

Report No.: L13-70001-T2

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LQF-708-02
Review No:06

EMC TEST REPORT

Project No.: L13-70001

Equipment under Test: Sine Wave Inverter

Model/Type : IM11502/ 1ph
S/N : IM4B-9944/0012
Rating : 2000VA inverter with isolating transformer and stabilizer 230VAC
110VDC $\pm$ 10 % 50HZ
Operating temperature range : -10° to 55°
Technology : spwm

Manufactured By: Taghzieh Electronic Co.

Trade Mark: 

Address: No. 11, 8th Alley, Sabounchi St., Beheshti St.

Applicant: Taghzieh Electronic Co.

Address: No. 1, Lashkari Sank Alley, Kamard Industrial Zone, after Jajroud Road Police,
Abali Road, Tehran

Tested According To: IEC 62040-2:2016/ISH1:2018

Issue Date: 25-May-2021

Test Result: Pass

No. of pages: 48

Tested By: Test Engineer

S. A. Sharafi

CEO

S. M. Mirsadri

Verified By: Technical Manager

S. M. Mirfallah

Approved By:

Engineering Deputy of
Test and Inspection

Prof. B. Vahidi

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1 GENERAL INFORMATION

1.1 Product Information

Equipment under test	: Sine Wave Inverter
Manufacturer	: Taghzieh Electronic Co.
Model/Type	: IM11502
Rating	: 2000VA inverter with isolating transformer and stabilizer 230VAC 110VDC $\pm$ 10% 50HZ

1.2 EUT Description

The inverter has two input voltages, AC and DC, whose main task is to convert the input dc voltage to the ac voltage at the output.

Whenever the dc input voltage is cut off or exceeds the allowable limit, the device gives the input AC directly to the output without interrupting the power load.



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Figure 1: EUT

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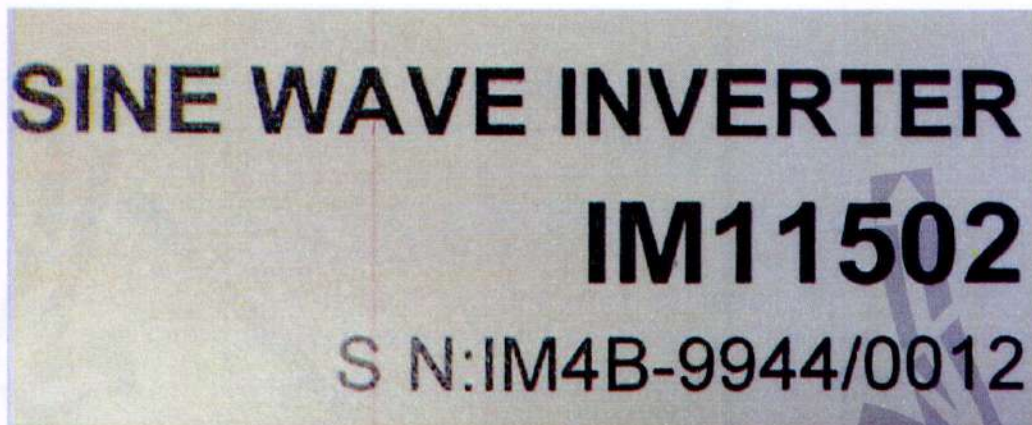


Figure 2: EUT name plate



Figure 3: Graphic user interface



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Figure 4: Auxiliary equipment (rectifier 3phase)

2 SUMMARY

This section presents an overview of standard and results. Refer to the next section for details of measured test results and applied test levels.

2.1 Overview of Results

Immunity Tests	Standards	Results
Electrostatic discharge	IEC 61000-4-2 :2008	Pass
Radiated EM field immunity	IEC 61000-4-3:2006	Pass
Burst	IEC 61000-4-4:2012	Pass
Surge	IEC 61000-4-5:2014	Pass
RF conducted immunity	IEC 61000-4-6: 2013	Pass
Power frequency magnetic field	IEC 61000-4-8:2009	Pass
Voltage dips and short interruptions	IEC 61000-4-11 :2020	N/A
Emission Tests	Standards	Results
EMI conducted measurement	IEC 62040-2:2016	Pass
EMI radiated measurement	IEC 62040-2:2016	Pass
Voltage flicker measurement	IEC 61000-3-3 :2013	N/A
Current harmonic measurement	IEC 61000-3-2 :2014	Pass

3 IMMUNITY TEST RESULTS

3.1 Test Requirements

At the request of the customer, the equipment has been tested as category C1 UPS.

3.2 Performance Criteria

Table 1: Performance criteria for immunity tests

	Criterion A	Criterion B
External and internal indications and metering	Change only during test	Change only during test
Control signals to external devices	No change	Change only temporarily in consistency with the actual UPS mode of operation
Mode of operationa	No change	Change only temporarily
a At all times, the UPS shall remain within the performance classification as declared by the UPS manufacturer (see IEC 62040-3:2011).		



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3.3 EUT Performance Condition

The equipment has been tested under a resistance load with a current of 9 A. The equipment display, current and DC connection are monitored during the test.

According to the customer, the change or loss of the following factors is considered as a basic loss of performance.

- over load
- voltage ac high and low
- weak battery
- high temperature failure
- inverter earth fault
- inverter fai

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3.4 Electrostatic Discharge Immunity Test

Electrostatic discharges (ESD) are the result of persons or objects that accumulate static electricity due to for instance walking on synthetic carpets. The ESD can influence the operation of equipment or damage its electronics, either by a direct discharge or indirectly by coupling or radiation. Both effects are simulated during the tests.

3.4.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

3.4.2 Ambient conditions

Ambient Temperature : 22.7 °C
Relative Humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

3.4.3 Instrument used for test

Equipment	Manufacturer	Model
ESD Generator	Schlöder	SESD 200

3.4.4 Procedure of test

The test was carried out according to IEC 61000-4-2 and table 1 of paragraph 6.3.2 of standard IEC 62040-2 under the following conditions:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.

