

EMC TEST REPORT

Report Number	:	68.772.16.007.01	Date of Issue:	19 July 2016
Model No.	:	KSG-30K, KSG-36K-HV, KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV		
Product Type	:	PV grid-interactive inverter		
Applicant	:	Shenzhen Kstar New Energy Company Limited.		
Address	:	The 9th Floor, R&D Building, Kstar Industrial Park, Guangming Hi-tech Industrial Zone, 518107 Shenzhen, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA		
Production Facility	:	Shenzhen KSTAR Science & Technology Co., Ltd Guangming Branch.		
Address	:	Kstar High Tech Park, Guangming High Technology Town, Gongming Street, Baoan District, 518107 Shenzhen City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA		
Test Result	:	<input checked="" type="checkbox"/> Positive <input type="checkbox"/> Negative		
Total pages including Appendices	:	70		

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1 General Information

1.1 Notes

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Prepared By EMC Project Engineer	2016-07-19 Date	Dawi Xu Name	 Signature
Approved By EMC Project Manager	2016-07-19 Date	Laurent Yuan Name	 Signature



1.2 Testing Laboratory

TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch
Building 12&13, Zhiheng Wisdomland Business Park, Nantou Checkpoint
Road 2, Nanshan District 518052, Shenzhen, CHINA

Tel: 86 755 8828 6998
Fax: 86 755 8828 5299

1.3 Details of Applicant

CLIENT: Shenzhen Kstar New Energy Company Limited.

ADDRESS: The 9th floor, R&D building, Kstar Industrial Park, Guangming Hi-Tech Industrial Zone,
518110 Shenzhen, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA.

PRODUCT DESCRIPTION: PV grid-interactive inverter

MANUFACTURERS MODEL NUMBER: KSG-30K, KSG-36K-HV, KSG-50K, KSG-50K-HV, KSG-60K,
KSG-60K-HV

1.4 Application Details

Date of test: 19 June, 2016---18 July, 2016

1.5 Test Item

Refer to table 1.

1.6 Applied Standard

APPLIED PRODUCT STANDARD: EN 61000-6-4:2007+A1: 2011
EN 61000-6-2:2005

1.7 Test environment condition

Ambient temperature	20~26
Relative humidity	35%~60%
Atmospheric pressure	100kPa

2 Summary of Results

Table 1 below shows a brief summary of the results obtained.

Table 1 Summary of results

Test Items	Test Configuration	Required Performance Criteria	Result
Emission			
<u>Radiated Emissions</u> Enclosure Port	TC1	N/A	Pass
<u>Conducted Emissions</u> <input checked="" type="checkbox"/> AC mains port <input type="checkbox"/> DC power port *1 <input type="checkbox"/> Telecommunications /network port	TC1	N/A	Pass
<u>Harmonics test</u> <input checked="" type="checkbox"/> AC mains port	TC1	N/A	Pass
<u>Flicker test</u> <input checked="" type="checkbox"/> AC mains port	TC1	N/A	Pass
Immunity			
<u>Power-frequency magnetic Fields</u> Enclosure Port	TC1	A	Pass
<u>Radiated-frequency electromagnetic Fields</u> Enclosure Port	TC1	A	Pass
<u>Electrostatic Discharge</u> Enclosure Port	TC1	B	Pass
<u>Fast Transients</u> <input checked="" type="checkbox"/> AC mains port <input checked="" type="checkbox"/> DC power port <input checked="" type="checkbox"/> Signal port	TC1	B	Pass
<u>Surges</u> <input checked="" type="checkbox"/> AC mains port <input checked="" type="checkbox"/> DC power port <input type="checkbox"/> signal port	TC1	B	Pass
<u>Conducted radio-frequency common mode</u> <input checked="" type="checkbox"/> AC mains port <input checked="" type="checkbox"/> DC power port <input checked="" type="checkbox"/> signal port	TC1	A	Pass
<u>Voltage dips</u> <input type="checkbox"/> AC mains port *2	N/A	N/A	Pass
<u>Voltage interruptions</u> <input type="checkbox"/> AC mains port *2	N/A	N/A	Pass

Note1:

1: Measurement taken is within the measurement uncertainty of measurement system.

2: TC = Test configuration

3: ☒ The item has been tested; ☐ The item has not been tested.

Note2:

*1: applicable only to ports intended for connection to a local DC power network.

*2: applicable only to AC input ports.

3 Equipment Specification

General Information:

Model differences:

The six models have same enclosure, same PCB layout, similar electrical control circuits, with mainly differences as below:

- (1) Model: KSG-30K and KSG-36K-HV are natural cooling, model: KSG-50K, KSG-60K, KSG-60K-HV are fans forced cooling.
- (2) Have different amounts of bus capacitors.
- (3) Have different parameter of boost, invert inductor and AC output EMI inductor.
- (4) Have different parameter of power semiconductors.
- (5) Have different parameter of X capacitor on AC EMI board.

Table 2 Ratings

Model	KSG-30K	KSG-36K-HV	KSG-50K	KSG-50K-HV	KSG-60K	KSG-60K-HV
V _{max} PV	1000 Vd.c.	1000 Vd.c.	1000 Vd.c.	1000 Vd.c.	1000 Vd.c.	1000 Vd.c.
I _{sc} PV	28 Ad.c. x 3	28 Ad.c. x 3	38 Ad.c. x 3	38 Ad.c. x 3	42 Ad.c. x 3	42 Ad.c. x 3
Nominal AC voltage	3/N/PE, 230/400 Va.c.	3~PE, 480 Va.c.	3/N/PE, 230/400 Va.c.	3~PE, 480 Va.c.	3/N/PE, 230/400 Va.c.	3~PE, 480 Va.c.
Nominal Frequency	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz	50 Hz
Max. Continuous output current	44 Aa.c.	44 Aa.c.	72 Aa.c.	61 Aa.c.	87 Aa.c.	72 Aa.c.
Nominal output power	30 kW	36 kW	50 kW	50 kW	60 kW	60 kW
Max. Continuous output power	33 kVA	40 kVA	55 kVA	55 kVA	66 kVA	66 kVA
Power factor (full load)	>0,99	>0,99	>0,99	>0,99	>0,99	>0,99
Protective class	I	I	I	I	I	I
Ingress protection	IP65	IP65	IP65	IP65	IP65	IP65

So the full EMC testing was applied on the model KSG-60K and KSG-60K-HV, other models are deemed to compliance relevant EMC requirements without further testing.

4 System Configuration and test environment during EMC Test

The Equipment under Test (EUT) was functioning correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical user installation.

4.1 Cables Used during Test

Table 3 Cable Used during Test

Port	Length	Type of Cable
DC input Power cable for Inverter	≤3m	Unshielded cable
AC Output cable for Inverter	<3m	Unshielded cable

4.2 Auxiliary Equipment Used during Test

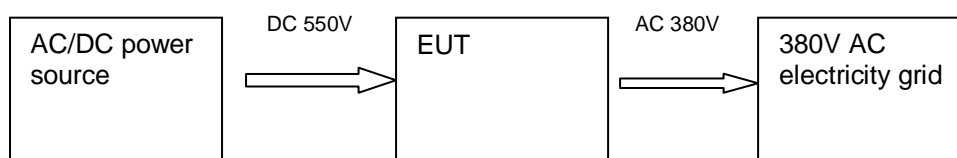
4.2.1 Test Configurations

The PV grid-interactive inverter --- KSG-60K and KSG-60K-HV were powered by external DC power supply and AC output port is connected to 380V AC electricity grid in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

Table 4 Configuration table

Configuration	Configuration Describe
TC1	Powered by external DC power supply and AC output port is connected to 380V AC electricity grid.

4.2.2 Test Connections of TC1:



5 Immunity Performance Criteria

The PV grid-interactive inverter is to be monitored for compliance against the performance criteria as appropriate for the particular test applied. The "pass/fail" performance criterion to be used during test is detailed below:

Table 5 Criteria to prove the acceptance of a EUT against electromagnetic disturbances

A	The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed, however, no change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
C	Temporary loss of function is allowed, provided the function is self- recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

6 Emission

6.1 Radiated Disturbance 30MHz to 1000MHz

6.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2003). The test distance was 3m. The set-up and test methods were according to EN 61000-6-4

A preliminary scan and a final scan of the emissions shall be made from 30 MHz to 1GHz by using a Quasi-Peak Detector. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°, The receive antenna has two polarizations V and H.

6.1.2 Test Results

The EUT has met the requirements of Radiated Emission of enclosure port.

Remark: The process measurement of the EUT need add cores and filter at AC mains.

The test data see section 9.1 of this report.

Table 6 Test Limits

Frequency range	30 ~ 1000MHz	
Measuring distance	3m	
Limits	30MHz~230MHz	50dB μ V/m
	230MHz~1GHz	57dB μ V/m

6.2 Conducted Disturbance 0.15 MHz to 30MHz

6.2.1 Test Procedure

The EUT was configured as described in section 4 for this test. The mains cable of the EUT being measured shall be connected to LISN, The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the LISN.

All telecommunication and signal ports must be correctly terminated using either appropriate associated equipment or a representative termination during the measurement of the conducted disturbances at the mains.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

6.2.2 Test Results

The EUT has met requirements of Conducted disturbance.

Remark: The process measurement of the EUT need add cores and filter at AC mains.

The test data see section 9.2 of this report.

Table 7 Test Limit of AC power port

Frequency range	150kHz~ 30MHz	
Classification	NIL	
Limit	Voltage limits	
	QP	AV
0.15MHz~0.5MHz	79dB μ V	66dB μ V
0.5MHz~5.0MHz	73dB μ V	60dB μ V
5.0MHz~30MHz	73dB μ V	60dB μ V

6.3 Current Harmonics Emissions

6.3.1 Test Procedure

The EUT is to be powered from a clean (low distortion) 380V 50Hz ac power source. The EUT was configured as described in section 4 for this test. The set-up and test methods were according to EN 61000-3-12/IEC 61000-3-12.

Test configurations: TC1

6.3.2 Test Results

The EUT has met the requirements (class A) EN 61000-3-12 for harmonics of AC power ports. The test data see section 9.3 of this report.

The limits of the EN 61000-3-12/IEC 61000-3-12 given apply to 230/400V, 50Hz systems. There are no limits for the other systems. So the test does not apply the model KSG-60K-HV.

6.4 Voltage Fluctuations (Flicker)

6.4.1 Test Procedure

The EUT is to be powered from a clean (low distortion) 380V 50Hz ac power source. The EUT was configured as described in section 4 for this test. The formal test ran 10mins and over a 2 hour period . the values of P_{lt} , P_{st} , $d(t)$, d_{max} and d_c is measured. Power's source impedance is $0.4+j0.25\Omega$. The set-up and test methods were according to EN 61000-3-11/IEC 61000-3-11.

Test configurations: TC1

6.4.2 Test Results

The EUT has met the requirements of EN 61000-3-11 for voltage fluctuations of AC power ports. The test data see section 9.4 of this report.

The limits of the EN 61000-3-12/IEC 61000-3-12 given apply to 230/400V, 50Hz systems. There are no limits for the other systems. So the test does not apply the model KSG-60K-HV.

7 Immunity requirements

7.1 Immunity to Electrostatic Discharge

7.1.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-2.

The test environment conditions recorded were:

Table 8 Test Environment Condition during ESD Test

Ambient temperature	22.3°C
Relative humidity	52.8%
Atmospheric pressure	100.5kPa

7.1.2 Test Results

The EUT has met the requirements of Performance Criterion A for Immunity to Electrostatic Discharge of enclosure port.

Details of the points tested were presented in Table 9 below.

Table 9 Test Results

Test Points	Specification Level				Conclusion
	±4kV Contact Discharges		±8kV Air Discharges		
	Positive	Negative	Positive	Negative	
Horizontal Coupling Plane-front	A	A	N/A	N/A	pass
Horizontal Coupling Plane-rear	A	A	N/A	N/A	pass
Horizontal Coupling Plane-left	A	A	N/A	N/A	pass
Horizontal Coupling Plane-right	A	A	N/A	N/A	pass
Vertical Coupling Plane-front	A	A	N/A	N/A	pass
Vertical Coupling Plane-rear	A	A	N/A	N/A	pass
Vertical Coupling Plane-left	A	A	N/A	N/A	pass
Vertical Coupling Plane-right	A	A	N/A	N/A	pass
Metallic Enclosure	A	A	N/A	N/A	pass
Gaps	N/A	N/A	A	A	pass
LED display	N/A	N/A	A	A	pass

7.2 Immunity to Radiated Electric Fields 80MHz to 2700MHz

7.2.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-3. All sides of the EUT (front, rear, left and right) were tested by antenna with vertical and horizontal polarization.

7.2.2 Test Results

The EUT has met the requirements of Performance Criterion A for Immunity to Radiated Electric Fields of enclosure port.

Table 10 Test Results

Test side of EUT	Front, Rear, Left, Right
Frequency range & Test Level	80MHz –1000MHz test level: 10 V/m(Un-modulated, rms) 1.4GHz –2.0GHz test level: 3 V/m(Un-modulated, rms) 2.0GHz –2.7GHz test level: 1 V/m(Un-modulated, rms)
Modulation	80% AM, 1kHz
Conclusion	Pass

7.3 Immunity to Electrical Fast Transient Bursts

7.3.1 Test Procedure

The EUT was configured as described in section 4 for this test. A series of Fast Transient Bursts meeting the specification were applied for a period of 120 seconds. The Transient Bursts were applied for both Positive and Negative Burst Trains to each type of Signal and Telecommunication Line in turn via a Capacitive Coupling Plate. The set-up and test methods were according to IEC 61000-4-4.

7.3.2 Test Results

The EUT has met the requirements of Performance Criterion A for Immunity to Electrical Fast Transient Bursts.

Table 11 Test Results

Ports	Measuring condition	Couple mode	Description	Conclusion
AC mains port	Level: ± 2.0 kV, 5kHz, during 2 minute	CDN	No fail detected	Pass
PV Power Port	Level: ± 2.0 kV, 5kHz, during 2 minute	Capacitive clamp	No fail detected	Pass

7.4 Immunity to Surges

7.4.1 Test Procedure

The EUT was configured as described in section 4 for this test. A series of High Energy Surges were applied to each type of signal and telecommunication line and AC power port. The set-up and test methods were according to IEC 61000-4-5.

7.4.2 Test Results

The EUT has met the requirements of Performance Criterion B for Immunity to Surges.

Table 12 Test Results

Ports	Measuring condition	Description	Conclusion
AC mains port	Line to Line, Level:±1kV, Tr/Th:1.2/50µs Interval: 60 seconds Line to Ground, Level:±2kV, Tr/Th:1.2/50µs Interval: 60 seconds	No fail detected	Pass
PV Power Port	Line to Line, Level:±0.5kV, Tr/Th:1.2/50µs Interval: 60 seconds Line to Ground, Level:±0.5kV, Tr/Th:1.2/50µs Interval: 60 seconds	No fail detected	Pass

7.5 Immunity to Continuous Conducted Interference 0.15MHz to 80MHz

7.5.1 Test Procedure

The EUT was configured as described in section 4 for this test. The applied level was Amplitude Modulated by a 1 kHz sinusoidal signal to a modulation depth of 80%. The set-up and test methods were according to IEC 61000-4-6.

7.5.2 Test Results

The EUT has met the requirements of Performance Criterion A for Immunity to Continuous Conducted Interference.

Table 13 Test Results

Ports	Measuring condition	Inject method	Description	Conclusion
AC mains port	Frequency range: 0.15 MHz to 80 MHz Induced voltage :10V (rms), 80% AM(1kHz)	CDN-M4	No fail detected	Pass
PV Power Port	Frequency range: 0.15 MHz to 80 MHz Induced voltage :10V (rms), 80% AM(1kHz)	EM clamp	No fail detected	Pass

7.6 Immunity to Power-frequency magnetic field

7.6.1 Test Procedure

The EUT was configured as described in section 4 for this test. The set-up and test methods were according to IEC 61000-4-8. The induction coil has been rotated by 90° in order to expose the EUT to the test field with different orientations.

7.6.2 Test Results

The EUT has met the requirements of Performance Criterion A for Immunity to Power-frequency magnetic field of enclosure port.

Table 14 Test Results

Test Level for continuous field	Distribution network frequency: 50Hz test level: 30A/m
Conclusion	Pass

Main Test Instruments

Table 16 Main Test Equipments

Test item	Description	Manufacturer	Model no.	Serial no.	Cal. due date
RE	EMI Test Receiver	Rohde & Schwarz	ESR 26	101269	2016-7-24
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9163	707	2016-8-02
	Horn Antenna	Rohde & Schwarz	HF907	102294	2016-7-24
	Pre-amplifier	Rohde & Schwarz	SCU 18	102230	2016-7-24
	3m Semi-anechoic chamber	TDK	9X6X6	----	2019-5-29
CE	LISN	SCHWARZBECK	NNLK 8129	8129-203	2016-7-24
	Test Receiver	Rohde & Schwarz	ESCS30	828985/018	2016-7-24
Harmonics & Flicker	Three Phase Harmonic flicker test system	CI	MX45-3PI-400-413-CTSHL-LF-SNK	1424A00547	2016-7-24
ESD	Electrostatic Discharge Simulator	Noiseken	ESS-2002	ESS0615075	2016-7-24
RS	Signal Generator	Rohde & Schwarz	SMB100A	177600	2016-7-24
	Power Amplifier	Rohde & Schwarz	BBA100	101238	2016-7-24
	Power Amplifier	Rohde & Schwarz	BBA150	101671	2016-7-24
	Log-Periodic Antenna	Rohde & Schwarz	HL046E	100160	N/A
	Power Meter	Rohde & Schwarz	NRP2	103497	2016-7-24
	Fully Anechoic Chamber	TDK	8X4X4	--	2016-7-24
EFT	Immunity simulator	EMTEST	UCS 500N7	P1313116005	2016-7-24
	7kV Coupling network 3-phase	EMTEST	CNI 503B5	P1425134991	2016-7-24
	Capacitive Coupling Clamp	EMTEST	HFK	P1426135389	2016-7-24

SURGE	Immunity simulator	EMTEST	UCS 500N7	P1313116005	2016-7-24
	7Kv Coupling network 3-phase	EMTEST	CNI 503B5	P1425134991	2016-7-24
	Telecom Surge Module	EMTEST	Tsurge 7	P1420134206	2016-7-24
	4Kv coupling/decoupling network	EMTEST	CNV 504 N1	P1420124192	2016-7-24
	4Kv CDN for 8 telecom lines	EMTEST	CNV 504 S1	P1421134530	2016-7-24
CS	Continuous Wave Simulator	EMTEST	CWS 500N1	P1420134224	2016-7-24
	Attenuator	EMTEST	ATT6/80	P1402129090	2016-7-24
	CDN	EMTEST	CDN-M2/M3	P1420134163	2016-7-24
	CDN	EMTEST	CDN-M4	P1346125919	2016-7-24
	Electromagnetic Injection Clamp	EMTEST	EM101	P1411132453	2016-7-24
PFMF	Immunity simulator	EMTEST	UCS 500N7	P1313116005	2016-7-24
	7Kv Coupling network 3-phase	EMTEST	CNI 503B5	P1425134991	2016-7-24
	Current Transformer	EMTEST	MC 2630	P1408131875	2016-7-24
	Magnetic Field Coil	EMTEST	MS 100N	P1325119613	2016-7-24

