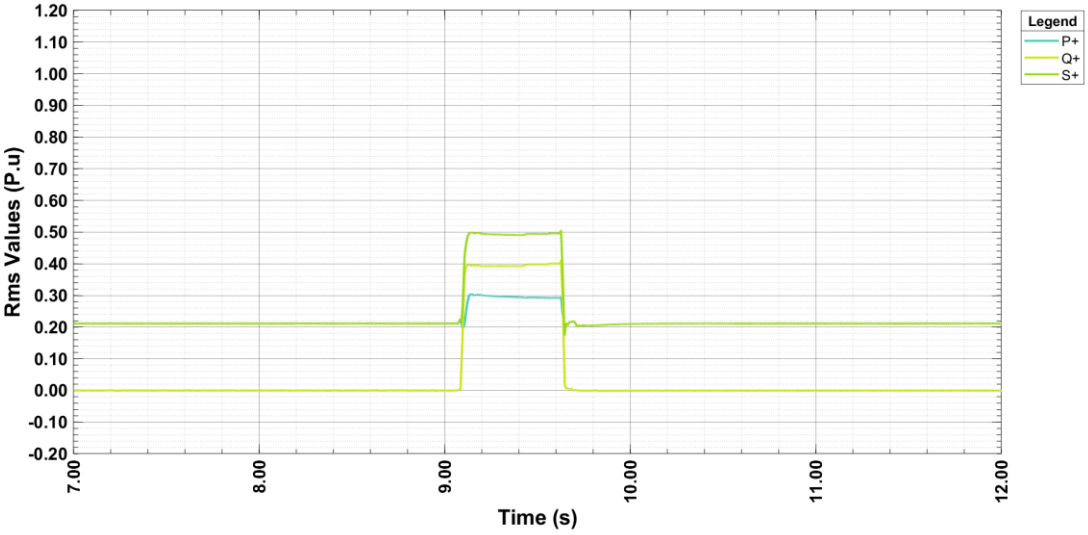
4.2.12 Graphics Test 4.2.20-3

Test 4.2.20-3



Test 4.2.20-3


Legend
IP+
IQ+
IS+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)


Legend
P+
Q+
S+
Rms Values (P.u)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
7.00
8.00
9.00
10.00
11.00
12.00
Time (s)

5 PICTURES

Front Side View

Side View


Side View

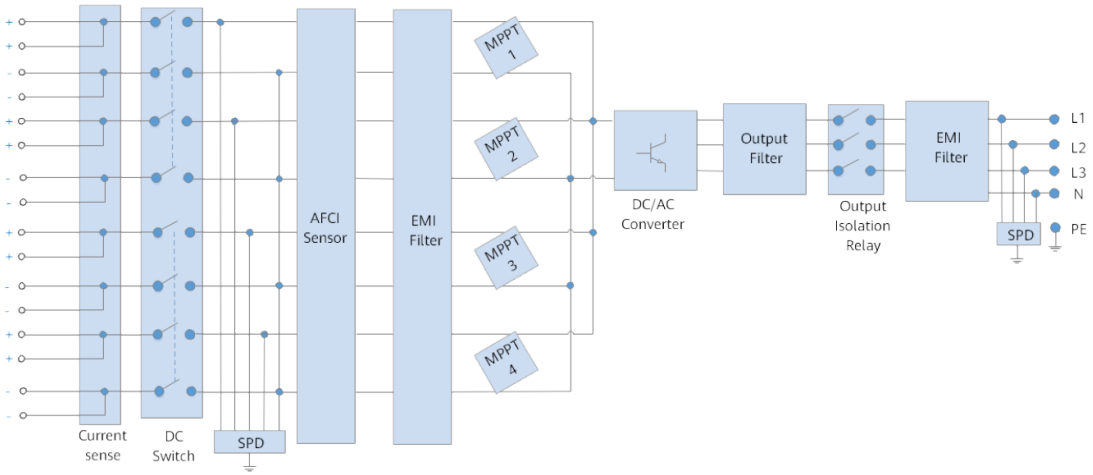
Side View


Connectors' Side

Back Side View


6 ELECTRICAL SCHEMES

SUN2000-40KTL-M3/ SUN2000-36KTL-M3/SUN2000-30KTL-M3



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