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- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.

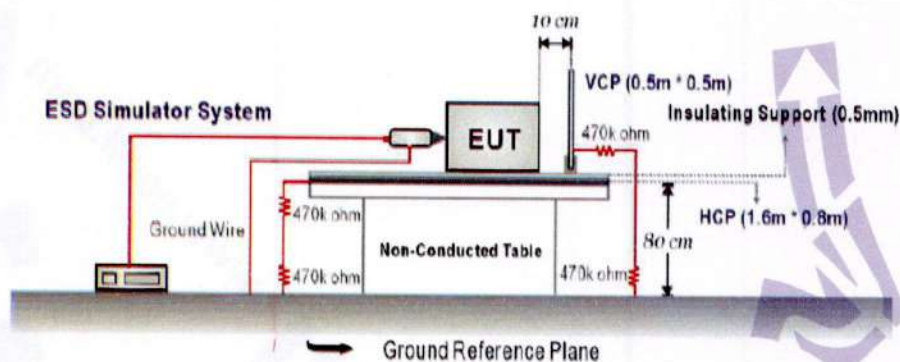


Figure 5: Test set-up for ESD immunity test

3.4.5 Performed test:

Basic Standard	: IEC 61000-4-2
Tested Ports	: Surface of the specimen
Air Discharges	: ± 8 kV
Contact Discharges	: ± 4 kV (Direct & Indirect)
Polarity	: Positive and negative
Number of Application	: Ten positive and ten negative

3.4.6 Test result

Test level	Coupling		Complied with Criteria	Acceptance Criteria	Result
± 4 kV	Contact	direct	A	B	PASS
		indirect	A	B	PASS
± 2 kV	Air		B	B	PASS
± 4 kV	Air		B	B	PASS
± 8 kV	Air		B	B	PASS



Figure 6: ESD test set-up

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3.5 Immunity to Radiated RF Electromagnetic Fields

The object of this test is evaluating the immunity of electrical and electronic equipment subjected to radiated, radio-frequency electromagnetic fields.

3.5.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

3.5.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

3.5.3 Instrument used for test

Equipment	Manufacturer	Model No	Serial No
Fully-Anechoic Chamber	HUAMING	FAR	-
Measurement Software	Rohde & Schwarz	EMC32 V8.3	N/A
Signal Generator	Rohde & Schwarz	SMIQ 06	1125.5555.26
Broadband Amplifier (30MHz-500MHz)	LOADSTAR	(30MHz-500MHz)	-
Broadband Amplifier (500MHz-3GHz)	LOADSTAR	(500MHz-3GHz)	-
Broadband Antenna	Aaronia	20600 EMI	201750
Power Meter	Keysight	N9020A	MY49100060

3.5.4 Procedure of test

The test procedure was in accordance with IEC 61000-4-3 table 1 of paragraph 6.3.2 of standard IEC 62040-2 as the following:

- The test was performed in a full-anechoic chamber
- The transmitting antenna was located at a distance of 3 meters from the EUT
- Tested as floor standing equipment, it is mounted on a 10 cm high non-conductive table
- The transmitting antenna was fixed at 1.5 meter above ground
- The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1000 Hz
- The dwell time at each frequency was 0.5 sec

Note: The dwell time at each frequency shall not be less than the time necessary for the EUT to be able to respond

- The frequency range is 80 MHz-1000 MHz
- For receivers and transmitters the stepped frequency increments shall be 1 % frequency increment of the momentary used frequency
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the three sides
- In order to be capable of judging the EUT performance visually, a CCD camera was used to monitor the EUT
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.



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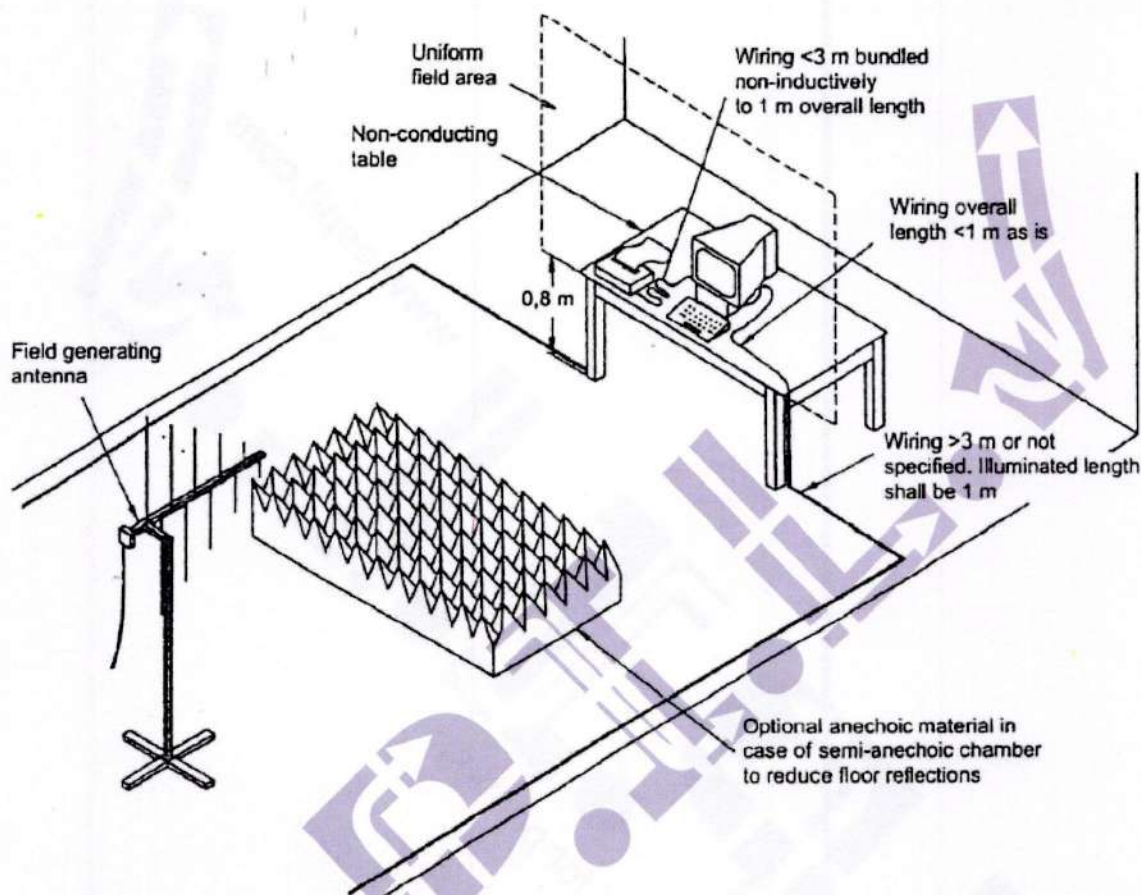