8 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

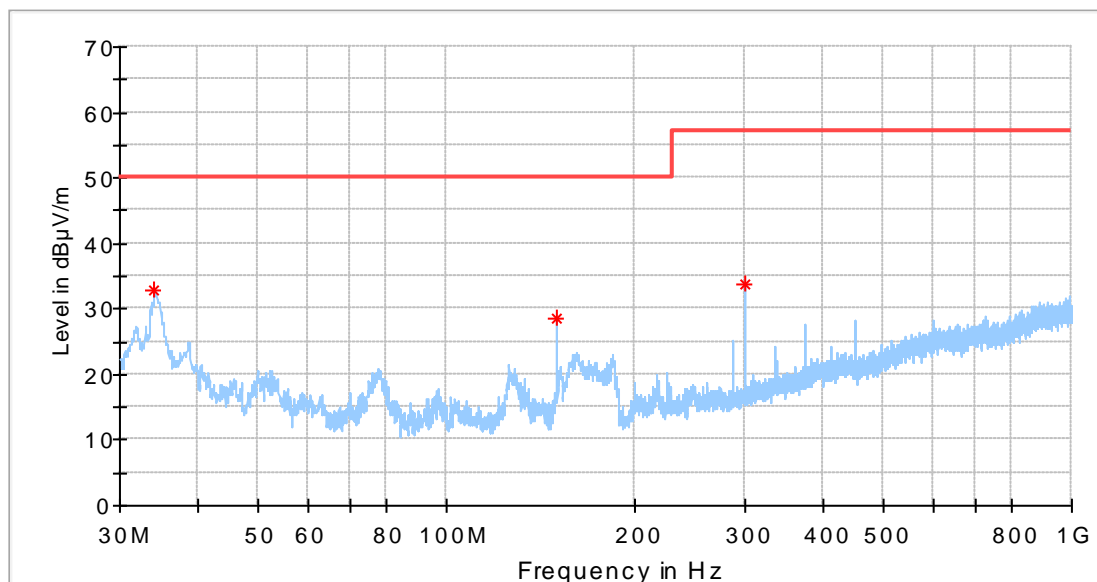
System Measurement Uncertainty

RE	Field strength (dB μ V/m)	Horizontal: 4.83dB; Vertical: 4.91dB;
CE	Disturbance Voltage(dB μ V)	3.50dB
Harmonics	Voltage(mA)	3.26%
fluctuations	Voltage(V)	4.76%
RS	Field strength(V/m)	19%, K=2
CS	Voltage(V)	29%, K=2
DIP	Voltage dips U(V)	The immunity measurement system uncertainty is within standard requirement and is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%.
	Short interruption U(V)	
EFT	Voltage(V)	
ESD	Voltage(V)	
SURGE	Voltage(V)	

9 Graph and Data of Emission Test

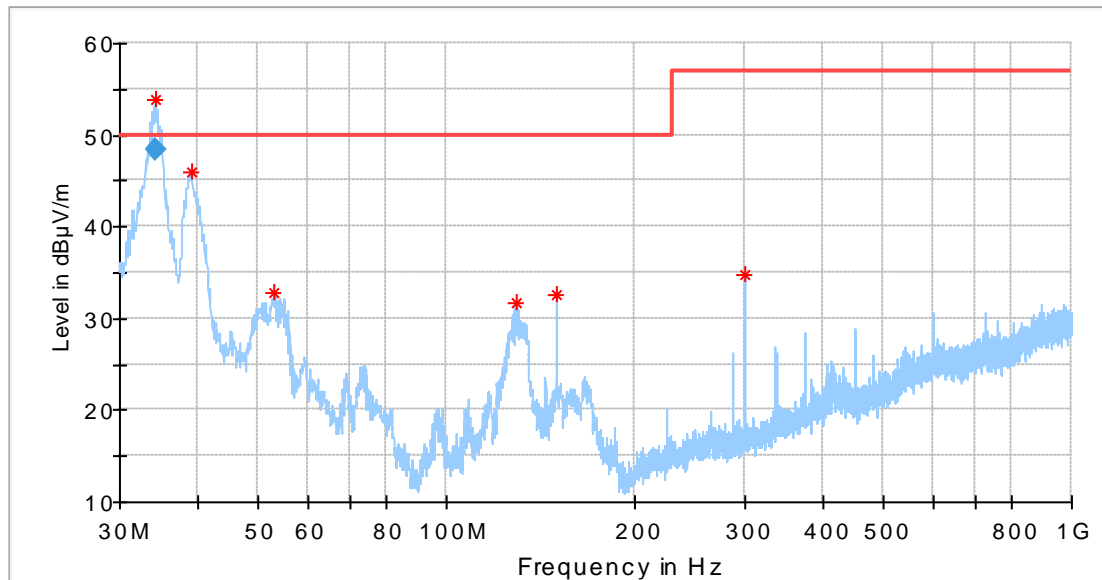
9.1 Radiated Disturbance

M/N: KSG-60K
 Operating Condition: TC1
 Test Specification: Horizontal
 Power Input: DC 550V



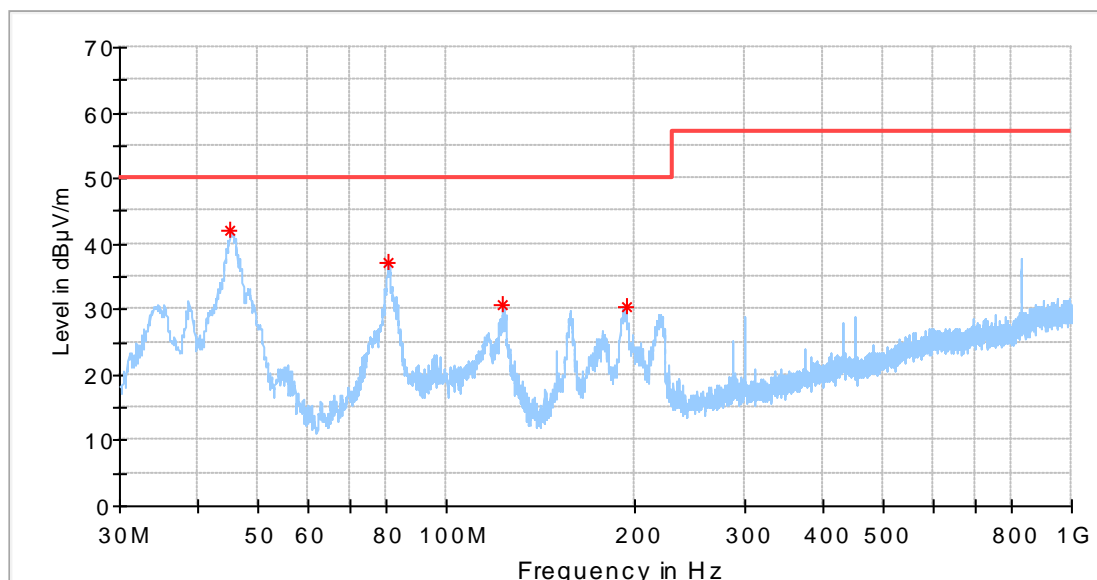
Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
34.061875	32.77	50.00	17.23	200.0	H	0.0
149.976875	28.51	50.00	21.49	200.0	H	9.0
300.023750	33.69	57.00	23.31	100.0	H	148.0

M/N: KSG-60K
 Operating Condition: TC1
 Test Specification: Vertical
 Power Input: DC 550V



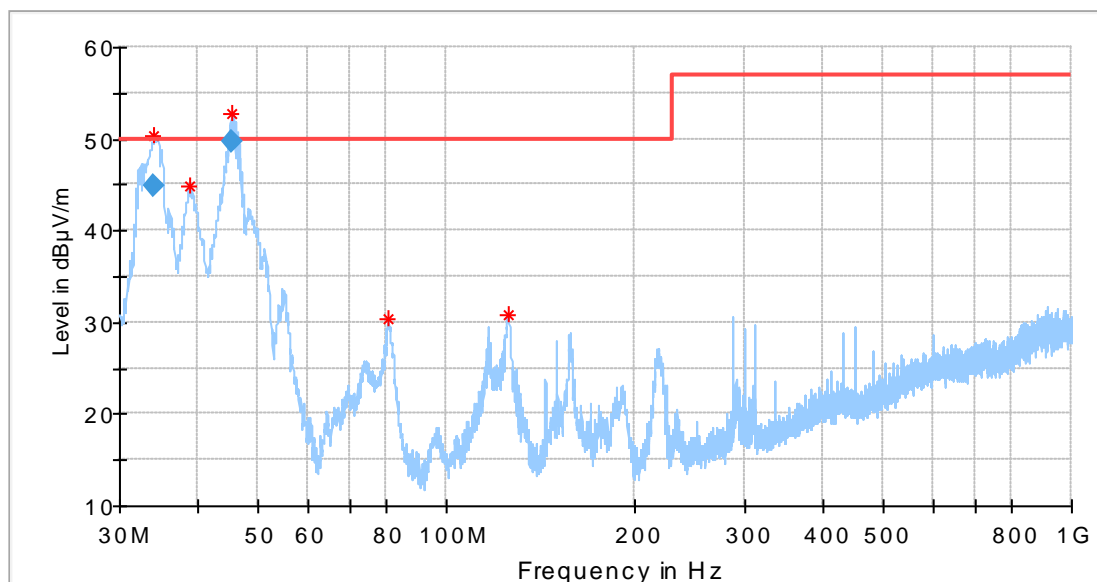
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
34.297812	48.39	50.00	1.61	115.0	V	51.0

M/N: KSG-60K-HV
 Operating Condition: TC1
 Test Specification: Horizontal
 Power Input: DC 550V



Frequency (MHz)	MaxPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
45.156250	42.01	50.00	7.99	200.0	H	281.0
80.561250	37.20	50.00	12.80	200.0	H	258.0
123.241250	30.67	50.00	19.33	200.0	H	281.0
193.566250	30.53	50.00	19.47	200.0	H	234.0

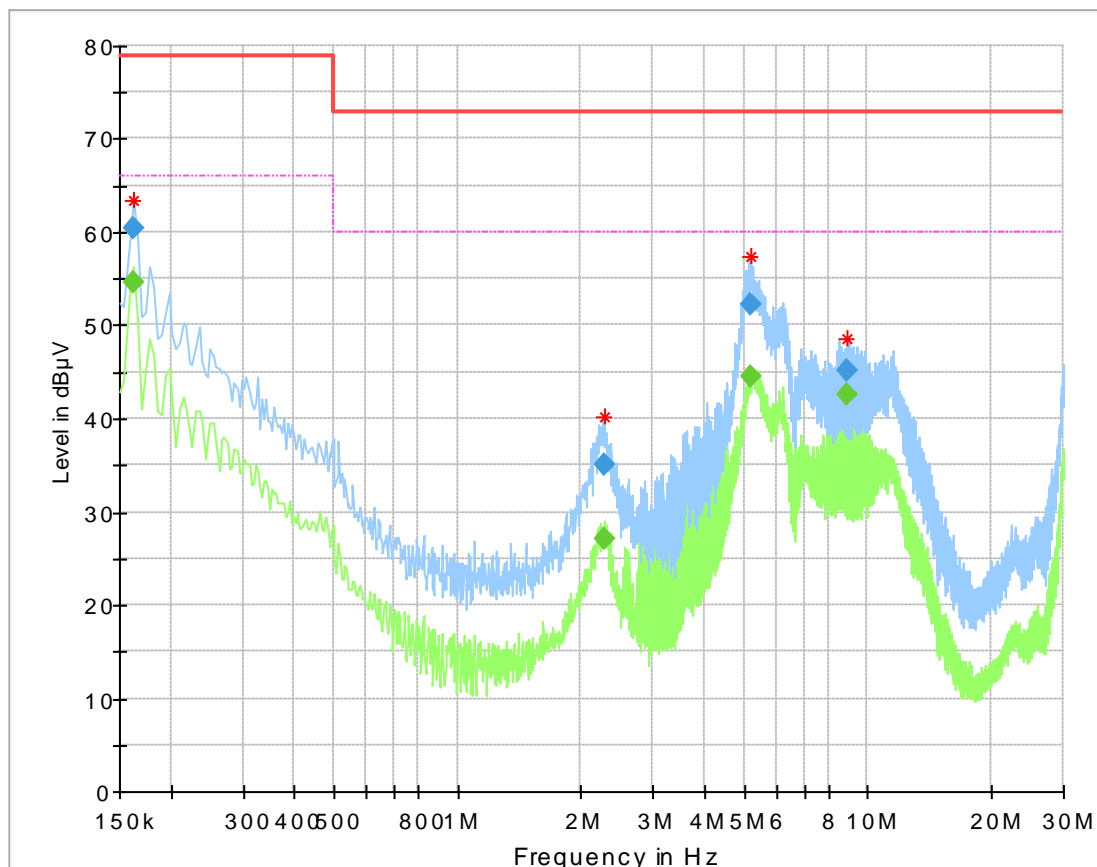
M/N: KSG-60K-HV
 Operating Condition: TC1
 Test Specification: Vertical
 Power Input: DC 550V



Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
34.102812	44.96	50.00	5.04	115.0	V	241.0
45.484062	49.63	50.00	0.37	100.0	V	218.0

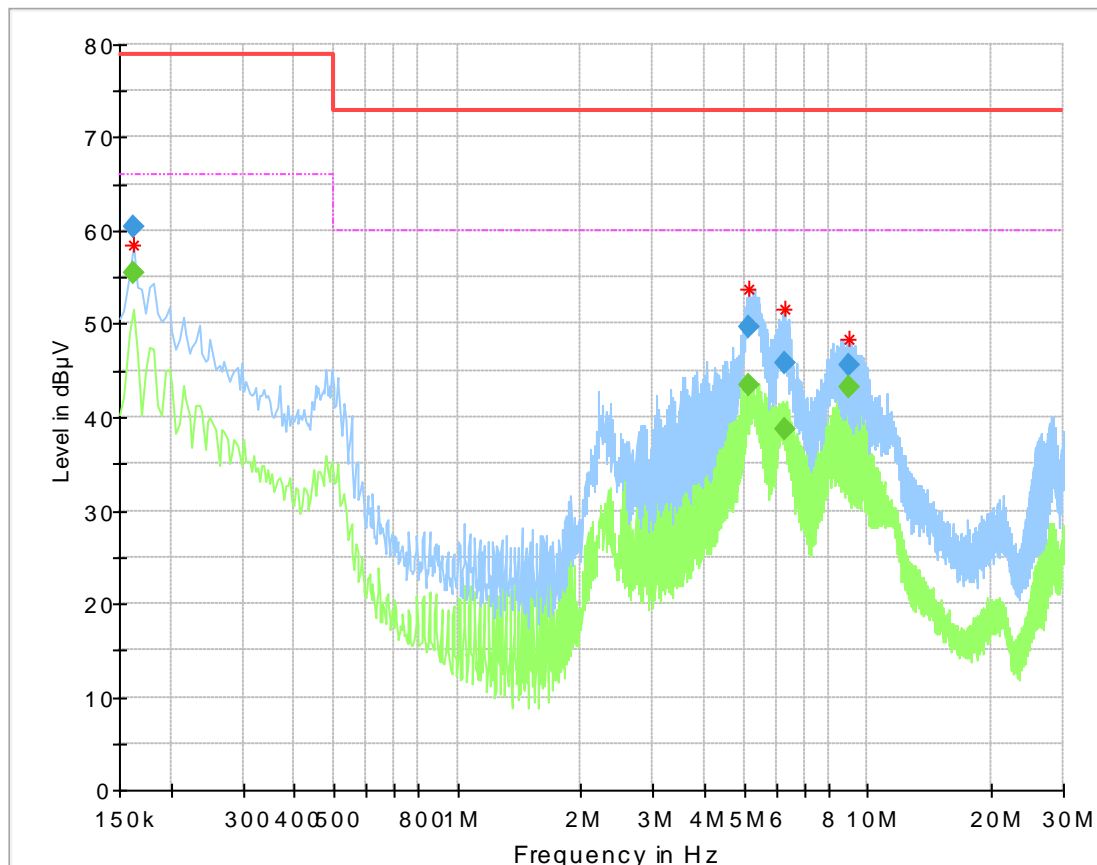
9.2 Conducted Disturbance

M/N: KSG-60K
 Operating Condition: TC1
 Test Specification: L1
 Power Input: DC 550V



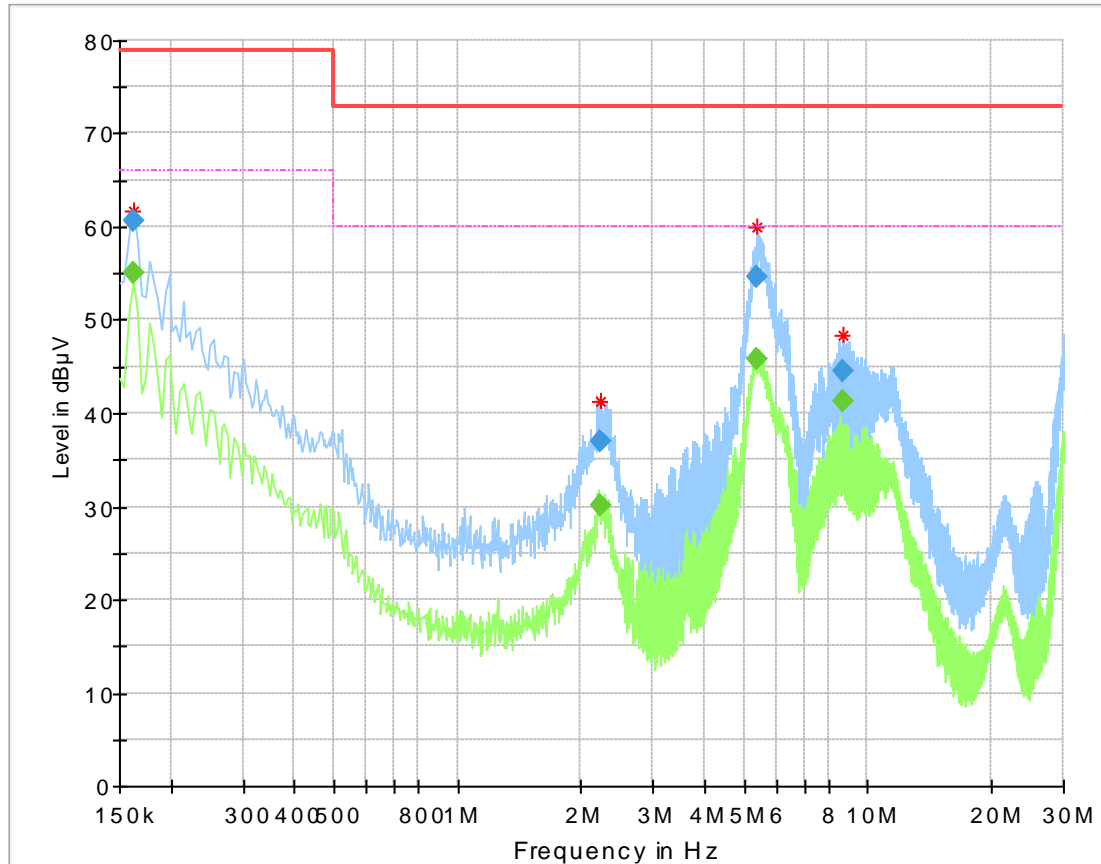
Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.161500	---	54.69	66.00	11.31	L1
0.161500	60.36	---	79.00	18.64	L1
2.269500	---	27.14	60.00	32.86	L1
2.269500	35.05	---	73.00	37.95	L1
5.193500	---	44.57	60.00	15.43	L1
5.193500	52.21	---	73.00	20.79	L1
8.917500	---	42.67	60.00	17.33	L1
8.917500	45.18	---	73.00	27.82	L1

M/N: KSG-60K
 Operating Condition: TC1
 Test Specification: L2
 Power Input: DC 550V