Figure 7: Example of test setup for table-top equipment

IEC 034/06

3.5.5 Test result

Frequency Range	Test level (V/m)	Dwell time (sec)	Ant. Polarity	Complied with Criteria	Acceptance Criteria	Result
80 MHz – 1 GHz	3	0.5	H / V	A	A	PASS

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Figure 8: EMS radiated test set-up

3.6 Electrical Fast Transient Burst Immunity Test

This test simulates quick transient noise interferences mostly generated when switching inductive loads. Significant for this interference's is a very short rise time of the single pulses and the high repetition rate within burst packet.

3.6.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

3.6.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

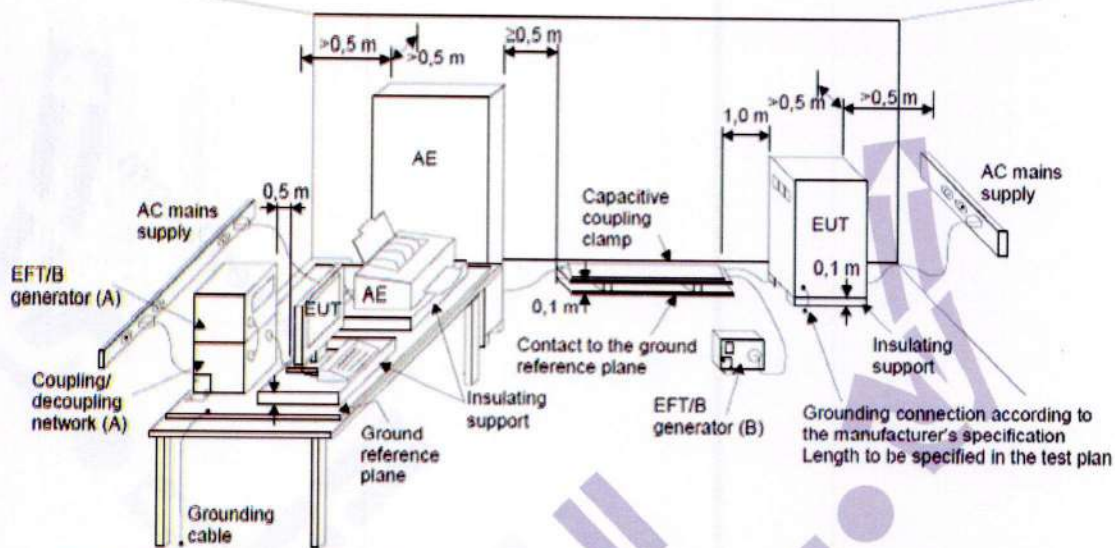
3.6.3 Instrument used for test

Equipment	Manufacturer	Model	S/N
Burst generator	Schlöder	SFT 400	403315

3.6.4 Procedure of test

The test was carried out according to IEC 61000-4-4 and table 1 of paragraph 6.3.2 of standard IEC 62040-2 under the following conditions:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.



IEC 645/12

Figure 9: Test set-up for electrical fast transient burst immunity

3.6.5 Performed test:

Basic standard	IEC 61000-4-4
Peak voltage	± 1 kV
Coupling method	Direct
Tested ports	AC power, DC port
Repetition rate	5 kHz
Coupling lines	L,N,PE & +, -
Test time	60 seconds

3.6.6 Test results

Coupling Line	Voltage	Repetition Frequency	Coupling Method	Complied with Criteria	Acceptance Criteria	Result
L	±1 kV	5 kHz	Direct	A	B	Pass
N	±1 kV	5 kHz	Direct	A	B	Pass
PE	±1 kV	5 kHz	Direct	A	B	Pass
L-N	±1 kV	5 kHz	Direct	A	B	Pass
L-PE	±1 kV	5 kHz	Direct	A	B	Pass
N-PE	±1 kV	5 kHz	Direct	A	B	Pass
L-N-PE	±1 kV	5 kHz	Direct	A	B	Pass
+	±1 kV	5 kHz	Direct	A	B	Pass
-	±1 kV	5 kHz	Direct	A	B	Pass
+, -	±1 kV	5 kHz	Direct	A	B	Pass



Figure 10: Burst test set-up



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3.7 Surge Immunity Test

This test simulates high-energy pulses on supply mains as if they appear for example after over-voltage events (e.g. lightning strikes). The pulse is a low transient with high-energy contents and due to its long duration may cause damage to an unprotected EUT.

3.7.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

3.7.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

3.7.3 Instrument used for test

Equipment	Manufacturer	Model	S/N
Surge generator	Schlöder	CWG 500	312081

3.7.4 Procedure of test

The test was carried out according to IEC 61000-4-5 and table 1 of paragraph 6.3.2 of standard IEC 62040-2 under the following conditions:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.

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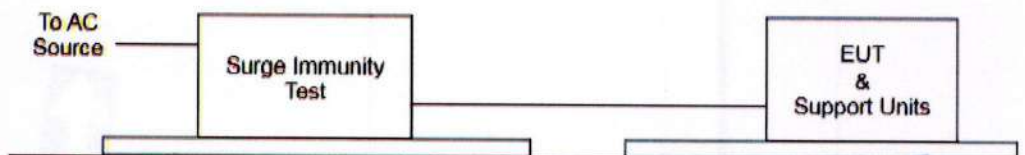


Figure 11: Test set up for surge immunity

3.7.5 Performed test:

Basic standard	IEC 61000-4-5
Pulse characteristics	0.5/50 μ s
Peak voltage	± 1 kV (Differential mode), ± 2 kV (Common mode)
Tested ports	AC power, DC port
Coupling line	L,N,PE & +,-
Repetition rate	1/60 sec

3.7.6 Test result

Coupling Line	Voltage	Coupling method	Complied with Criteria	Acceptance Criteria	Result
L-PE	± 2 kV	Capacitive	A	B	Pass
N-PE	± 2 kV	Capacitive	A	B	Pass
L-N	± 1 kV	Capacitive	A	B	Pass
+,-	± 1 kV	Capacitive	A	B	Pass



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Figure 12: Surge test set-up

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3.8 Immunity to Conducted Disturbances, Induced by RF Fields

The object of this test is evaluating the functional immunity of electrical and electronic equipment when subjected to conducted disturbances induced by radio-frequency fields.

3.8.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

3.8.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

3.8.3 Instrument used for test

Equipment	Manufacturer	Model
Signal Generator	R&S	SML-01
Power Amplifier	Com-Power	ACS-230-50W
Attenuator	Com-Power	ATTN-6-100W
CDN	Com-Power	M325E
BCI	Com-Power	CLCI-100

3.8.4 Procedure of test

The test procedure was in accordance with IEC 61000-4-6 and table 1 of paragraph 6.3.2 of standard IEC 62040-2 as the following:

- The frequency range is swept from 150 kHz to 80 MHz, using the signal level of 10 V established during the setting process, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or to change coupling devices as necessary.

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- Where the frequency is swept incrementally, the step size is 1 % of the preceding frequency value.
- The dwell time at each frequency was 0.5 sec.
- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.

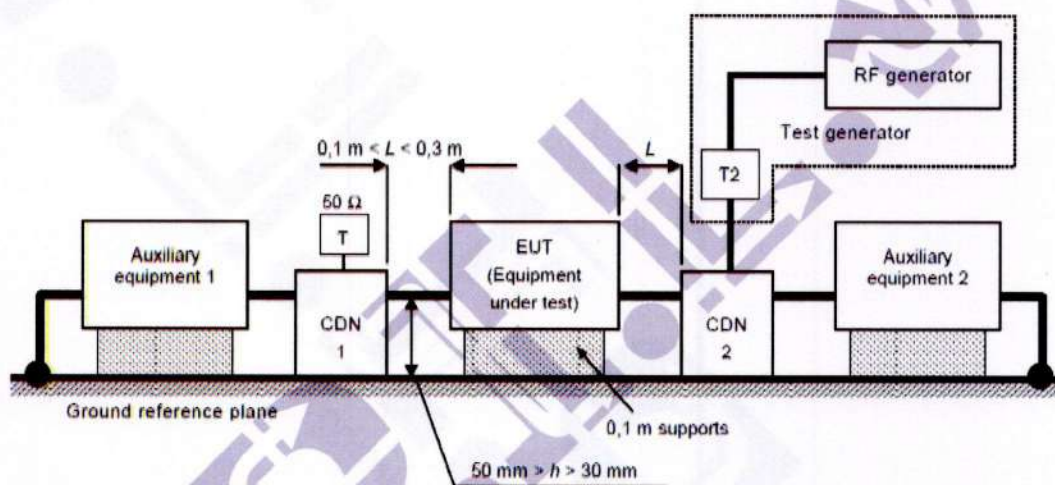


Figure 13: Test set up for Immunity to conducted disturbances, induced by RF fields

3.8.5 Test result

Test Port	Injection Method	Test Level (V)	Complied with Criteria	Acceptance Criteria	Frequency Range (MHz)	Dwell Time (Sec)	Result
L-N-PE	CDN	3	A	A	0.15 - 80	0.5	PASS
+-	CDN	3	A	A	0.15 - 80	0.5	PASS

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Figure 14: Conducted RF test set-up



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3.9 Power Frequency Magnetic Field Immunity Test

Magnetic fields can affect the reliable operation of electrical and electronic equipment. The power frequency magnetic field simulates power frequency current in conductors or leakage from transformers or other current carrying conductors in the area.

3.9.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

3.9.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

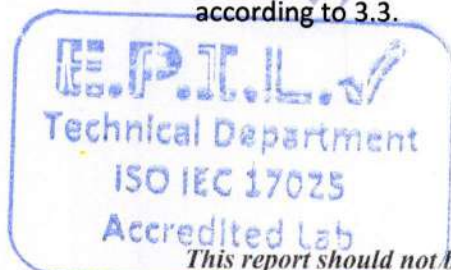
3.9.3 Instrument used for test

Equipment	Model	Manufacturer
Power freq. magnetic field	1m×1m 1 turn inductive coil	EPIL
Test generator	CPC-100	Omicron
EMF tester	EMF 827	LUTRON

3.9.4 Procedure of test

The test was carried out according to IEC 61000-4-8 and table 1 of paragraph 6.3.2 of standard IEC 62040-2 under the following conditions:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.



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- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.

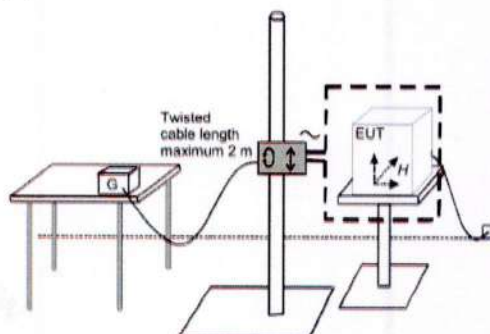


Figure 15: Example of test set-up for table-top equipment

3.9.5 Performed test:

Basic standard	IEC 61000-4-8
Test frequency	50 Hz

3.9.6 Test result

Orientation	Field A/M	Test Duration	Complied with Criteria	Acceptance Criteria	Result
X	3	10 min	A	A	Pass
Y	3	10 min	A	A	Pass
Z	3	10 min	A	A	Pass

4 EMISSION TESTS RESULTS

Emission measurements were executed at the operating mode with rated load to which achieve worst case emission condition during the tests.