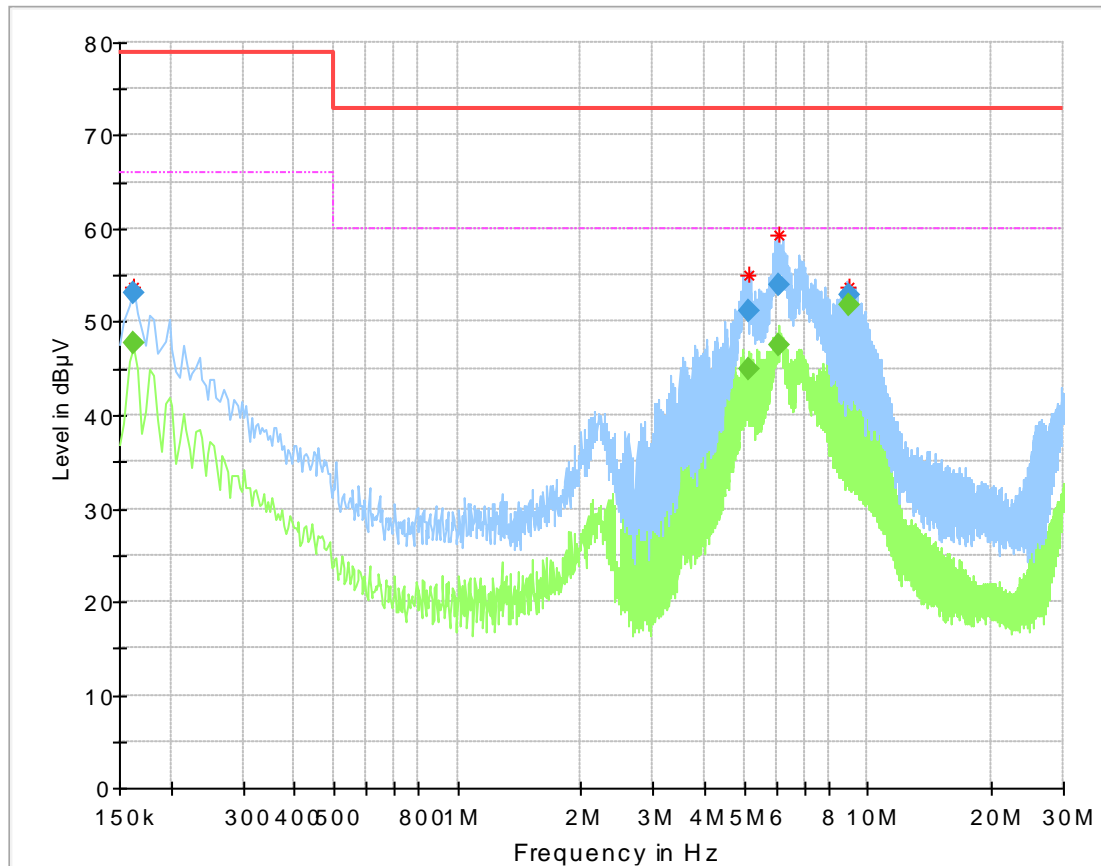
Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.161500	---	55.41	66.00	10.59	L2
0.161500	60.44	---	79.00	18.56	L2
5.129500	---	43.52	60.00	16.48	L2
5.129500	49.69	---	73.00	23.31	L2
6.277500	---	38.61	60.00	21.39	L2
6.277500	45.76	---	73.00	27.24	L2
9.009500	---	43.13	60.00	16.87	L2
9.009500	45.56	---	73.00	27.44	L2

M/N: KSG-60K
 Operating Condition: TC1
 Test Specification: L3
 Power Input: DC 500V



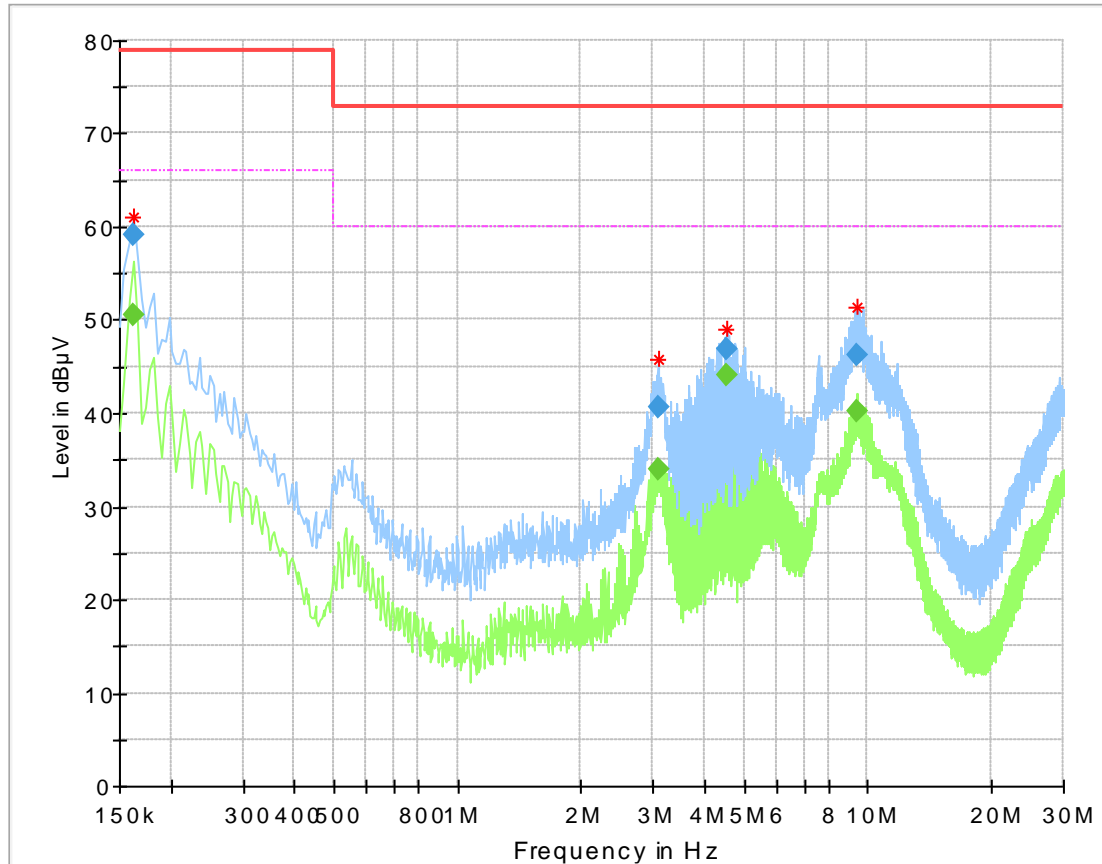
Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.161500	---	55.12	66.00	10.88	L3
0.161500	60.60	---	79.00	18.40	L3
2.233500	---	30.01	60.00	29.99	L3
2.233500	36.97	---	73.00	36.03	L3
5.378500	---	45.89	60.00	14.11	L3
5.378500	54.60	---	73.00	18.40	L3
8.701500	---	41.36	60.00	18.64	L3
8.701500	44.61	---	73.00	28.39	L3

M/N: KSG-60K
 Operating Condition: Full Load
 Test Specification: N
 Power Input: DC 500V



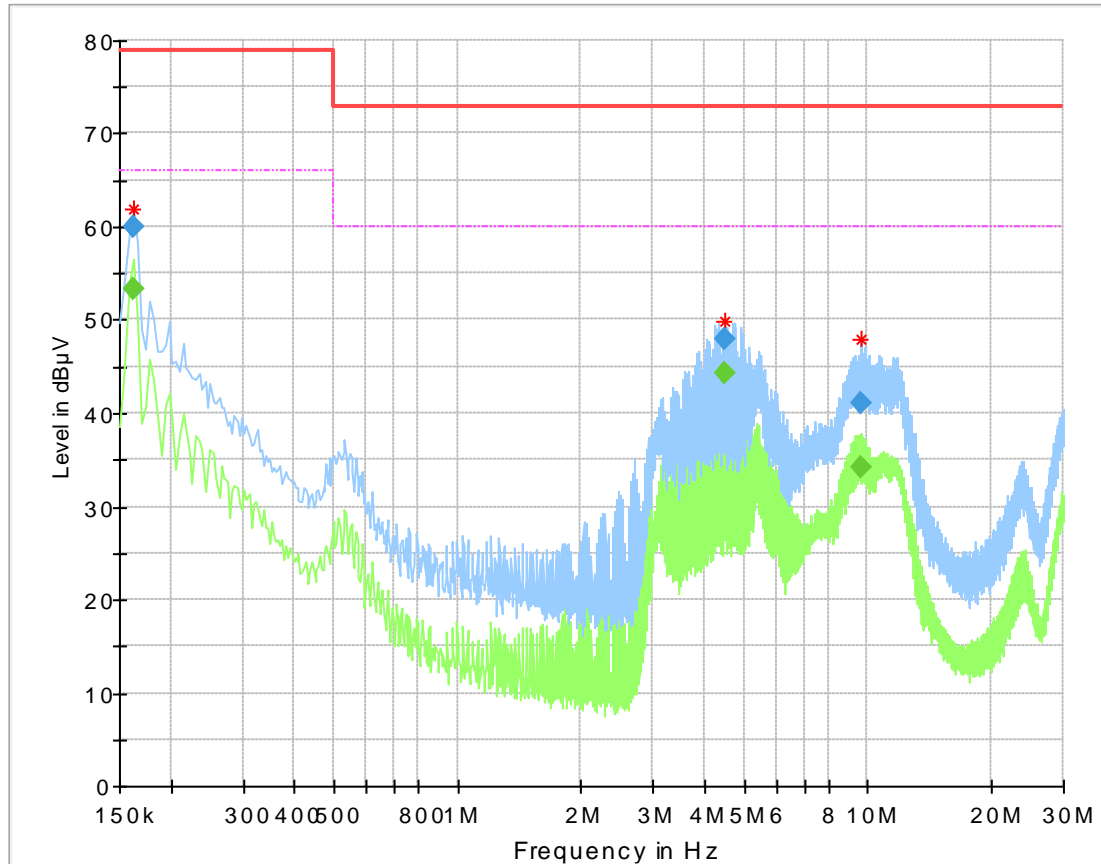
Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.161500	---	47.74	66.00	18.26	N
0.161500	53.08	---	79.00	25.92	N
5.133500	---	45.00	60.00	15.00	N
5.133500	51.08	---	73.00	21.92	N
6.041500	---	47.58	60.00	12.42	N
6.041500	53.88	---	73.00	19.12	N
9.009500	---	51.90	60.00	8.10	N
9.009500	52.94	---	73.00	20.06	N

M/N: KSG-60K-HV
 Operating Condition: TC1
 Test Specification: L1
 Power Input: DC 550V



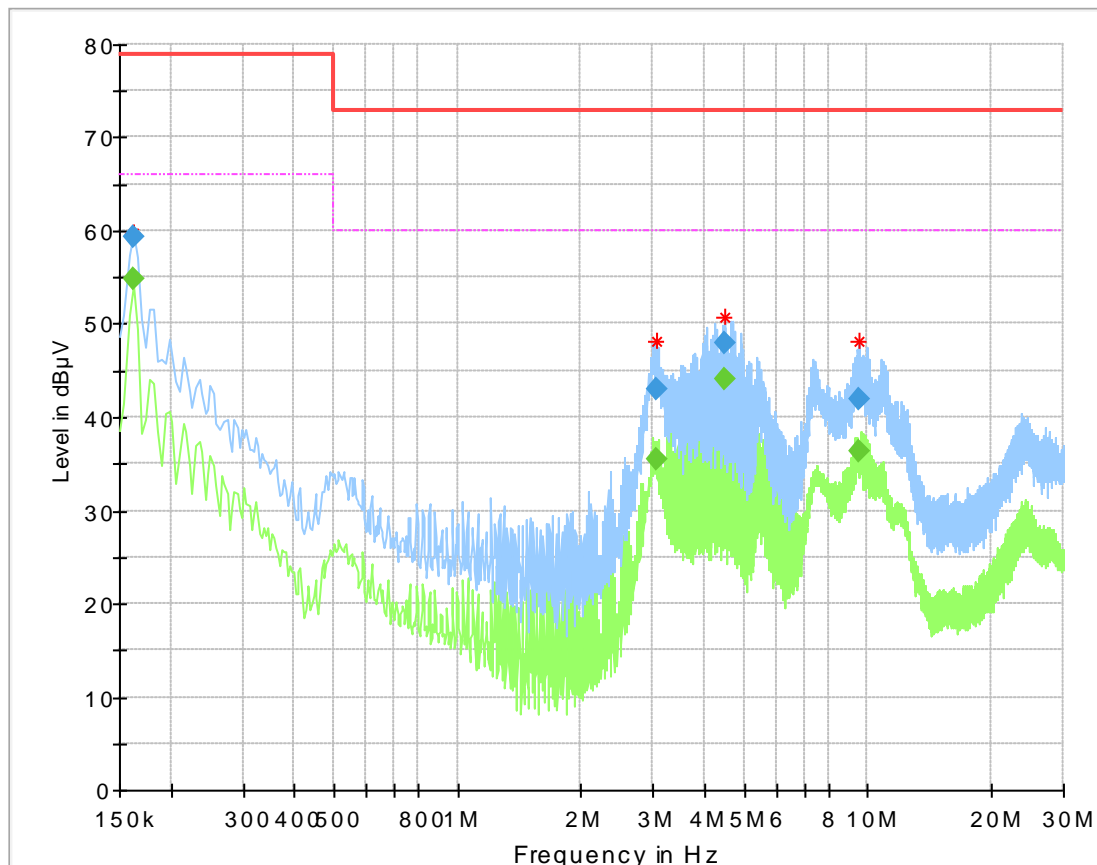
Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line
0.161500	---	50.53	66.00	15.47	L1
0.161500	59.24	---	79.00	19.76	L1
3.082500	---	34.03	60.00	25.97	L1
3.082500	40.66	---	73.00	32.34	L1
4.525500	---	44.05	60.00	15.95	L1
4.525500	46.98	---	73.00	26.02	L1
9.437500	---	40.24	60.00	19.76	L1
9.437500	46.26	---	73.00	26.74	L1

M/N: KSG-60K-HV
 Operating Condition: TC1
 Test Specification: L2
 Power Input: DC 550V



Frequency (MHz)	QuasiPeak (dBμV)	Average (dBμV)	Limit (dBμV)	Margin (dB)	Line
0.161500	---	53.27	66.00	12.73	L2
0.161500	59.97	---	79.00	19.03	L2
4.497500	---	44.37	60.00	15.63	L2
4.497500	48.00	---	73.00	25.00	L2
9.678500	---	34.30	60.00	25.70	L2
9.678500	40.97	---	73.00	32.03	L2

M/N: KSG-60K-HV
 Operating Condition: TC1
 Test Specification: L3
 Power Input: DC 550V



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Line
0.161500	---	54.86	66.00	11.14	L3
0.161500	59.38	---	79.00	19.62	L3
3.062500	---	35.40	60.00	24.60	L3
3.062500	43.10	---	73.00	29.90	L3
4.469500	---	44.06	60.00	15.94	L3
4.469500	48.03	---	73.00	24.97	L3
9.529500	---	36.25	60.00	23.75	L3
9.529500	42.02	---	73.00	30.98	L3

9.3 Harmonics

Phase L1:

EUT: KSG-60K

Tested by: Leon zhang

Test category: Table:3, Rsce=33,

Test Margin: 100

Test date: 2016/6/22

Start time: 15:42:43

End time: 15:45:35

Test duration (min): 2.5

Data file name: CTSMXH_H-000029.cts_data

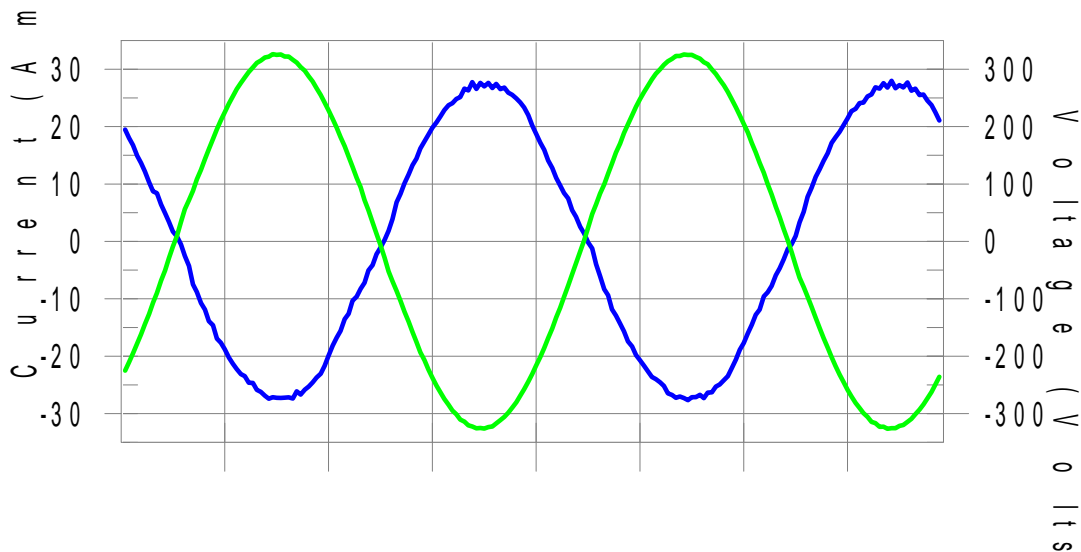
Comment: TC1

Customer: Shenzhen Kstar New Energy Company Limited

Test Result: Pass

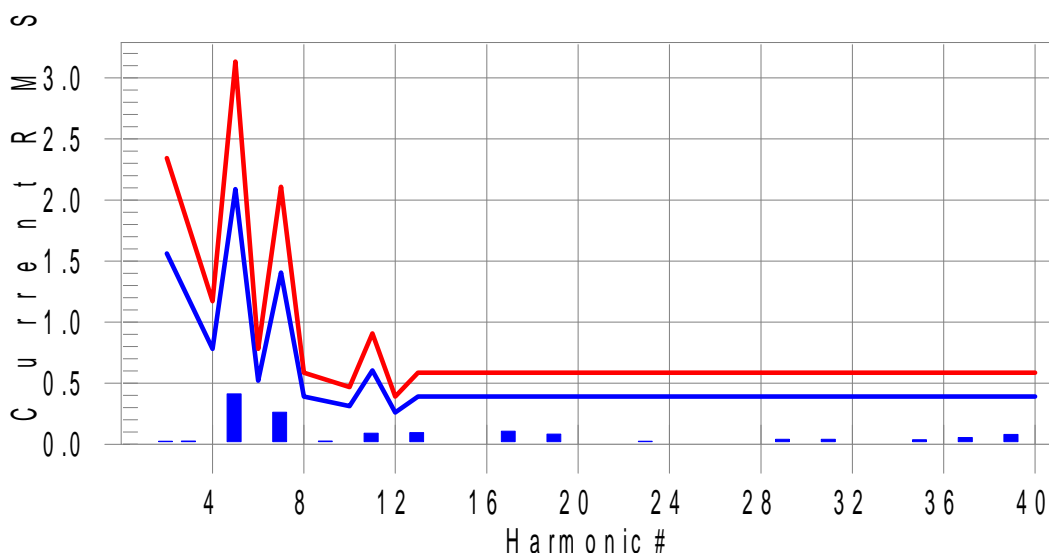
Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line

European Limits



Test result: Pass

Worst harmonic was #13 with 17.24 % of the limit.

Maximum Harmonic Current Results

Test Result: Pass Measured I-ref: 19.580(Amps) Source: Normal
I-THC(%): 2.8 Limit(%): 13.0 PWHC(%): 4.8 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts): 230.26 Frequency(Hz): 50.00
I_Peak (Amps): 29.717 I_RMS (Amps): 19.580
I_Fund (Amps): 19.514 Crest Factor: 1.522
Power (Watts): -4501 Power Factor: -0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.025	1.562	1.6	0.040	2.343	1.7	Pass
3	0.027	N/A	N/A	0.042	N/A	N/A	N/A
4	0.016	0.781	2.0	0.024	1.171	2.1	Pass
5	0.413	2.089	19.8	0.430	3.133	13.7	Pass
6	0.010	0.521	1.9	0.016	0.781	2.1	Pass
7	0.263	1.406	18.7	0.277	2.108	13.2	Pass
8	0.010	0.390	2.5	0.015	0.586	2.5	Pass
9	0.026	N/A	N/A	0.032	N/A	N/A	N/A
10	0.010	0.312	3.0	0.016	0.469	3.4	Pass
11	0.091	0.605	15.1	0.096	0.908	10.6	Pass
12	0.010	0.260	3.7	0.016	0.390	4.2	Pass
13	0.097	0.390	24.9	0.101	0.586	17.2	Pass
14	0.003	N/A	N/A	0.006	N/A	N/A	N/A
15	0.009	N/A	N/A	0.013	N/A	N/A	N/A
16	0.011	N/A	N/A	0.014	N/A	N/A	N/A
17	0.107	N/A	N/A	0.110	N/A	N/A	N/A
18	0.012	N/A	N/A	0.018	N/A	N/A	N/A
19	0.084	N/A	N/A	0.091	N/A	N/A	N/A
20	0.003	N/A	N/A	0.006	N/A	N/A	N/A
21	0.010	N/A	N/A	0.015	N/A	N/A	N/A
22	0.008	N/A	N/A	0.012	N/A	N/A	N/A
23	0.025	N/A	N/A	0.027	N/A	N/A	N/A
24	0.008	N/A	N/A	0.014	N/A	N/A	N/A
25	0.008	N/A	N/A	0.011	N/A	N/A	N/A
26	0.003	N/A	N/A	0.005	N/A	N/A	N/A
27	0.014	N/A	N/A	0.017	N/A	N/A	N/A
28	0.003	N/A	N/A	0.006	N/A	N/A	N/A
29	0.042	N/A	N/A	0.048	N/A	N/A	N/A
30	0.006	N/A	N/A	0.010	N/A	N/A	N/A
31	0.042	N/A	N/A	0.047	N/A	N/A	N/A
32	0.003	N/A	N/A	0.004	N/A	N/A	N/A
33	0.015	N/A	N/A	0.022	N/A	N/A	N/A
34	0.005	N/A	N/A	0.007	N/A	N/A	N/A
35	0.037	N/A	N/A	0.044	N/A	N/A	N/A
36	0.007	N/A	N/A	0.010	N/A	N/A	N/A
37	0.055	N/A	N/A	0.059	N/A	N/A	N/A
38	0.005	N/A	N/A	0.009	N/A	N/A	N/A
39	0.081	N/A	N/A	0.113	N/A	N/A	N/A
40	0.004	N/A	N/A	0.006	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.146	0.921	15.83	OK
3	0.376	2.878	13.07	OK
4	0.041	0.921	4.40	OK
5	0.420	3.453	12.16	OK
6	0.028	0.921	3.04	OK
7	0.497	2.878	17.26	OK
8	0.035	0.921	3.79	OK
9	0.404	1.381	29.24	OK
10	0.025	0.921	2.72	OK
11	0.371	1.612	23.00	OK
12	0.028	0.691	4.00	OK
13	0.306	1.381	22.19	OK
14	0.024	0.691	3.54	OK
15	0.280	0.691	40.54	OK
16	0.029	0.691	4.21	OK
17	0.260	0.691	37.71	OK
18	0.030	0.691	4.38	OK
19	0.251	0.691	36.28	OK
20	0.031	0.691	4.51	OK
21	0.213	0.691	30.80	OK
22	0.027	0.691	3.94	OK
23	0.208	0.691	30.07	OK
24	0.025	0.691	3.56	OK
25	0.156	0.691	22.53	OK
26	0.023	0.691	3.39	OK
27	0.157	0.691	22.71	OK
28	0.025	0.691	3.65	OK
29	0.108	0.691	15.59	OK
30	0.020	0.691	2.88	OK
31	0.130	0.691	18.76	OK
32	0.020	0.691	2.92	OK
33	0.101	0.691	14.58	OK
34	0.027	0.691	3.96	OK
35	0.166	0.691	24.03	OK
36	0.024	0.691	3.43	OK
37	0.130	0.691	18.87	OK
38	0.027	0.691	3.86	OK
39	0.273	0.691	39.56	OK
40	0.030	0.691	4.41	OK

Phase L2:

EUT: KSG-60K

Tested by: Leon zhang

Test category: Table:3, Rsce=33,

Test Margin: 100

Test date: 2016/6/22

Start time: 15:42:43

End time: 15:45:35

Test duration (min): 2.5

Data file name: CTSMXH_H-000029.cts_data

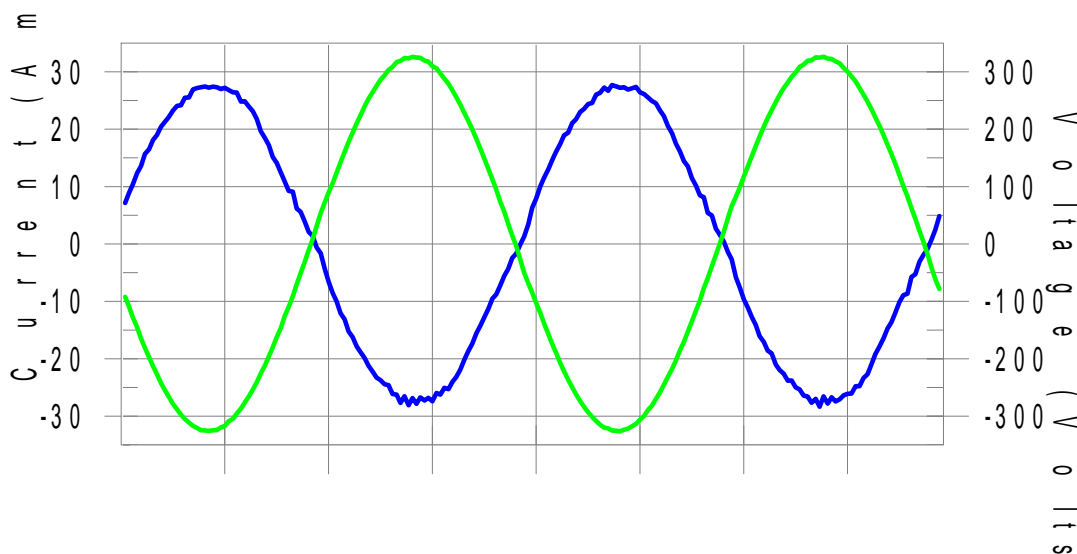
Comment: TC1

Customer: Shenzhen Kstar New Energy Company Limited

Test Result: Pass

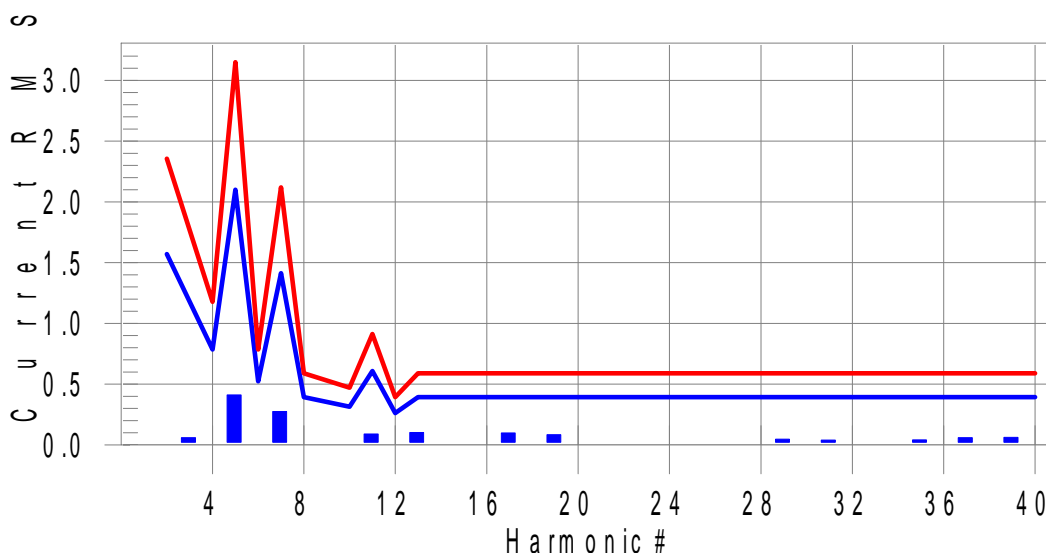
Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line

European Limits



Test result: Pass

Worst harmonic was #13 with 17.94 % of the limit.

Maximum Harmonic Current Results

Test Result: Pass Measured I-ref: 19.671(Amps) Source: Normal
I-THC(%): 2.8 Limit(%): 13.0 PWHC(%): 4.5 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	230.22	Frequency(Hz):	50.00
I_Peak (Amps):	29.747	I_RMS (Amps):	19.671
I_Fund (Amps):	19.615	Crest Factor:	1.515
Power (Watts):	-4521	Power Factor:	-0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.019	1.570	1.2	0.034	2.355	1.4	Pass
3	0.027	N/A	N/A	0.072	N/A	N/A	N/A
4	0.017	0.785	2.1	0.028	1.177	2.4	Pass
5	0.410	2.100	19.5	0.430	3.150	13.6	Pass
6	0.009	0.523	1.7	0.016	0.785	2.1	Pass
7	0.274	1.413	19.4	0.287	2.119	13.5	Pass
8	0.010	0.392	2.5	0.015	0.589	2.6	Pass
9	0.026	N/A	N/A	0.017	N/A	N/A	N/A
10	0.009	0.314	2.8	0.012	0.471	2.5	Pass
11	0.090	0.608	14.8	0.095	0.913	10.4	Pass
12	0.009	0.262	3.3	0.015	0.392	3.9	Pass
13	0.102	0.392	25.9	0.106	0.589	17.9	Pass
14	0.007	N/A	N/A	0.011	N/A	N/A	N/A
15	0.014	N/A	N/A	0.017	N/A	N/A	N/A
16	0.011	N/A	N/A	0.015	N/A	N/A	N/A
17	0.098	N/A	N/A	0.101	N/A	N/A	N/A
18	0.011	N/A	N/A	0.019	N/A	N/A	N/A
19	0.085	N/A	N/A	0.090	N/A	N/A	N/A
20	0.006	N/A	N/A	0.010	N/A	N/A	N/A
21	0.009	N/A	N/A	0.013	N/A	N/A	N/A
22	0.008	N/A	N/A	0.014	N/A	N/A	N/A
23	0.015	N/A	N/A	0.018	N/A	N/A	N/A
24	0.009	N/A	N/A	0.015	N/A	N/A	N/A
25	0.011	N/A	N/A	0.014	N/A	N/A	N/A
26	0.006	N/A	N/A	0.009	N/A	N/A	N/A
27	0.012	N/A	N/A	0.015	N/A	N/A	N/A
28	0.006	N/A	N/A	0.008	N/A	N/A	N/A
29	0.048	N/A	N/A	0.054	N/A	N/A	N/A
30	0.004	N/A	N/A	0.007	N/A	N/A	N/A
31	0.039	N/A	N/A	0.043	N/A	N/A	N/A
32	0.006	N/A	N/A	0.009	N/A	N/A	N/A
33	0.015	N/A	N/A	0.021	N/A	N/A	N/A
34	0.004	N/A	N/A	0.007	N/A	N/A	N/A
35	0.041	N/A	N/A	0.049	N/A	N/A	N/A
36	0.007	N/A	N/A	0.011	N/A	N/A	N/A
37	0.059	N/A	N/A	0.062	N/A	N/A	N/A
38	0.005	N/A	N/A	0.009	N/A	N/A	N/A
39	0.062	N/A	N/A	0.086	N/A	N/A	N/A
40	0.004	N/A	N/A	0.006	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.097	0.921	10.54	OK
3	0.371	2.877	12.90	OK
4	0.041	0.921	4.50	OK
5	0.415	3.453	12.02	OK
6	0.031	0.921	3.32	OK
7	0.491	2.877	17.07	OK
8	0.033	0.921	3.57	OK
9	0.377	1.381	27.27	OK
10	0.037	0.921	4.07	OK
11	0.365	1.611	22.68	OK
12	0.044	0.690	6.39	OK
13	0.318	1.381	23.03	OK
14	0.033	0.691	4.77	OK
15	0.296	0.691	42.85	OK
16	0.048	0.691	7.00	OK
17	0.268	0.691	38.79	OK
18	0.046	0.691	6.62	OK
19	0.255	0.691	36.96	OK
20	0.040	0.691	5.80	OK
21	0.201	0.691	29.13	OK
22	0.041	0.691	5.93	OK
23	0.195	0.691	28.23	OK
24	0.044	0.691	6.33	OK
25	0.154	0.691	22.26	OK
26	0.031	0.691	4.46	OK
27	0.132	0.691	19.06	OK
28	0.036	0.691	5.17	OK
29	0.107	0.691	15.53	OK
30	0.034	0.691	4.85	OK
31	0.130	0.691	18.79	OK
32	0.028	0.691	4.00	OK
33	0.131	0.691	18.90	OK
34	0.031	0.691	4.43	OK
35	0.173	0.691	25.12	OK
36	0.031	0.691	4.52	OK
37	0.124	0.691	17.90	OK
38	0.035	0.691	5.11	OK
39	0.192	0.690	27.76	OK
40	0.037	0.691	5.37	OK

Phase L3:

EUT: KSG-60K

Tested by: Leon zhang

Test category: Table:3, Rsce=33,

Test Margin: 100

Test date: 2016/6/22

Start time: 15:42:43

End time: 15:45:35

Test duration (min): 2.5

Data file name: CTSMXH_H-000029.cts_data

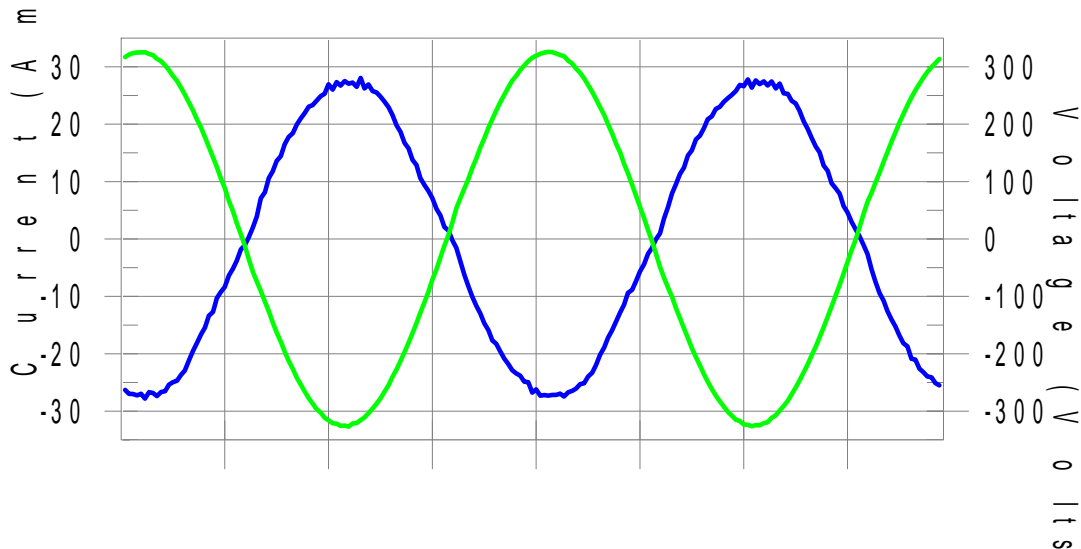
Comment: TC1

Customer: Shenzhen Kstar New Energy Company Limited

Test Result: Pass

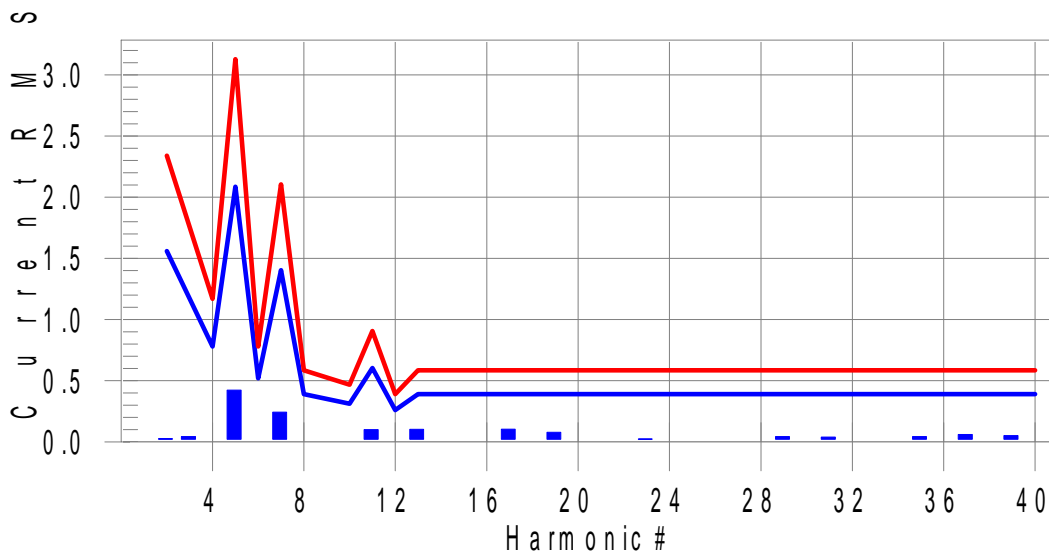
Source qualification: Normal

Current & voltage waveforms



Harmonics and Class 3 limit line

European Limits



Test result: Pass

Worst harmonic was #13 with 18.24 % of the limit.

Maximum Harmonic Current Results

Test Result: Pass Measured I-ref: 19.537(Amps) Source: Normal
I-THC(%): 2.8 Limit(%): 13.0 PWHC(%): 4.4 PWHC Limit(%): 22.0

Highest parameter values during test:

V_RMS (Volts):	230.16	Frequency(Hz):	50.00
I_Peak (Amps):	29.593	I_RMS (Amps):	19.537
I_Fund (Amps):	19.482	Crest Factor:	1.518
Power (Watts):	-4489	Power Factor:	-0.999

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.026	1.559	1.7	0.040	2.339	1.7	Pass
3	0.027	N/A	N/A	0.057	N/A	N/A	N/A
4	0.016	0.780	2.0	0.025	1.169	2.2	Pass
5	0.422	2.086	20.2	0.438	3.128	14.0	Pass
6	0.011	0.520	2.0	0.020	0.780	2.5	Pass
7	0.243	1.403	17.3	0.258	2.105	12.3	Pass
8	0.006	0.390	1.4	0.009	0.585	1.5	Pass
9	0.026	N/A	N/A	0.022	N/A	N/A	N/A
10	0.010	0.312	3.4	0.016	0.468	3.5	Pass
11	0.099	0.604	16.4	0.104	0.906	11.4	Pass
12	0.008	0.260	2.9	0.011	0.390	2.9	Pass
13	0.103	0.390	26.3	0.107	0.585	18.2	Pass
14	0.007	N/A	N/A	0.010	N/A	N/A	N/A
15	0.006	N/A	N/A	0.010	N/A	N/A	N/A
16	0.010	N/A	N/A	0.014	N/A	N/A	N/A
17	0.104	N/A	N/A	0.108	N/A	N/A	N/A
18	0.009	N/A	N/A	0.012	N/A	N/A	N/A
19	0.078	N/A	N/A	0.084	N/A	N/A	N/A
20	0.004	N/A	N/A	0.008	N/A	N/A	N/A
21	0.005	N/A	N/A	0.009	N/A	N/A	N/A
22	0.008	N/A	N/A	0.013	N/A	N/A	N/A
23	0.023	N/A	N/A	0.026	N/A	N/A	N/A
24	0.008	N/A	N/A	0.011	N/A	N/A	N/A
25	0.010	N/A	N/A	0.013	N/A	N/A	N/A
26	0.006	N/A	N/A	0.009	N/A	N/A	N/A
27	0.013	N/A	N/A	0.016	N/A	N/A	N/A
28	0.005	N/A	N/A	0.008	N/A	N/A	N/A
29	0.045	N/A	N/A	0.053	N/A	N/A	N/A
30	0.005	N/A	N/A	0.007	N/A	N/A	N/A
31	0.039	N/A	N/A	0.042	N/A	N/A	N/A
32	0.007	N/A	N/A	0.009	N/A	N/A	N/A
33	0.017	N/A	N/A	0.024	N/A	N/A	N/A
34	0.004	N/A	N/A	0.008	N/A	N/A	N/A
35	0.044	N/A	N/A	0.052	N/A	N/A	N/A
36	0.006	N/A	N/A	0.010	N/A	N/A	N/A
37	0.061	N/A	N/A	0.065	N/A	N/A	N/A
38	0.006	N/A	N/A	0.011	N/A	N/A	N/A
39	0.050	N/A	N/A	0.075	N/A	N/A	N/A
40	0.003	N/A	N/A	0.005	N/A	N/A	N/A

Note: Measured I-ref was applied for this test.