4.1 Power Line Conducted Emission Measurement

Conducted measurements are performed on several electrical lines of the EUT, and extract the conducted RF interference that EUT injects into power lines.

4.1.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

4.1.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

4.1.3 Instrument used for test

Equipment	Manufacturer	Model
EMI receiver	R&S	ESCS 30
2-Line LISN	R&S	ENV216

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4.1.4 Procedure of test

The test was carried out according to table 1 of paragraph 5.3.2 of standard IEC 62040-2 under the following condition:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- Measurements made with quasi-peak and average detectors receiver
- Bandwidth : 9 kHz
- Measuring time: 50 ms
- Frequency range: 0.15 MHz - 30 MHz
- Measured at 3 m distance
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.
- EMI conducted test is performed only on the AC input of the device.

4.1.5 Limits of mains terminal disturbance voltage

Table 2: Limits for conducted disturbance at the mains ports for category C1 UPS

Frequency Range MHz	Limits dB(μ V/m)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

4.1.6 Uncertainty of measurements

The reported expanded uncertainty, U_{lab} , is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evolution has been carried out in accordance with the documents CISPR 16-4-2:2014.

Uncertainty of conducted emission (0.15-30 MHz) : 3.35 dB

Compliance or non-compliance with a disturbance limit is determined according to the following, quoted from CISPR 16-4-2:2014.

If U_{lab} is less or equal to U_{cisp} then:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} then:

- Compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;

U_{cisp} for conducted disturbance, 150 kHz-30 MHz, is 3.4 dB.



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4.1.7 Test result¹

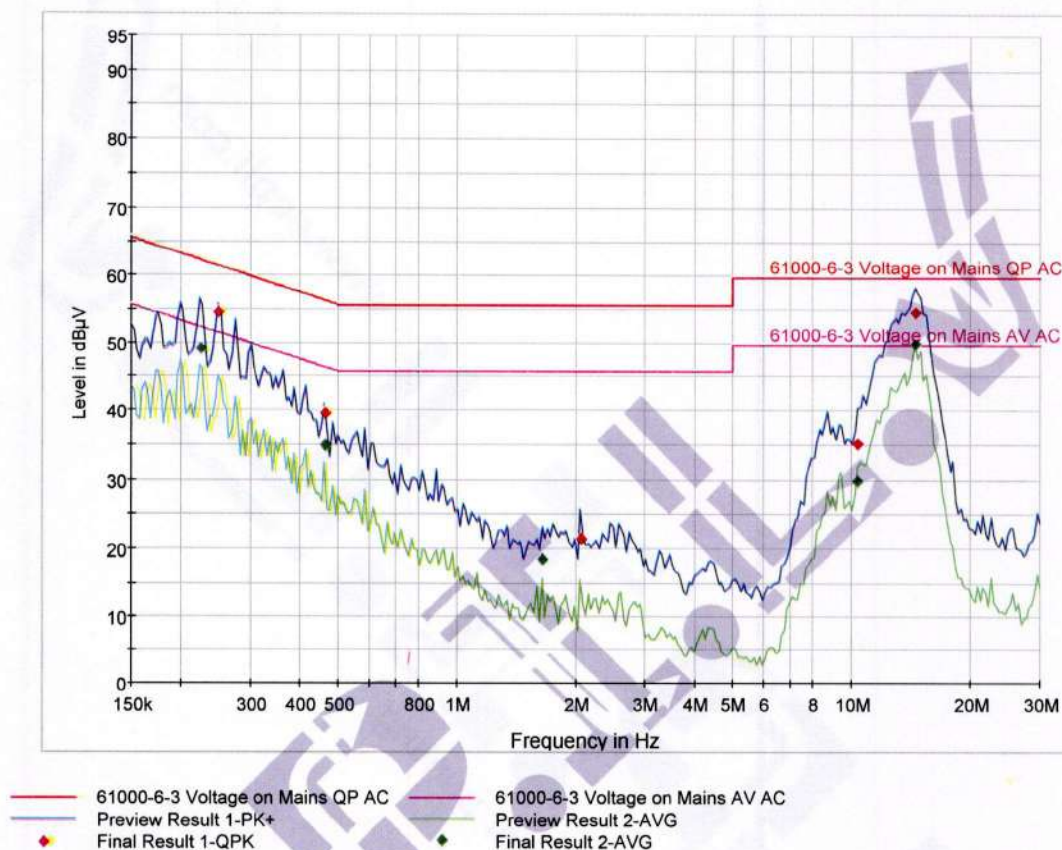


Figure 16: Measured conducted disturbance level (dBμV)

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The above test has been passed by installing a delta filter, model 10DPCW5S and rating 115/250V; 10A; 50/60Hz at the AC voltage input.