Voltage Source Verification Data

Harm#	Harmonics V-rms	Limit V-rms	% of Limit	Status
2	0.087	0.920	9.46	OK
3	0.376	2.877	13.08	OK
4	0.041	0.920	4.50	OK
5	0.419	3.452	12.14	OK
6	0.022	0.920	2.38	OK
7	0.492	2.877	17.10	OK
8	0.021	0.920	2.28	OK
9	0.391	1.381	28.29	OK
10	0.019	0.921	2.09	OK
11	0.379	1.611	23.54	OK
12	0.026	0.690	3.77	OK
13	0.317	1.381	22.98	OK
14	0.023	0.690	3.27	OK
15	0.280	0.690	40.61	OK
16	0.023	0.690	3.26	OK
17	0.264	0.690	38.21	OK
18	0.027	0.690	3.87	OK
19	0.258	0.690	37.37	OK
20	0.032	0.690	4.64	OK
21	0.209	0.690	30.27	OK
22	0.018	0.690	2.57	OK
23	0.202	0.690	29.30	OK
24	0.026	0.690	3.79	OK
25	0.153	0.690	22.21	OK
26	0.021	0.690	3.06	OK
27	0.146	0.690	21.21	OK
28	0.016	0.690	2.25	OK
29	0.115	0.690	16.66	OK
30	0.020	0.690	2.94	OK
31	0.136	0.690	19.77	OK
32	0.025	0.690	3.68	OK
33	0.132	0.690	19.17	OK
34	0.022	0.690	3.15	OK
35	0.171	0.690	24.79	OK
36	0.031	0.690	4.44	OK
37	0.127	0.690	18.34	OK
38	0.027	0.690	3.95	OK
39	0.161	0.690	23.30	OK
40	0.027	0.690	3.98	OK

9.4 Flicker

Phase L1:

EUT: KSG-60K

Test category: All parameters

Test date: 2016/6/22

Test duration (min): 10

Comment: TC1

Customer: Shenzhen Kstar New Energy Company Limited

Z-test Phase = $(0.150 + j 0.150 \text{ Ohm})$ Neutral = $(0.100 + j 0.100 \text{ Ohm})$

Tested by: leon zhang

Test Margin: 100

End time: 16:14:17

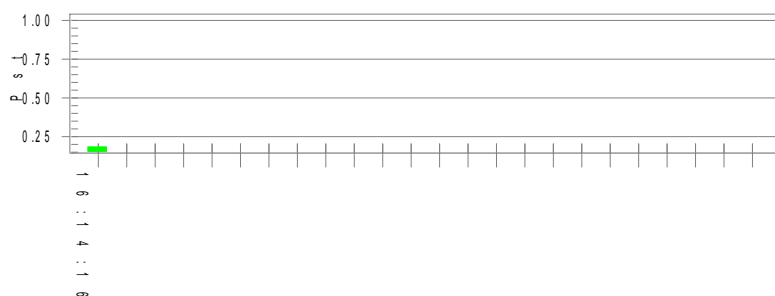
Start time: 16:03:44

Data file name: CTSMXH_F-000031.cts_data

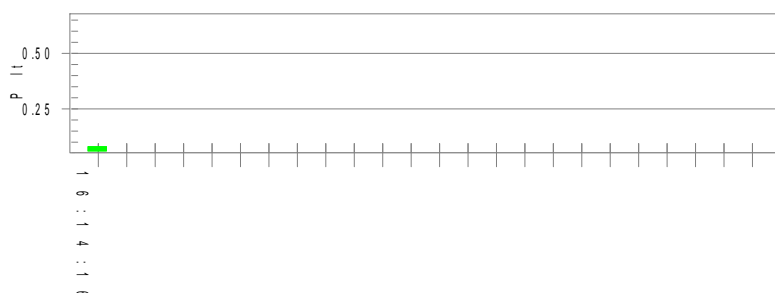
Test Result: Pass

Status: Test Completed

Pst_i and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.16

T-max (mS):	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	-0.22	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.185	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.081	Test limit:	0.650	Pass
Calculated dmax(%):	0.000			
Calculated dc(%):	0.000			
Calculated Pst :	0.246			
Calculated Plt :	0.108			

The maximum permissible system impedance Zsys:

Z-phase A = $1.964 \text{ Ohm} + j 1.227 \text{ Ohm}$ ($1.964 \text{ Ohm} + 3906 \text{ ?H}$)
 Z-neutral A = $1.309 \text{ Ohm} + j 0.818 \text{ Ohm}$ ($1.309 \text{ Ohm} + 2604 \text{ ?H}$)

Phase L2:

EUT: KSG-60K

Test category: All parameters

Test date: 2016/6/22

Start time: 16:03:44

Tested by: leon zhang

Test Margin: 100

End time: 16:14:17

Test duration (min): 10

Data file name: CTSMXH_F-000031.cts_data

Comment: TC1

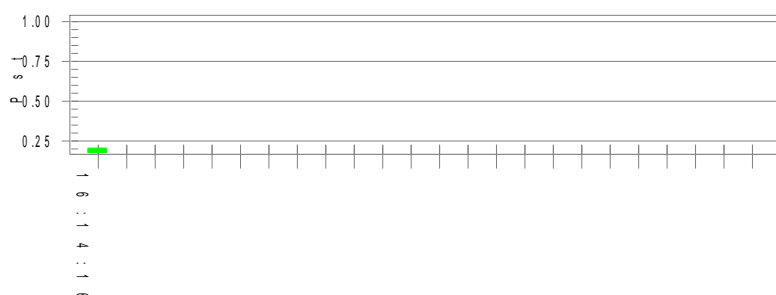
Customer: Shenzhen Kstar New Energy Company Limited

Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

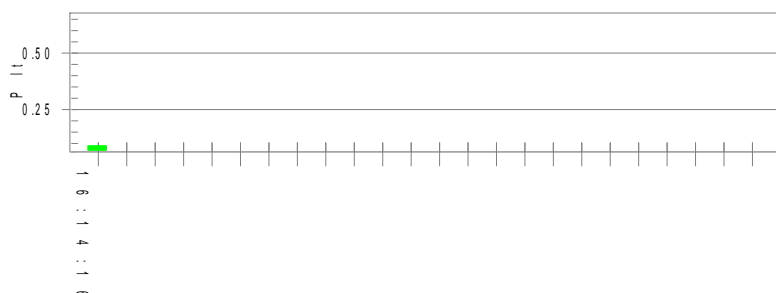
Test Result: Pass

Status: Test Completed

Pst and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.14

Time(mS) > dt:	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	-0.21	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.206	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.090	Test limit:	0.650	Pass

Calculated dmax(%): 0.000

Calculated dc(%): 0.000

Calculated Pst : 0.275

Calculated Plt : 0.120

The maximum permissible system impedance Zsys :

Z-phase C = 1.667 Ohm + j 1.042 Ohm (1.667 Ohm + 3316 ?H)
Z-neutral C = 1.111 Ohm + j 0.694 Ohm (1.111 Ohm + 2210 ?H)

Phase L3:

EUT: KSG-60K

Test category: All parameters

Test date: 2016/6/22

Test duration (min): 10

Comment: TC1

Customer: Shenzhen Kstar New Energy Company Limited

Z-test Phase = (0.150 + j 0.150 Ohm) Neutral = (0.100 + j 0.100 Ohm)

Tested by: leon zhang

Test Margin: 100

End time: 16:14:17

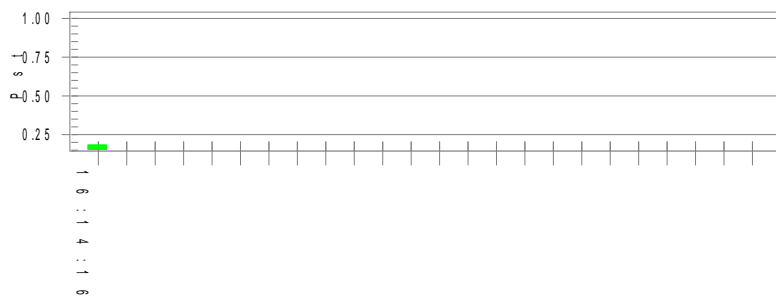
Start time: 16:03:44

Data file name: CTSMXH_F-000031.cts_data

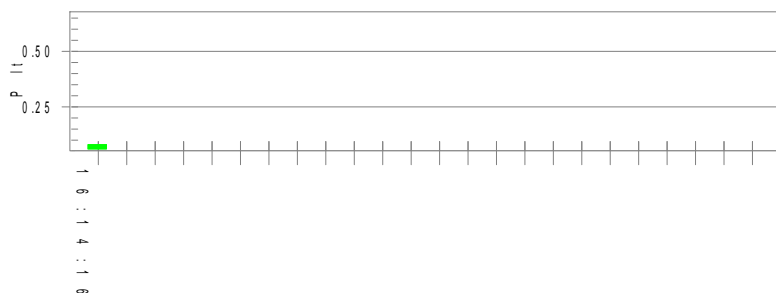
Test Result: Pass

Status: Test Completed

Pst_i and limit line



Plt and limit line



Parameter values recorded during the test:

Vrms at the end of test (Volt): 233.16

T-max (mS):	0.0	Test limit (mS):	500.0	Pass
Highest dc (%):	0.00	Test limit (%):	3.30	Pass
Highest dmax (%):	-0.22	Test limit (%):	4.00	Pass
Highest Pst (10 min. period):	0.185	Test limit:	1.000	Pass
Highest Plt (2 hr. period):	0.081	Test limit:	0.650	Pass
Calculated dmax(%):	0.000			
Calculated dc(%):	0.000			
Calculated Pst :	0.246			
Calculated Plt :	0.108			

The maximum permissible system impedance Zsys:

Z-phase A = 1.964 Ohm + j 1.227 Ohm (1.964 Ohm + 3906 ?H)
 Z-neutral A = 1.309 Ohm + j 0.818 Ohm (1.309 Ohm + 2604 ?H)

10 Photographs of Test Set-ups

10.1 Radiated Emissions



Radiated Emission

10.2 Conducted Emissions



Conducted Emissions

10.3 Harmonics and Voltage fluctuations



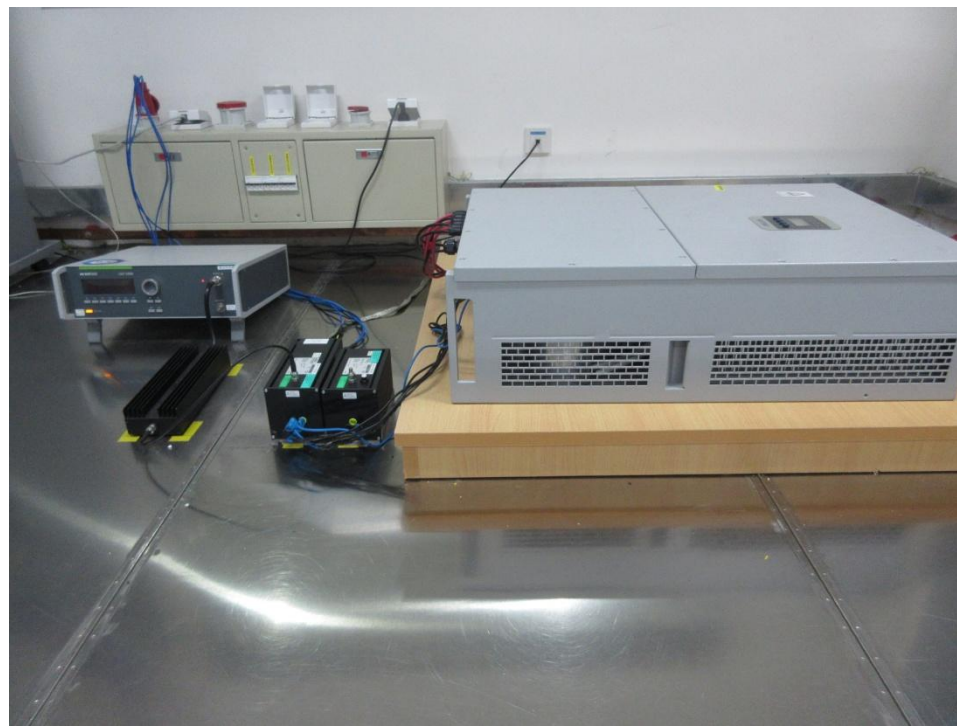
10.4 Immunity



Immunity to Electrostatic Discharge



Immunity to Radiated-frequency electromagnetic field



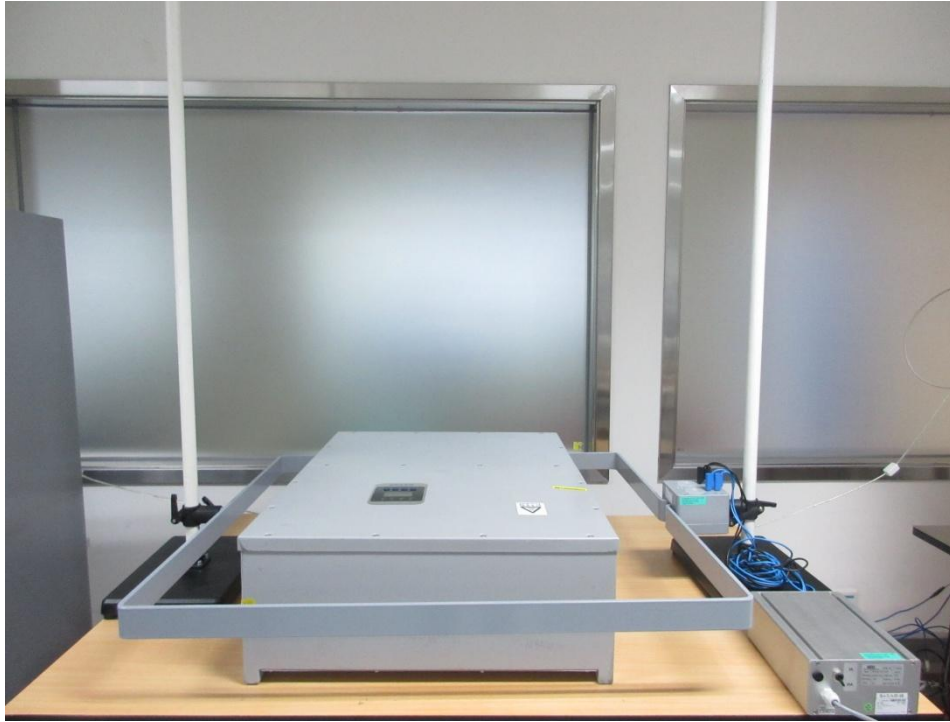
Immunity to conducted radio-frequency common mode



Immunity to Fast Transients



Immunity to Surge



Immunity to Power-frequency magnetic field

11 Photographs of Product



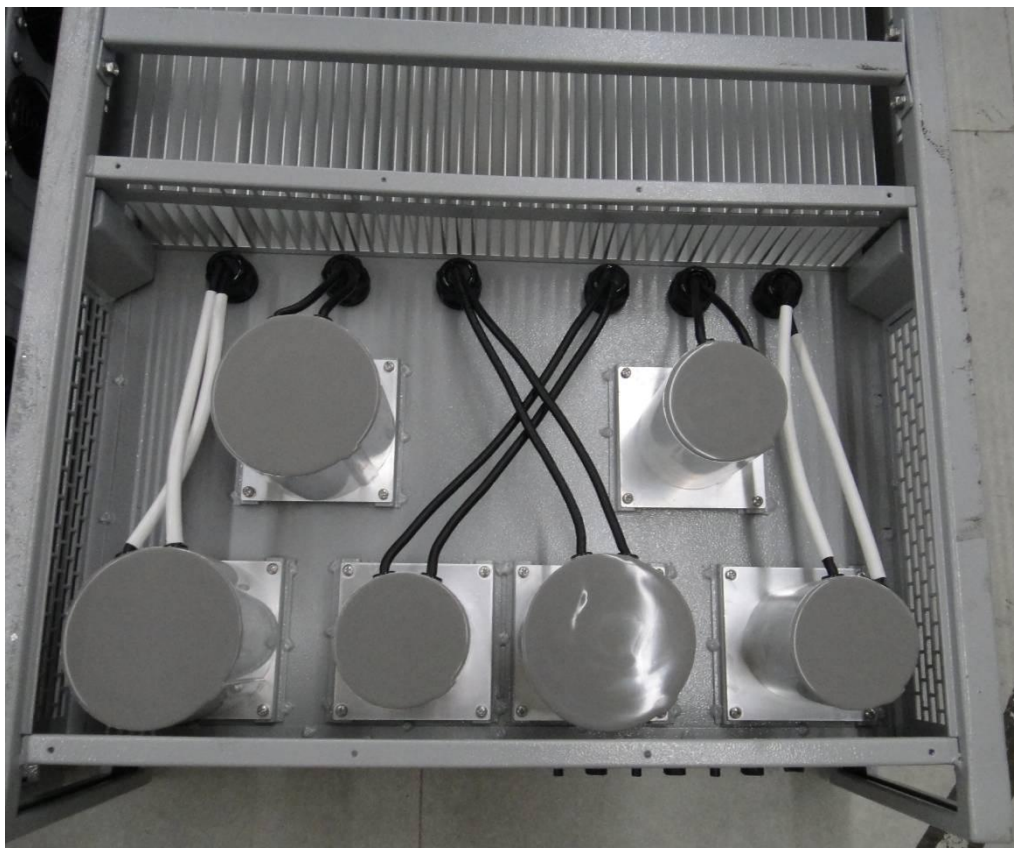
Picture 1: Overall view of the unit, model: KSG-30K, KSG-36K-HV



Picture 2: Overall view of the unit, model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



Picture 3: Rear view of the unit, model: KSG-30K, KSG-36K-HV



Picture 4: Rear view of the unit, model: KSG-30K, KSG-36K-HV



Picture 5: Overall view of the unit, model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



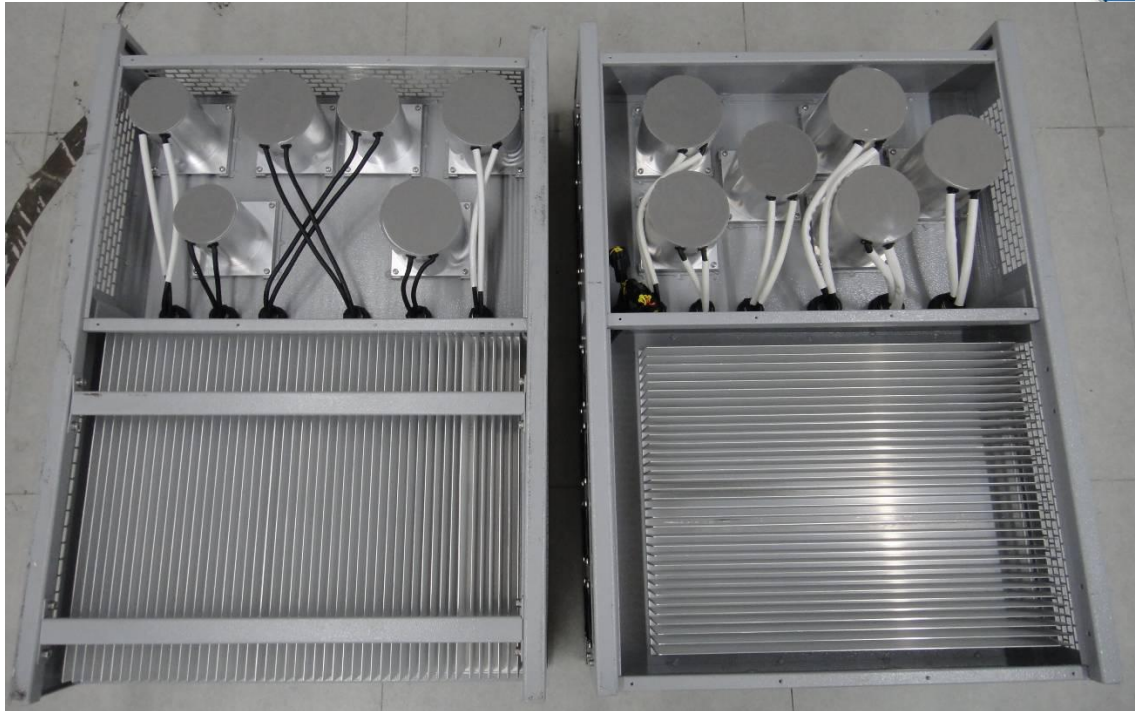
Picture 6: Rear view of the unit, model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



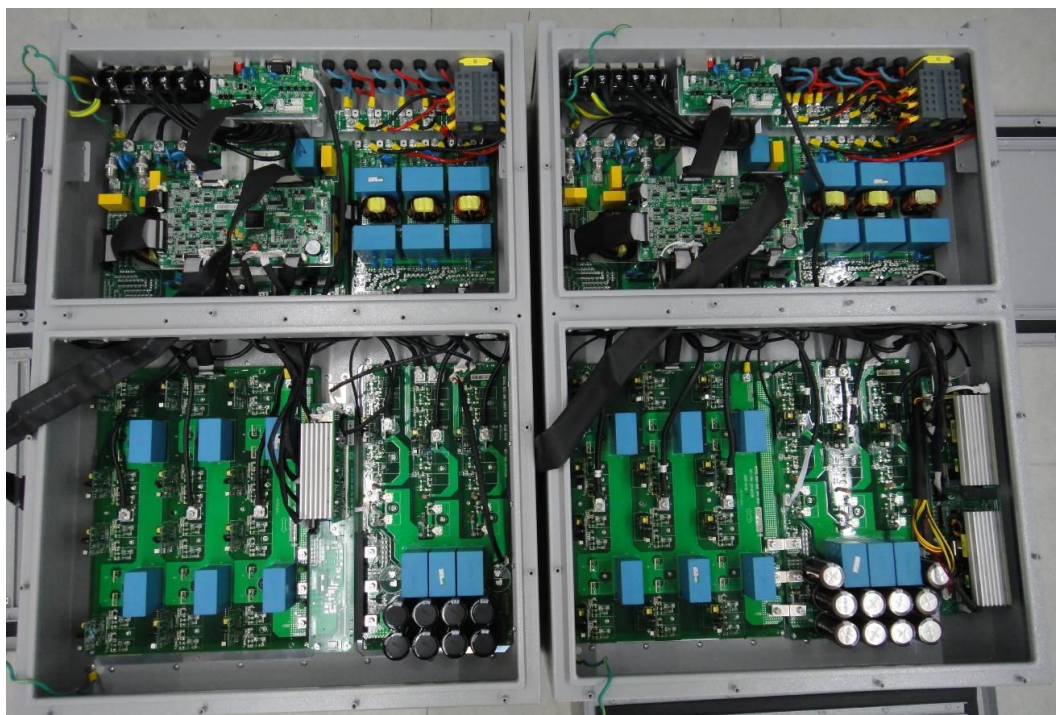
Picture 7: Rear view of the unit, model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



Picture 8: Bottom view of the PCE



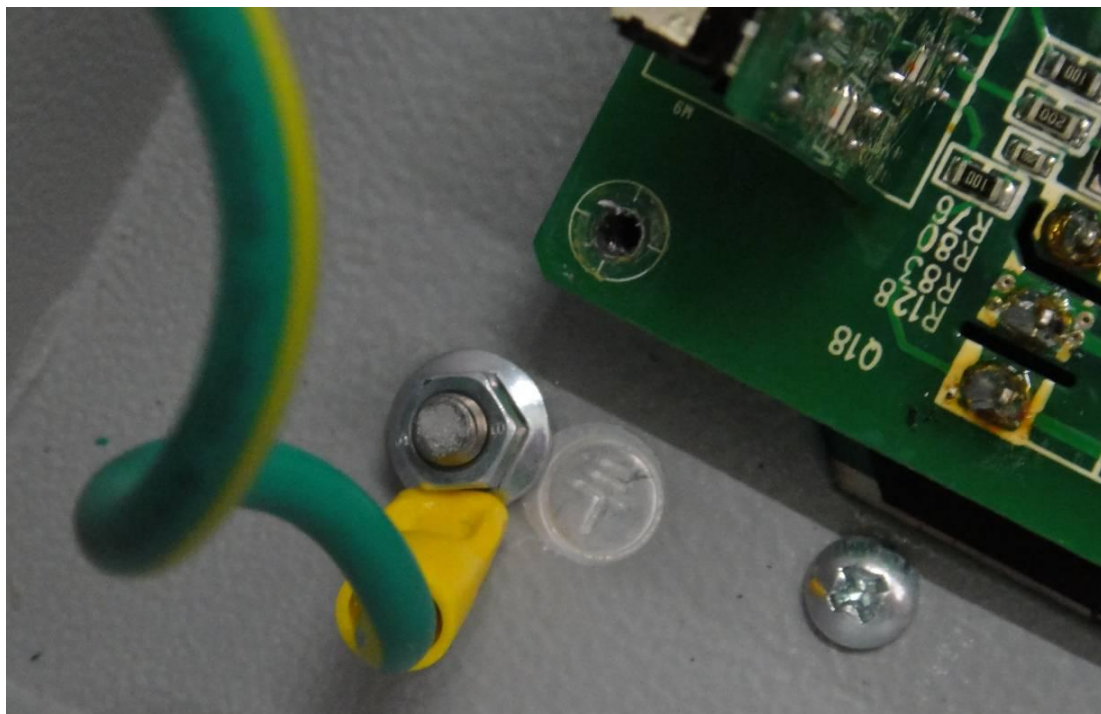
Picture 9: The left photo is model: KSG-30K, KSG-36K-HV, the right photo is model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



Picture 10: The left photo is model: KSG-30K, KSG-36K-HV, the right photo is model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



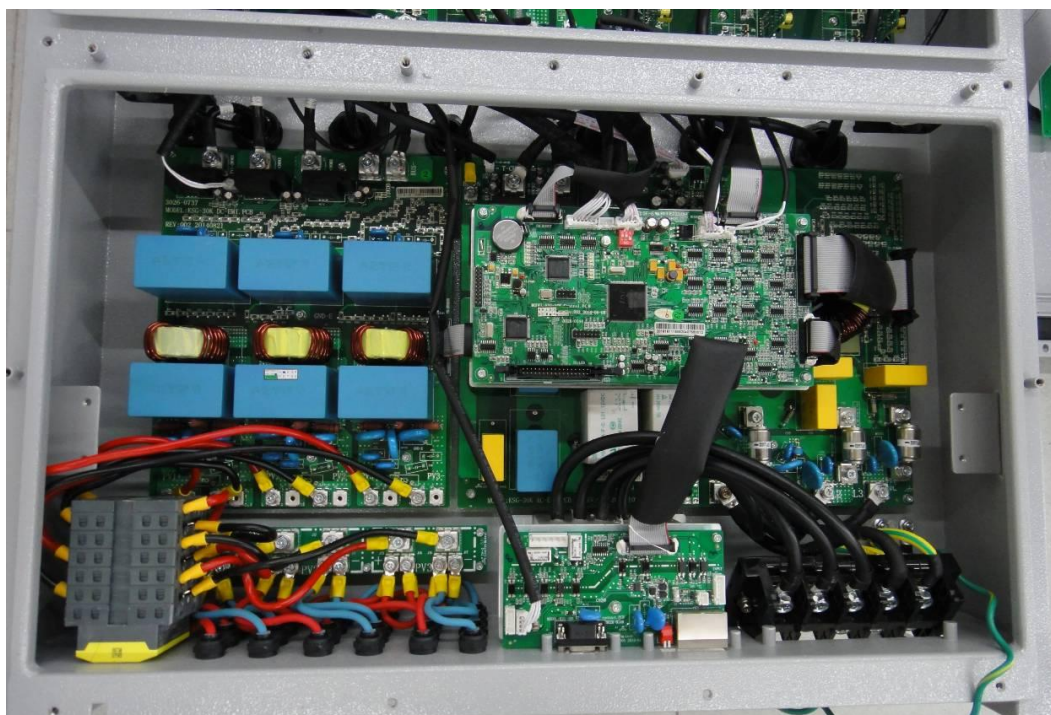
Picture 11: Internal view of the PCE, top case opened.



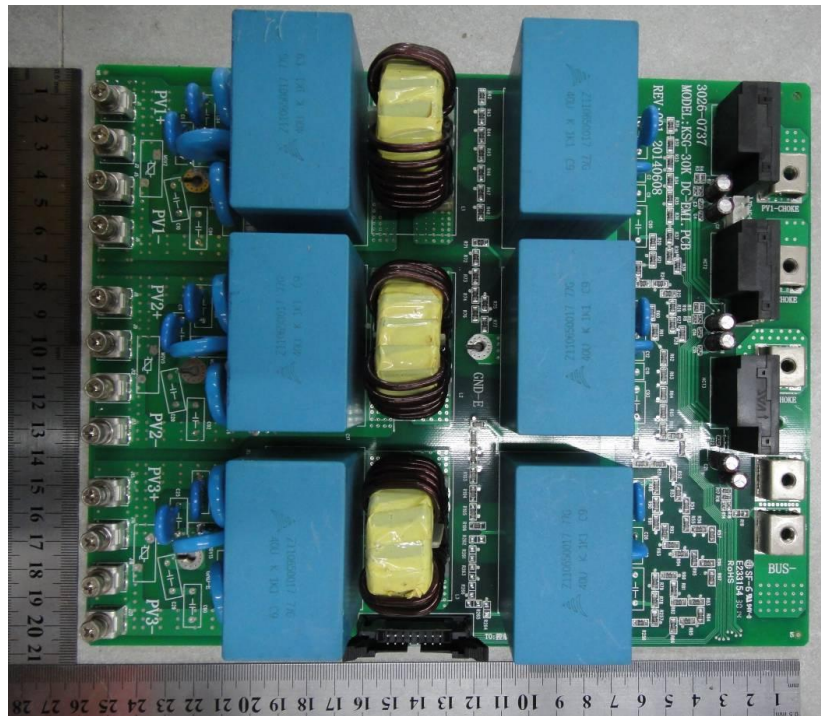
Picture 12: PE terminal



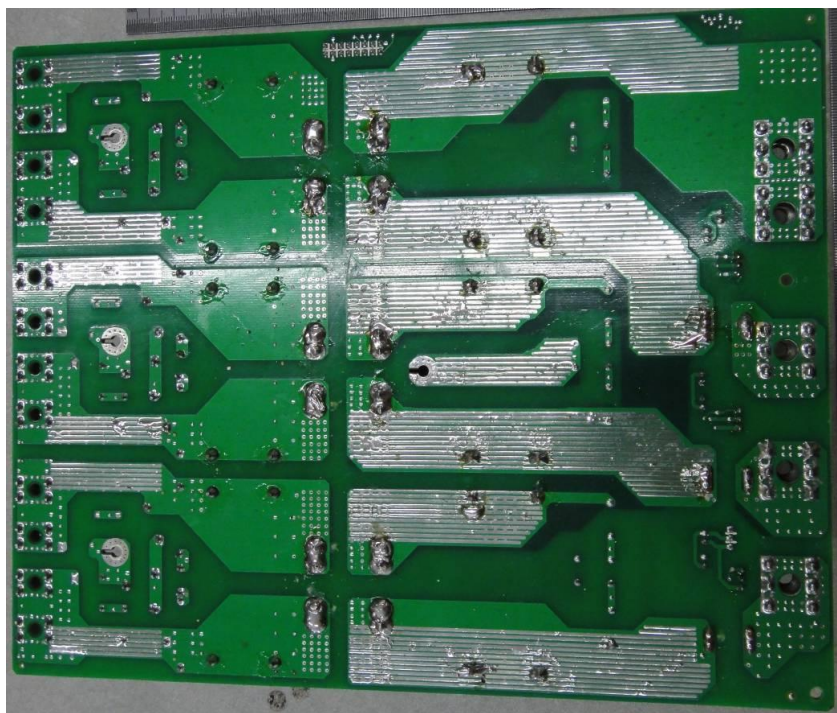
Picture 13: Internal view of the PCE



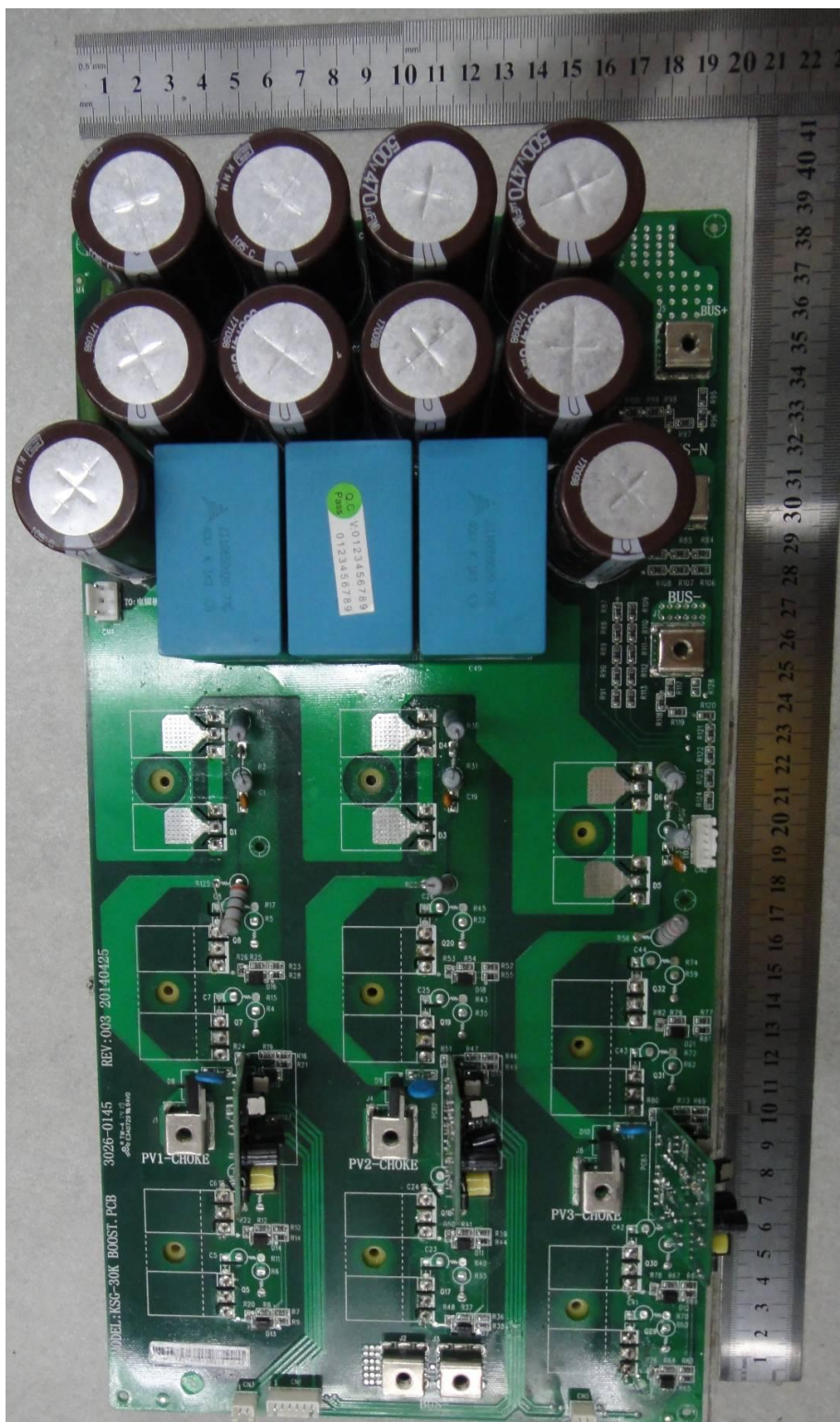
Picture 14: Internal view of the PCE



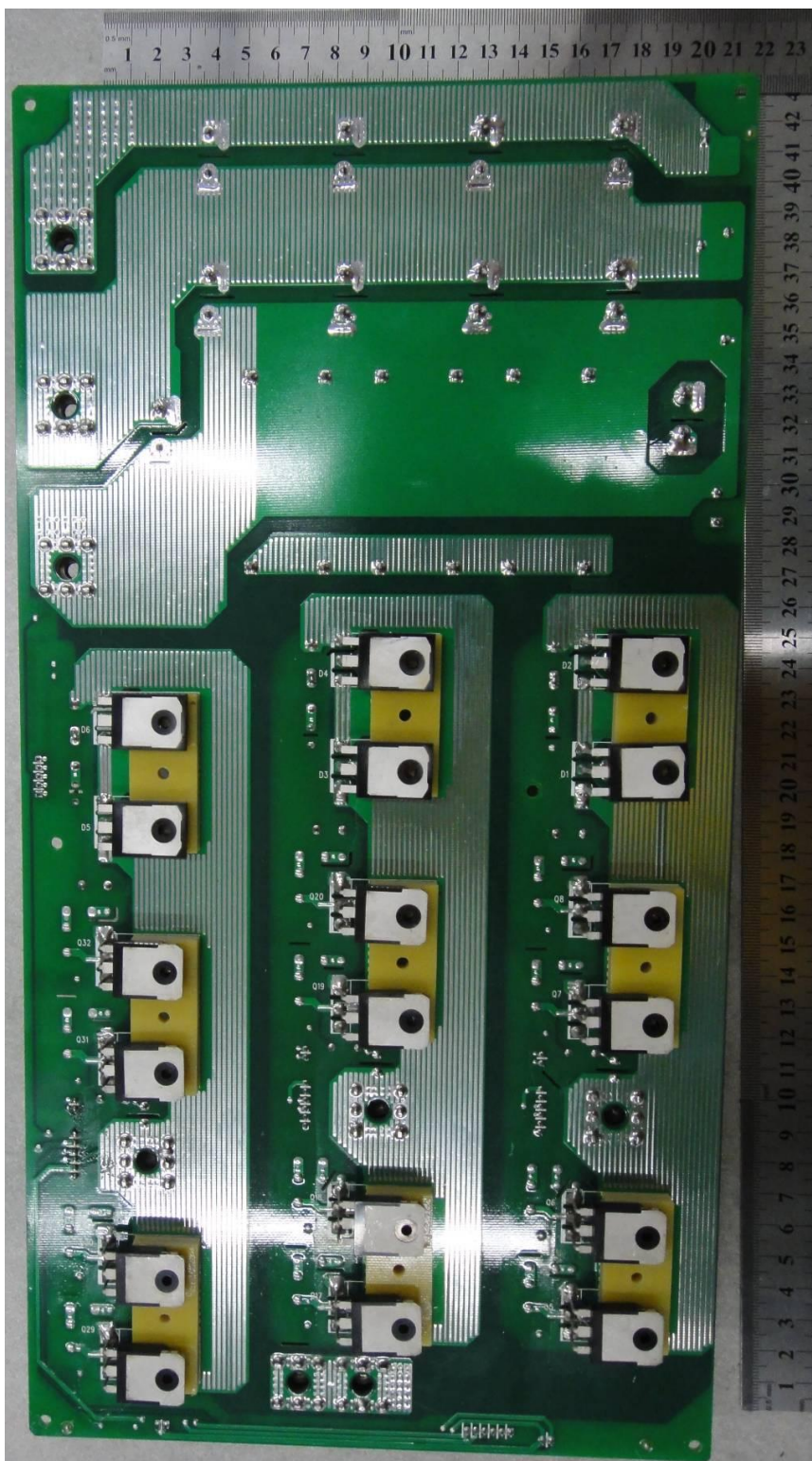
Picture 15: PCB top view of the DC EMI board