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Table 3: EMI Conducted QP final result

Frequency MHz	QuasiPeak dBμV	Meas. Time ms	Bandwidth kHz	Filter	Line	Corr. dB	Margin dB	Limit dBμV	Comment
0.248699	54.9	50.0	9.000	On	N	10.1	6.9	61.8	Pass
0.465796	39.8	50.0	9.000	On	N	10.1	16.8	56.6	Pass
2.063012	21.8	50.0	9.000	On	L1	10.1	34.2	56.0	Pass
10.396797	35.5	50.0	9.000	On	N	10.2	24.5	60.0	Pass
14.499221	54.9	50.0	9.000	On	L1	10.3	5.1	60.0	Pass

Table 4: EMI Conducted AV final result

Frequency MHz	Average dBμV	Meas. Time ms	Bandwidth kHz	Filter	Line	Corr. dB	Margin dB	Limit dBμV	Comment
0.225616	49.2	50.0	9.000	On	N	10.0	3.4	52.6	Pass
0.465796	35.0	50.0	9.000	On	N	10.1	11.6	46.6	Pass
1.652820	18.5	50.0	9.000	On	N	10.1	27.5	46.0	Pass
10.396797	30.0	50.0	9.000	On	N	10.2	20.0	50.0	Pass
14.499221	50.0	50.0	9.000	On	L1	10.3	0.0	50.0	Pass



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Figure 17: EMI conducted test set-up

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4.2 Radiated Emission Measurement

The purpose of interference measurements is to verify that the EUT (Equipment under test) does not generate electromagnetic interference, that is, it does not emit electromagnetic radiation above specified limits, so that other electrical devices operation will not be disturbed by it.

4.2.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

4.2.2 Ambient conditions

Ambient temperature : 22.7 °C
Relative humidity : 33.8 %
Atmospheric pressure : 86.5 kPa

4.2.3 Instrument used for test

Test Equipment	Manufacturer	Model	Serial No.
Full Anechoic Chamber	HUAMING	FAR-3	-
EMI Receiver	Rohde & Schwarz	ESCS 30	10329
EMI Receiver	Keysight	N9020A	MY49100060
Broadband Antenna	Aaronia	20600 EMI	201750
EMI Test Software	Rohde & Schwarz	EMC32	Ver. 8.3

4.2.4 Procedure of test

The test was carried out according to table 3 of paragraph 5.3.3 of standard IEC 62040-2 under the following condition:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- Measurements made with a quasi-peak detector receiver
- Bandwidth : 120 kHz
- Measuring time: 500 ms
- Frequency range: 30 MHz - 1 GHz
- Measured at 3 m distance
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.

4.2.5 Limits for radiated disturbance

Table 5: Limits for radiated (30-1000 MHz) disturbance

Frequency Range MHz	Quasi-Peak Limits dB(μV/m)
30 to 230	40
230 to 1000	47

4.2.6 Uncertainty of measurements

The reported expanded uncertainty, U_{lab} , is based on a standard uncertainty multiplied by a coverage factor $k=2$, providing a level of confidence of approximately 95%. The uncertainty evolution has been carried out in accordance with the documents CISPR 16-4-2:2014.

Uncertainty of radiated emission (30-1000 MHz): 5.25 dB

Uncertainty of radiated emission (1-6 GHz): 4.95 dB

Compliance or non-compliance with a disturbance limit is determined according to the following, quoted from CISPR 16-4-2:2014.

If U_{lab} is less or equal to U_{cisp} then:

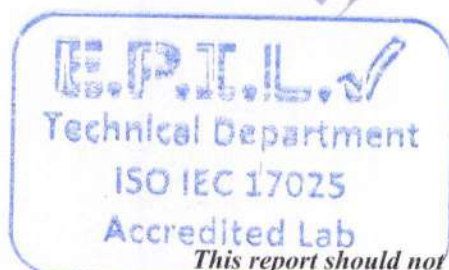
- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} then:

- Compliance is deemed to occur if no measured disturbance, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance, increased by $(U_{lab} - U_{cisp})$, exceeds the disturbance limit;

U_{cisp} for radiated disturbance (electric field strength in a FAR), 30 MHz-1GHz, is 5.3 dB.

U_{cisp} for radiated disturbance (electric field strength in a FAR), 1GHz-6GHz, is 5.2 dB.



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4.2.7 Test result

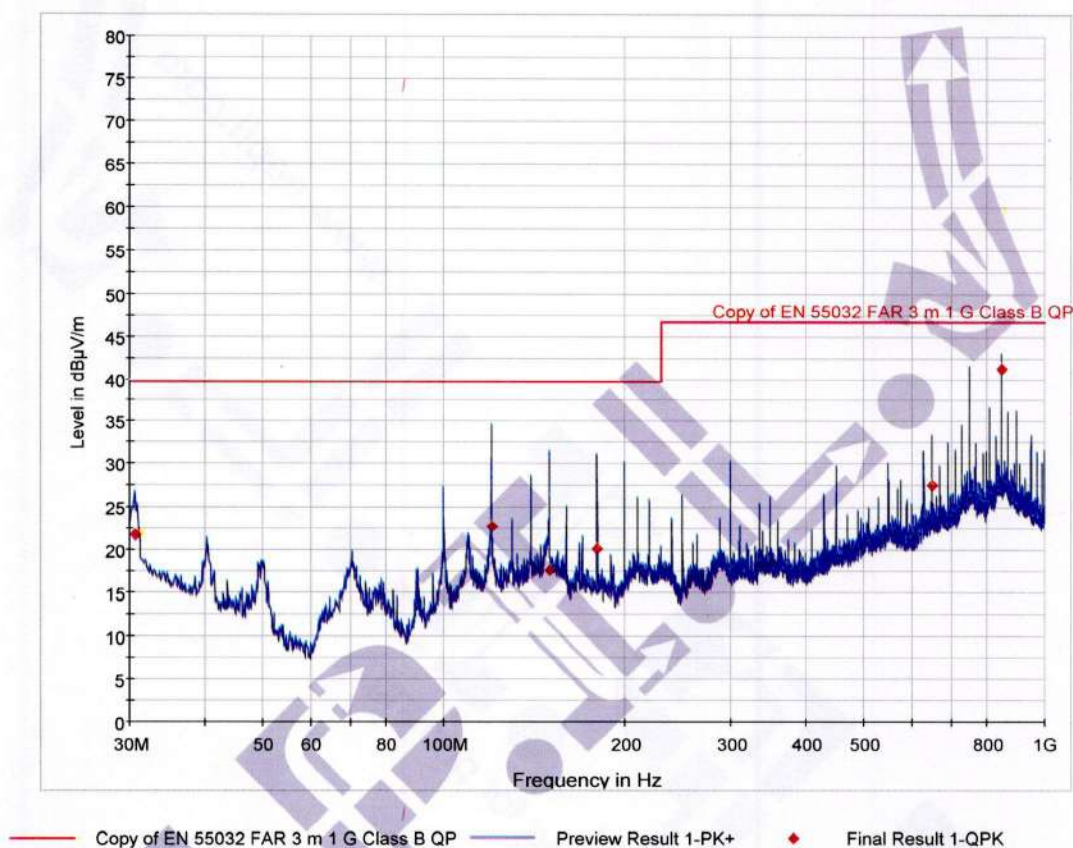


Figure 18: Measured radiated (30 to 1000 MHz) disturbance level (dBμV/m)

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Table 6: EMI radiated (30-1000 MHz) QP final result

Frequency MHz	QuasiPeak dB μ V/m	Polarization	Corr. dB	Margin dB	Limit dB μ V/m	Comment
30.620000	22.0	V	16.5	18.0	40.0	Pass
120.020000	23.0	H	13.8	17.0	40.0	Pass
149.940000	17.9	H	18.0	22.1	40.0	Pass
180.020000	20.4	H	11.0	19.6	40.0	Pass
649.980000	27.8	H	20.7	19.2	47.0	Pass
849.980000	41.5	H	24.8	5.5	47.0	Pass

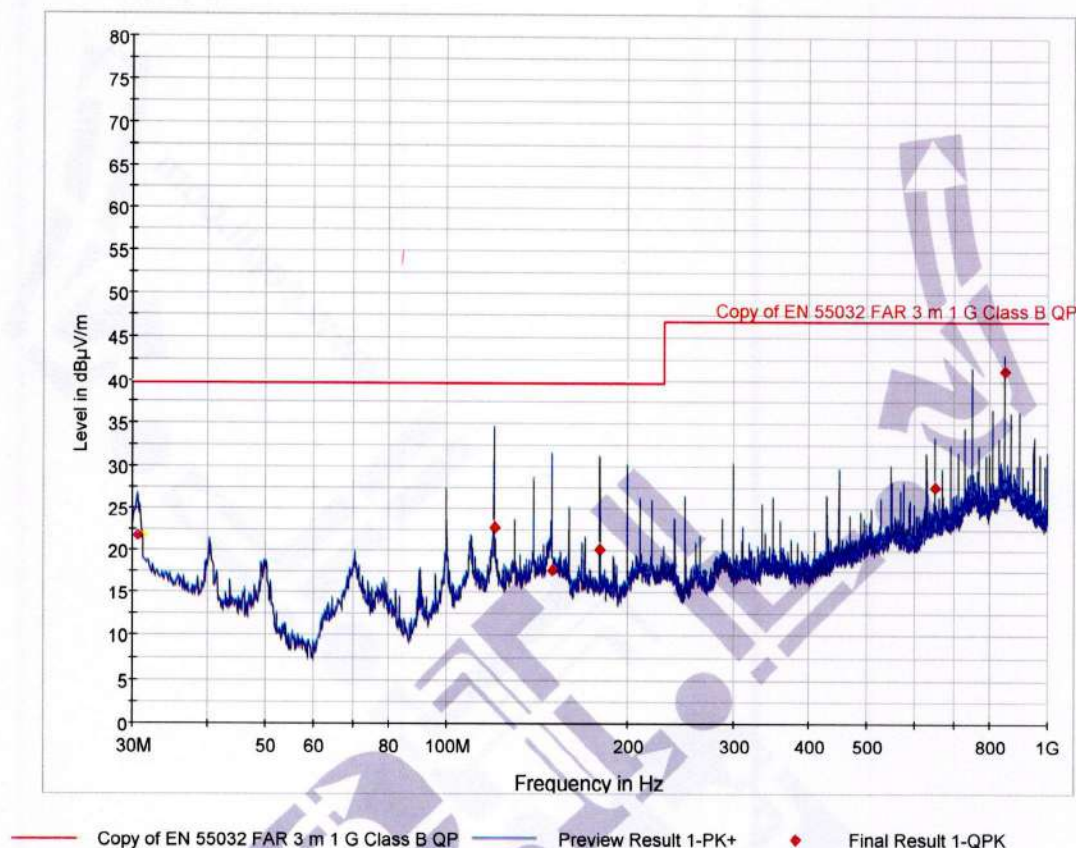


Figure 19: EMI radiated test set-up



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4.3 Current Harmonic Emission Measurement

4.3.1 Test data

Location : EPIL.
Date : 17-May-2021
Engineer of EPIL : S. A. Sharafi

4.3.2 Ambient conditions

Ambient temperature : 20.7 °C
Relative humidity : 26.9 %
Atmospheric pressure : 86.5 kPa

4.3.3 Instrument used for test

Equipment	Manufacturer	Model	S/N
Power quality analyzer	Fluke	435	14280001

When a type of equipment is brought into operation or is taken out of operation, manually or automatically, harmonic currents and power are not taken into account for the first 10 s following the switching event.

The equipment under test shall not be in stand-by mode for more than 10 % of any observation period.

4.3.4 Procedure of test

The test was carried out according to EN 61000-3-2 under the following condition:

- Tested as floor standing equipment
- The EUT was operated within the rated voltage and normal working condition according to 3.3.
- The equipment is connected simultaneously to the 110V DC rectifier (Figure 4) and the 230V AC power supply.

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4.3.5 Harmonic current limits

For the following categories of equipment, limits are not specified in this standard:

- Equipment with a rated power of 75 W or less, other than lighting equipment; at that time.
- Professional equipment with a total rated power greater than 1 kW;
- Symmetrically controlled heating elements with a rated power less than or equal to 200 W;
- Independent dimmers for incandescent lamps with a rated power less than or equal to 1 kW.