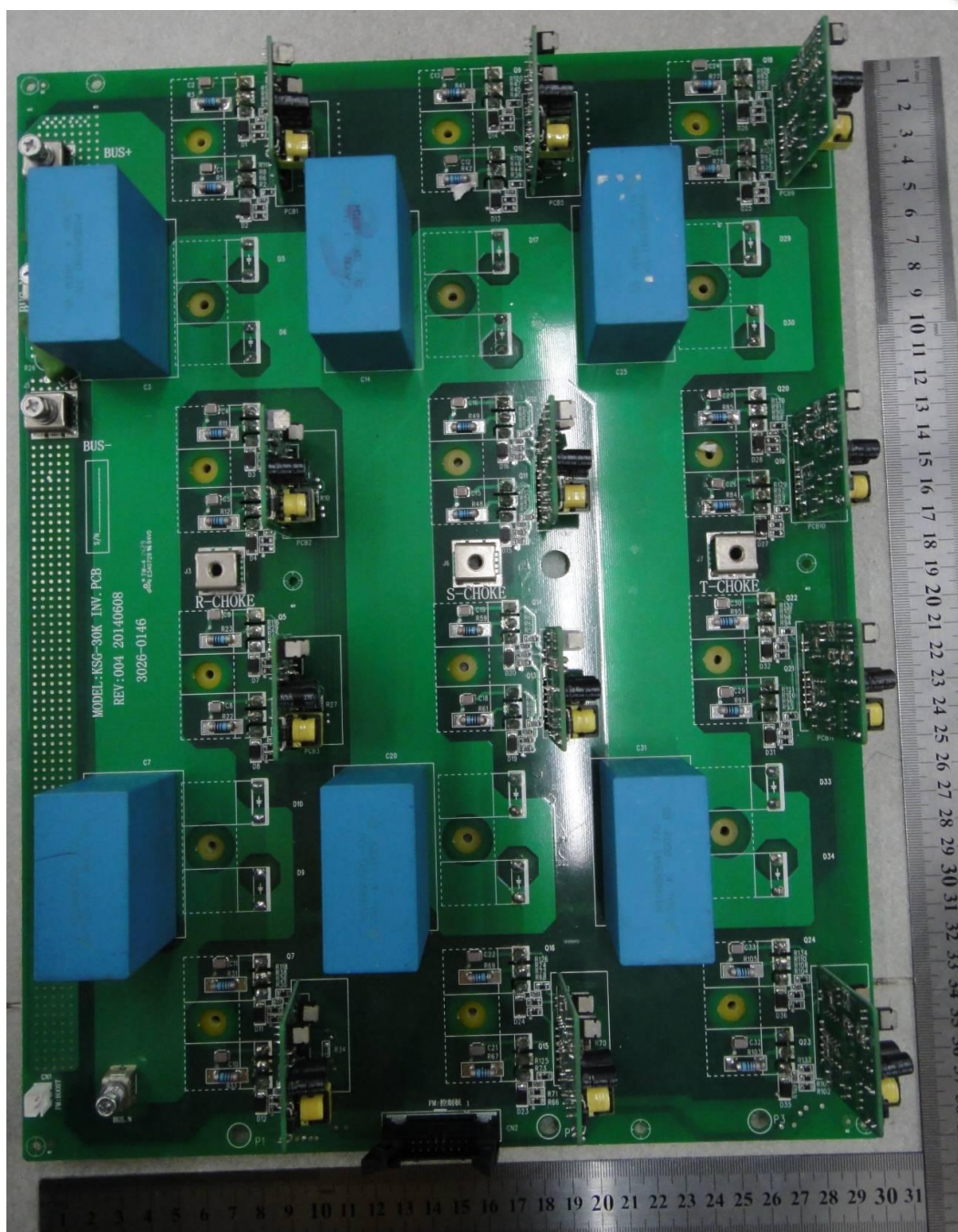
Picture 16: PCB bottom view of the DC EMI board



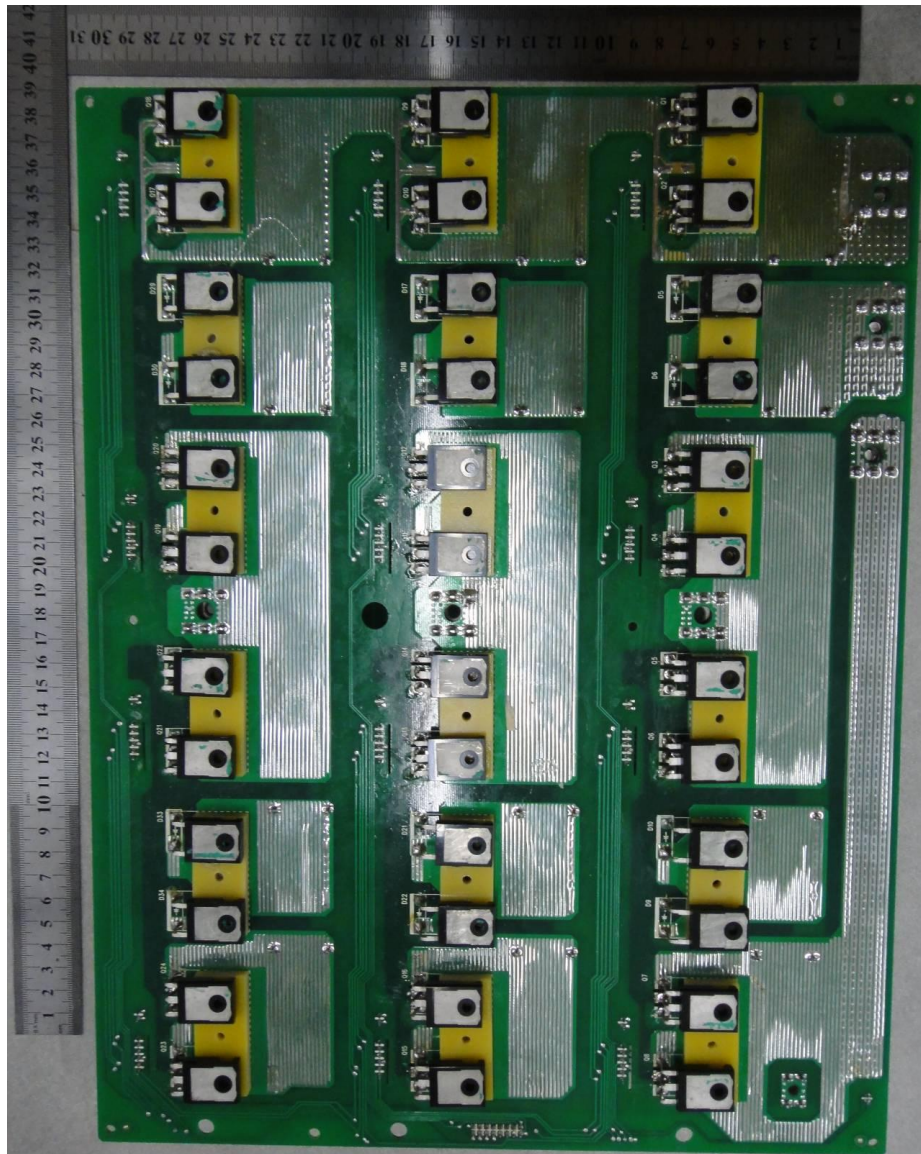
Picture 17: PCB top view of the boost board



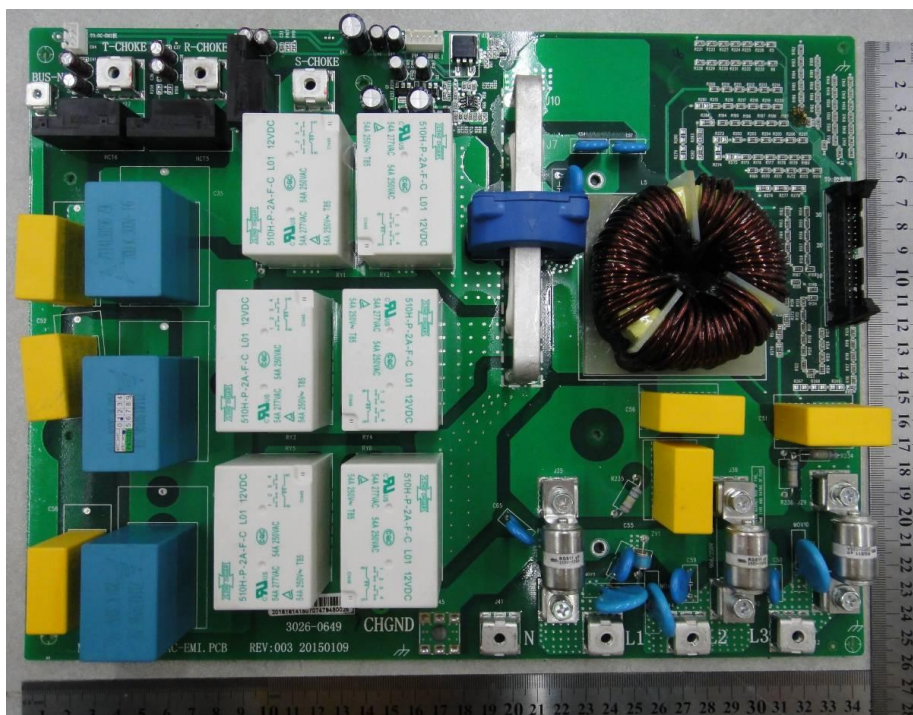
Picture 18: PCB bottom view of the boost board



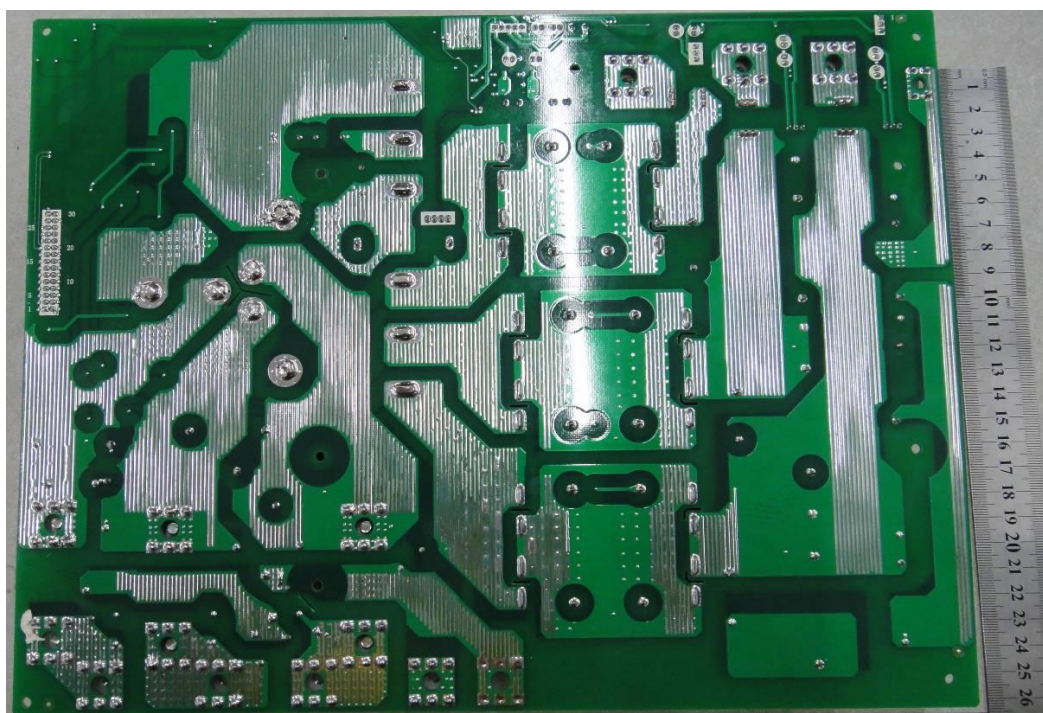
Picture 19: PCB top view of the Invert board



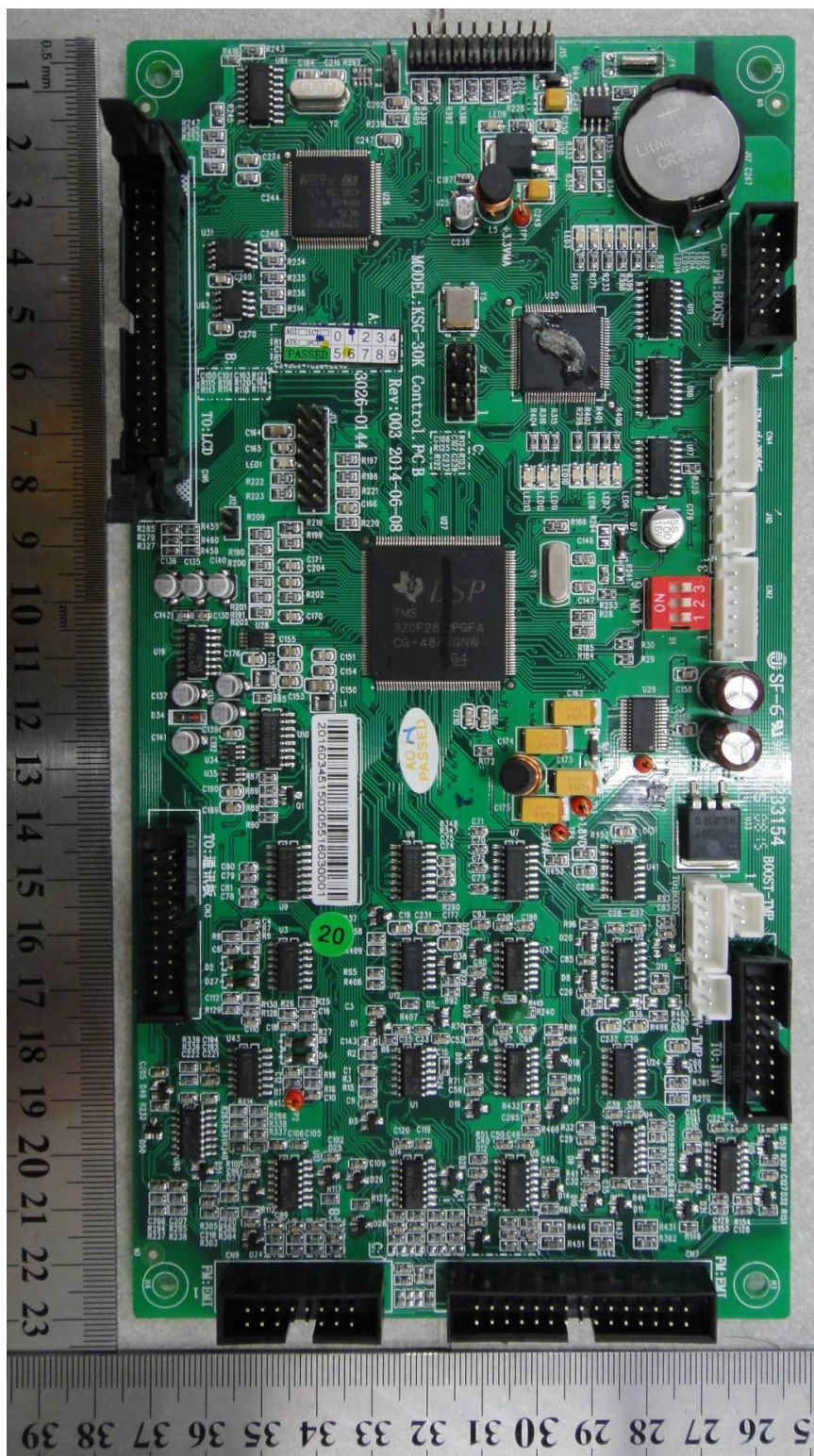
Picture 20: PCB bottom view of the Invert board



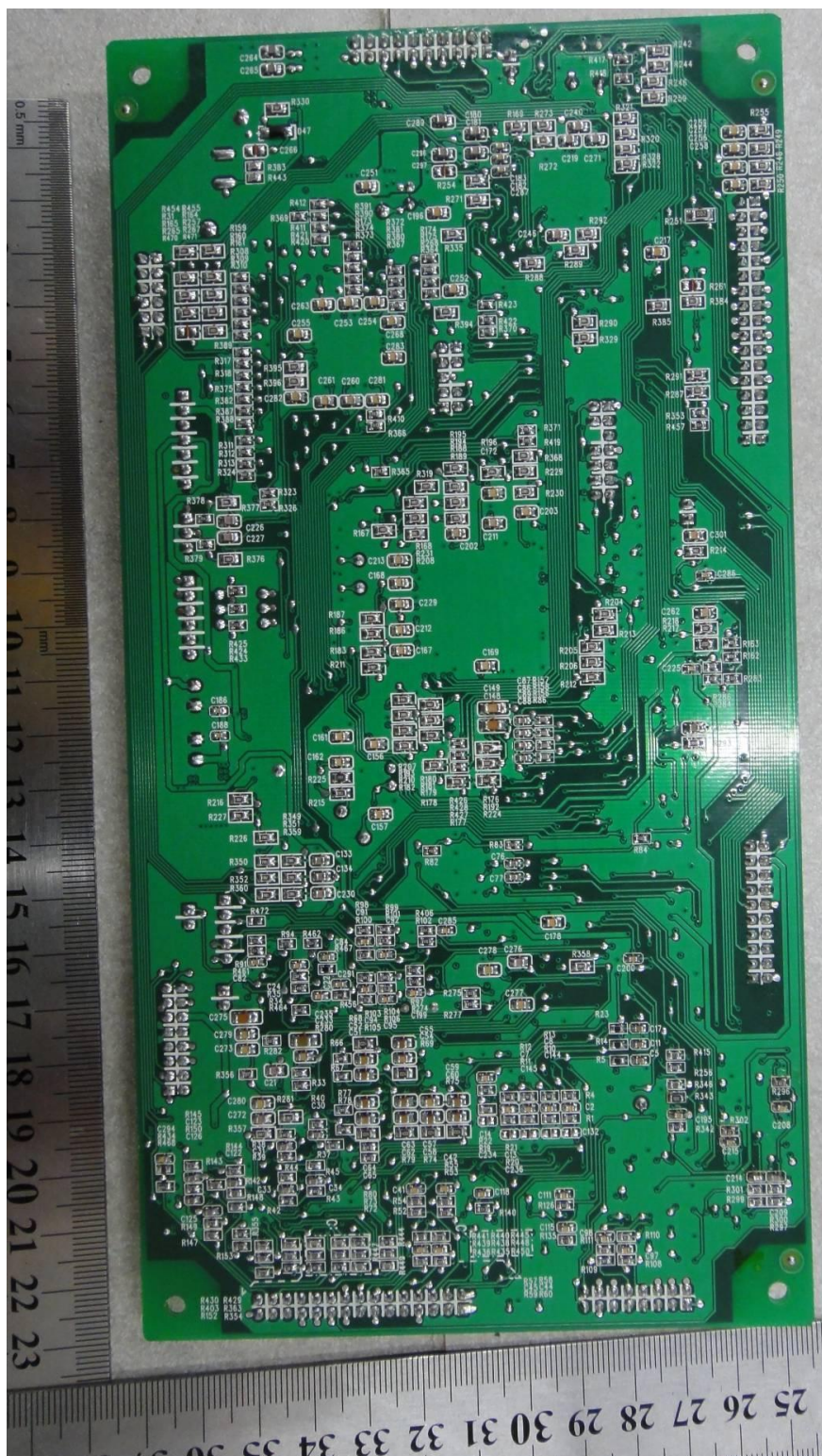
Picture 21: PCB top view of the AC EMI board