4.3.6 Test result

Classification of equipment: Class A

Harmonics Number	Frequency Hz	Current A	Limits A	Results
1	50	10.50	-	Pass
2	100	0.17	1.08	Pass
3	150	0.74	2.30	Pass
4	200	0.09	0.43	Pass
5	250	0.37	1.14	Pass
6	300	0.05	0.30	Pass
7	350	0.18	0.77	Pass
8	400	0.03	0.23	Pass
9	450	0.28	0.4	Pass
10	500	0.04	0.18	Pass
11	550	0.33	0.33	Pass
12	600	0.04	0.15	Pass
13	650	0.13	0.21	Pass
14	700	0.03	0.13	Pass
15	750	0.09	0.15	Pass
16	800	0.02	0.11	Pass

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Harmonics Number	Frequency Hz	Current A	Limits A	Results
17	850	0.13	0.13	Pass
18	900	0.02	0.10	Pass
19	950	0.11	0.11	Pass
20	1000	0.02	0.09	Pass
21	1050	0.05	0.10	Pass
22	1100	0.02	0.08	Pass
23	1150	0.06	0.9	Pass
24	1200	0.01	0.07	Pass
25	1250	0.07	0.09	Pass
26	1300	0.01	0.07	Pass
27	1350	0.05	0.08	Pass
28	1400	0.01	0.06	Pass
29	1450	0.02	0.07	Pass
30	1500	0.01	0.06	Pass
31	1550	0.01	0.07	Pass
32	1600	0.04	0.05	Pass
33	1650	0.01	0.06	Pass
34	1700	0.02	0.05	Pass
35	1750	0.01	0.06	Pass
36	1800	0.02	0.05	Pass
37	1850	0.01	0.06	Pass
38	1900	0.02	0.04	Pass
39	1950	0.02	0.05	Pass
40	2000	0.01	0.04	Pass



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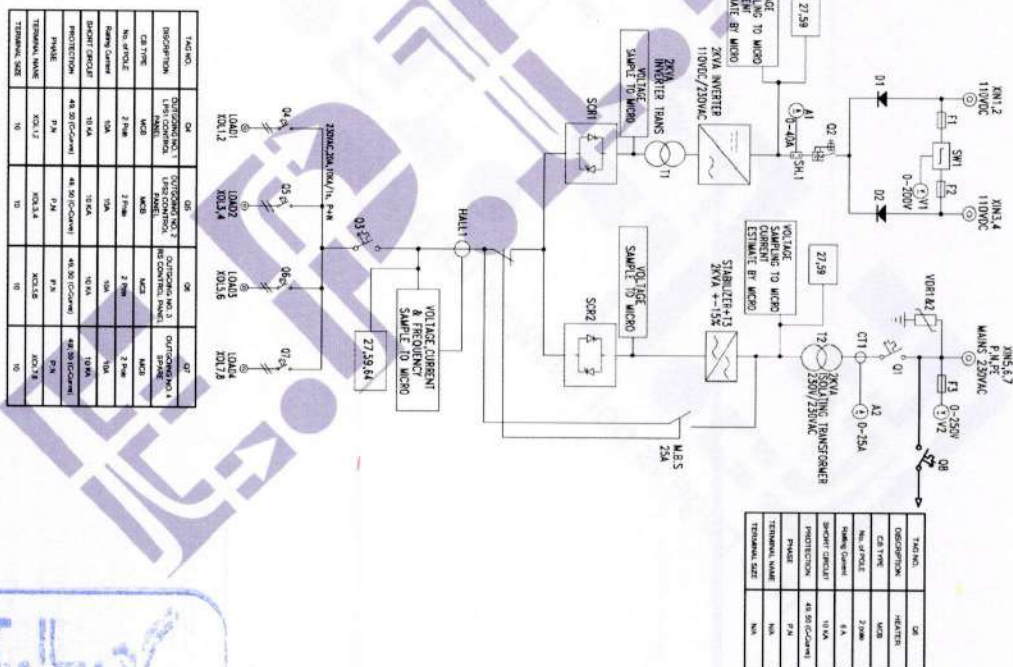
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5 ANNEX

ITEM	DESCRIPTION	TYPE/CONNECTION	LOCATION	SYMBOL/NOTES
1	VOL. 1	LEI JAVAN TIGER-ON BOARD	VOL. 1.2	
2	VOL. 2	LEI JAVAN TIGER-ON BOARD	HALL 1	
3	CURRENT	WAGO PAKS 1.5	CT1	
4	SHUNT	FRITZGERMANN 5A/50V	SH.1	
5	AMP. METER	FRITZGERMANN 2-40A/DC	A1	
6	VOL. 1 METER	2000A/50V/DC	V1	
7	AMP. METER	2000A/50V/DC	A2	
8	VOL. 1 METER	2000A/50V/DC	V2	
9	FUSE	2000A/50V/DC	F1, F2, F3	

TAG NO.	F1	F2	F3
DESCRIPTION	For voltmeter protection	For voltmeter protection	For voltmeter protection
No. of POLE	1 pole	1 pole	1 pole
Rating Current	2 A	2 A	2 A
PROTECTION	50	50	50

TAG NO.	O2	O1	O3
DISCREPTION	INCOMING CB	INCOMING CB	OUTGOING CB
CB TYPE	MCB	MCB	MCB
No. of POLE	3 pole	2 pole	2 pole
Rating Current	32A	16A	16A
SHORT CIRCUIT	18 KA	10 KA	10 KA
PROTECTION	40, 50 (C-Curve)	40, 50 (C-Curve)	40, 50 (C-Curve)
POLARITY PHASE	+ ABTT	P.N	P.N
TERMINAL NAME	XN1-4	XN5,6	N/A
TERMINAL SIZE	25	16	N/A



TAG NO.	USE
DESCRIPTION	WATER
CB TYPE	MCB
No. of POLE	2 pole
Rating Current	16A
SHORT CIRCUIT	10 KA
PROTECTION	40, 50 (C-Curve)
POLARITY	P.N
TERMINAL NAME	N/A
TERMINAL SIZE	N/A