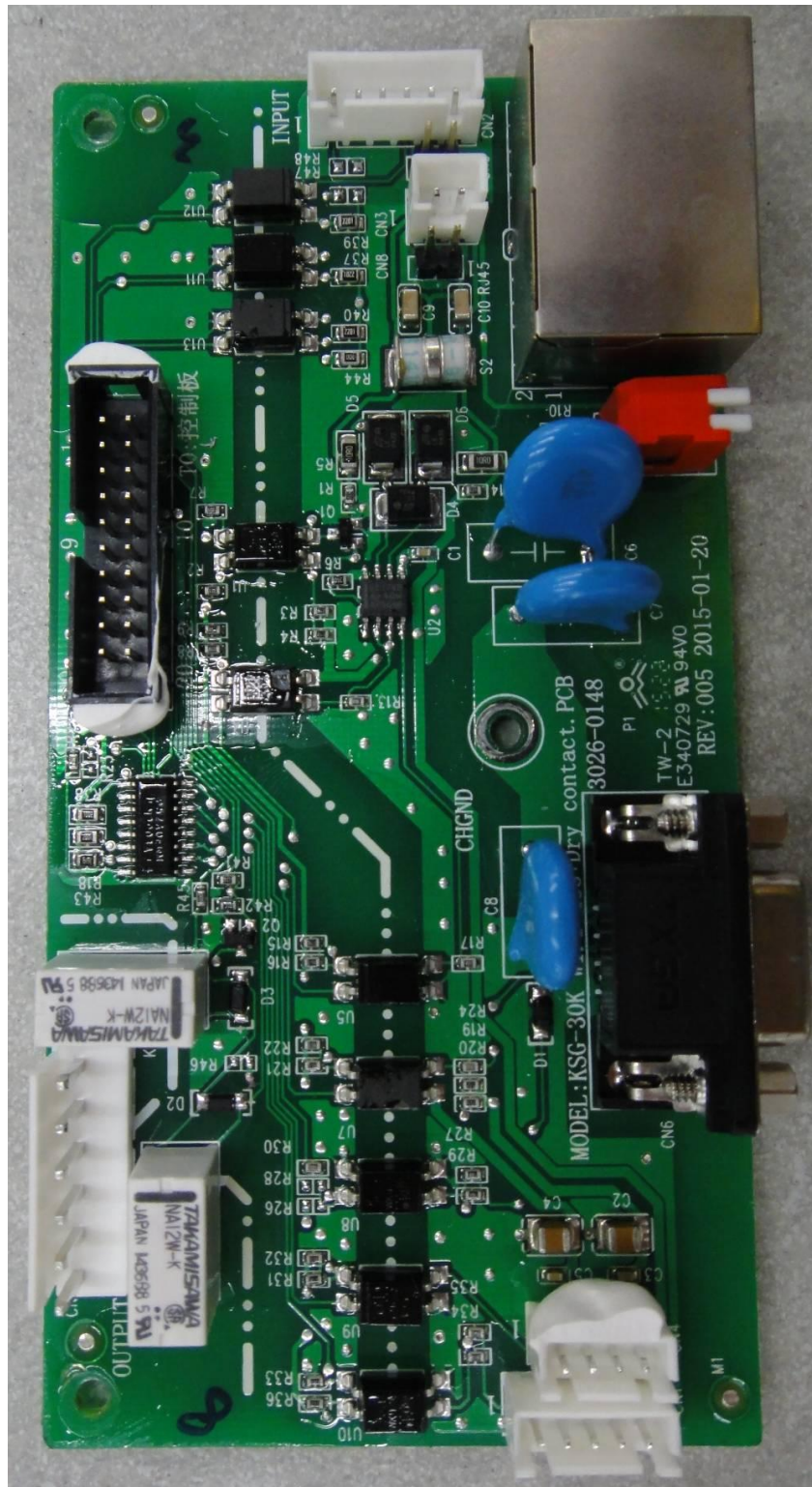
Picture 22: PCB bottom view of the AC EMI board



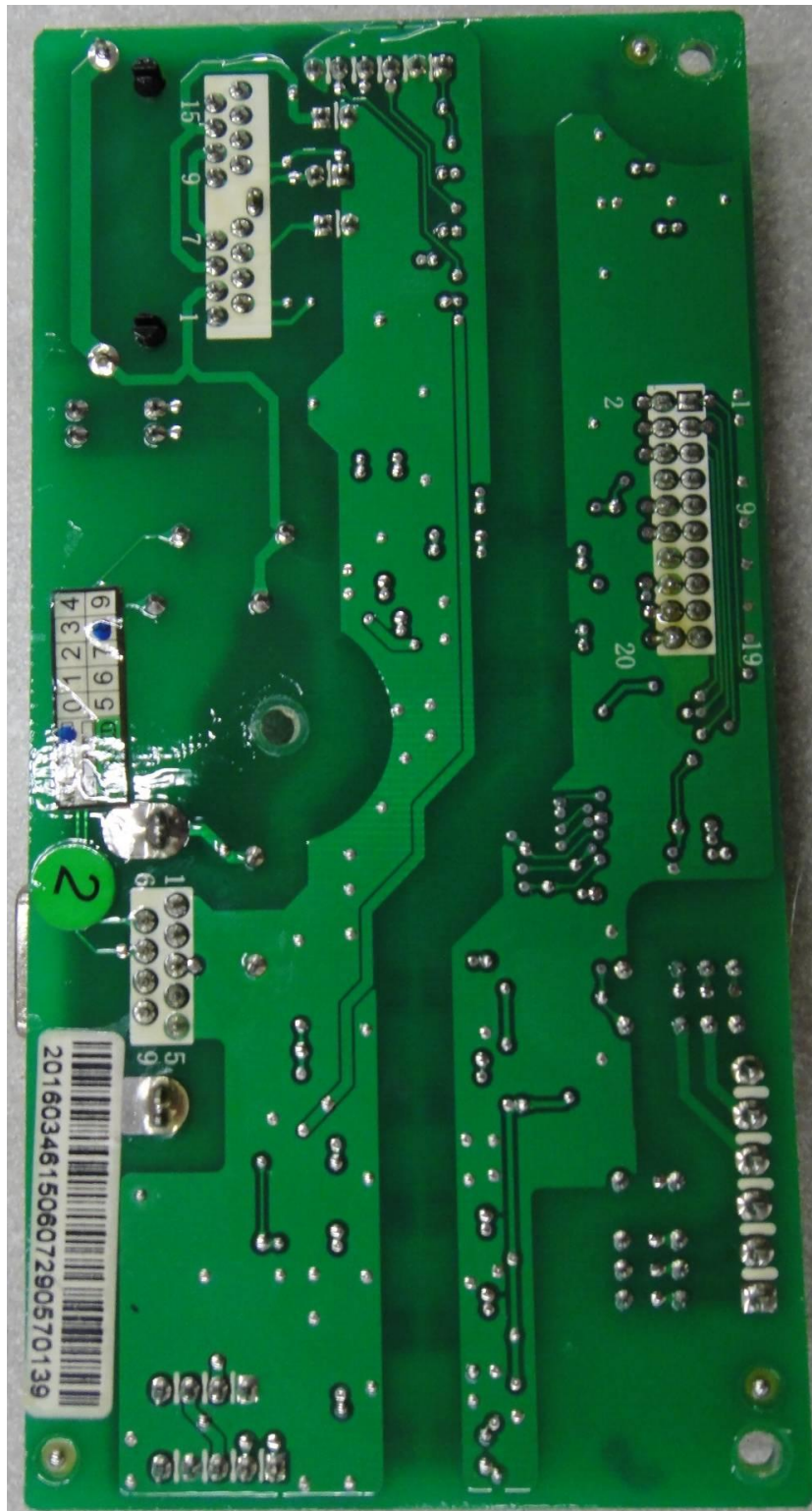
Picture 23: PCB top view of the control board



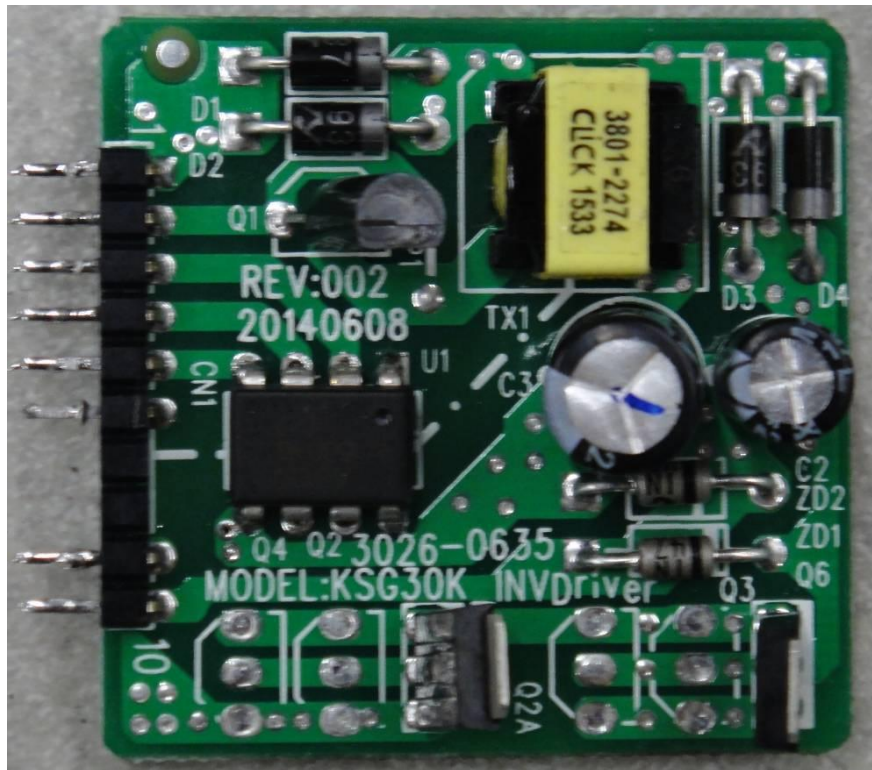
Picture 24: PCB bottom view of the control board



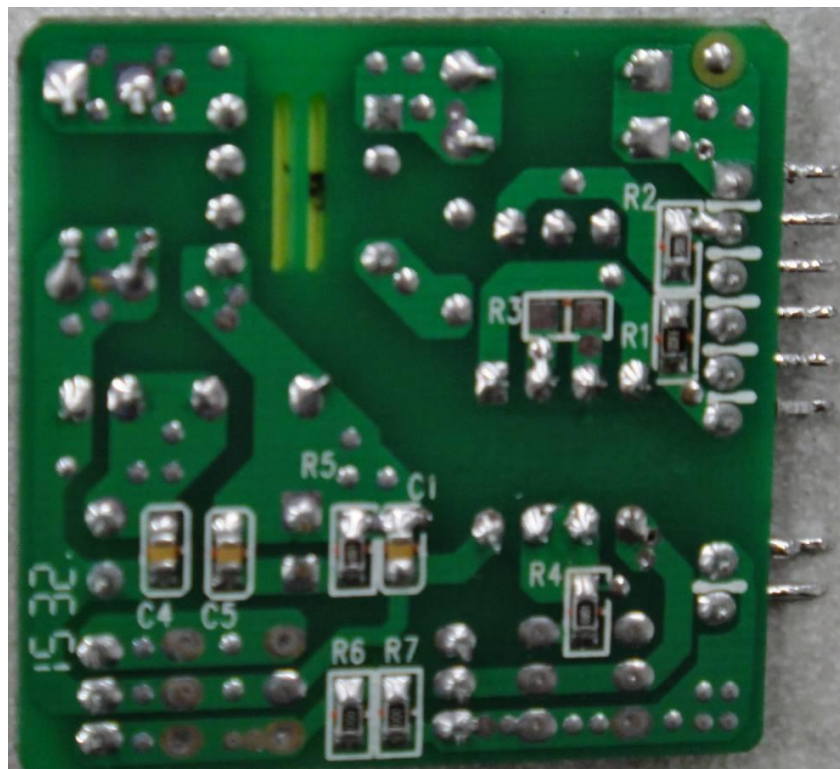
Picture 25: PCB top view of the Communication isolated board



Picture 26: PCB bottom view of the Communication isolated board



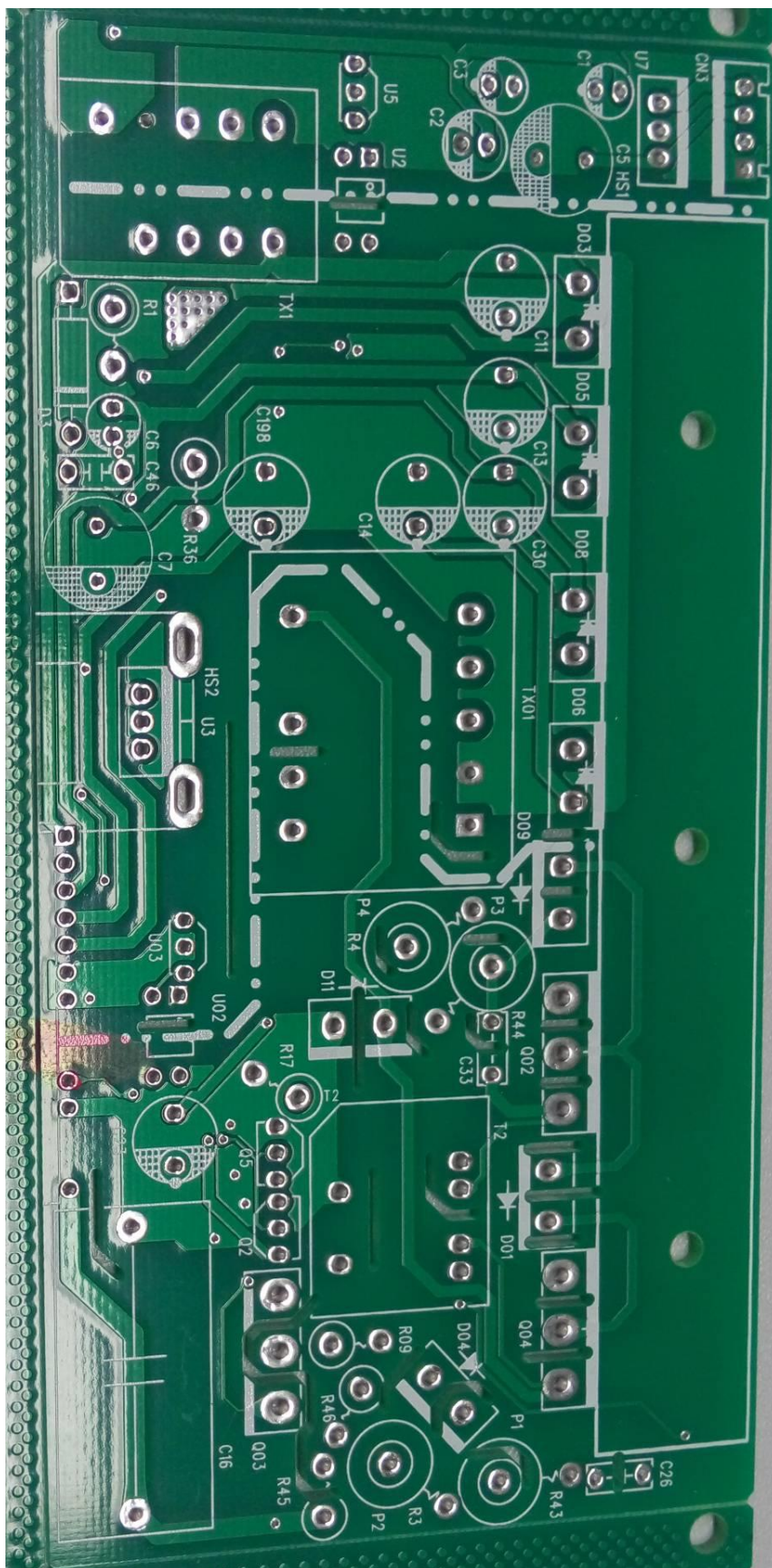
Picture 27: PCB top view of the IGBT drive board



Picture 28: PCB bottom view of the IGBT drive board



Picture 29: PCB top view of the SMPS, 1 cps used for model: KSG-30K, KSG-36K-HV, 2 pcs used for model: KSG-50K, KSG-50K-HV, KSG-60K, KSG-60K-HV



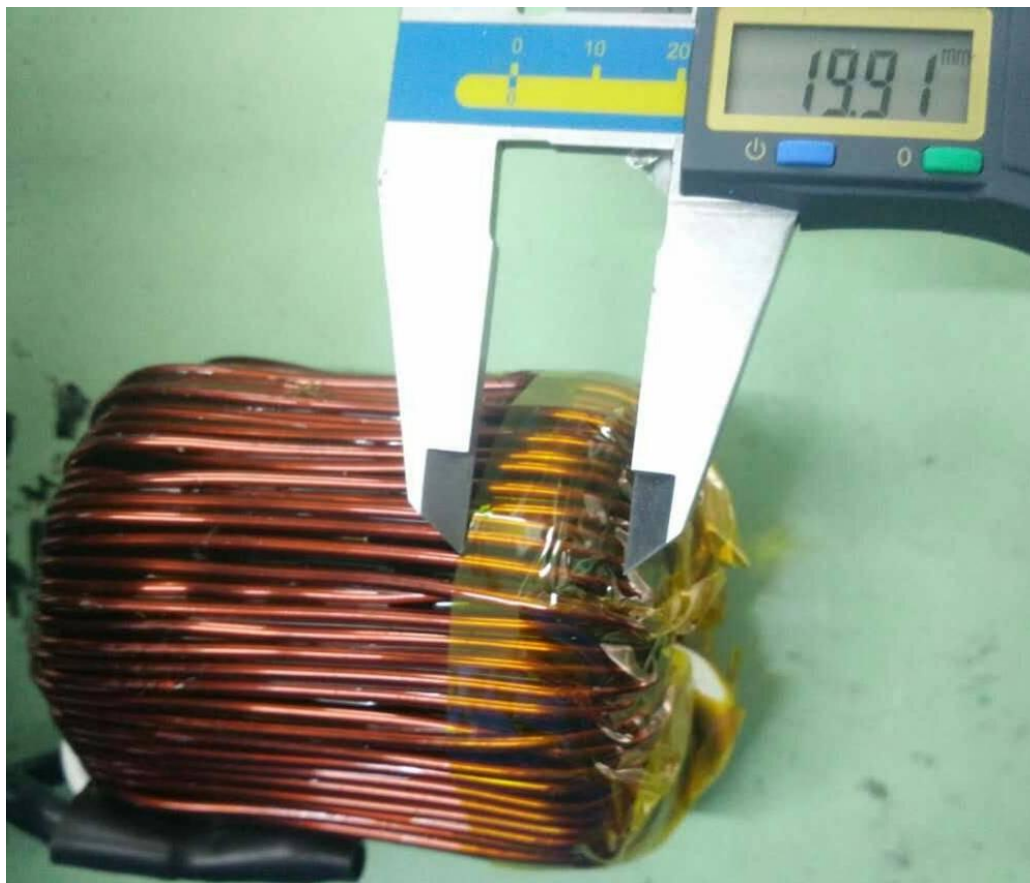
Picture 30: PCB bottom view of the SMPS



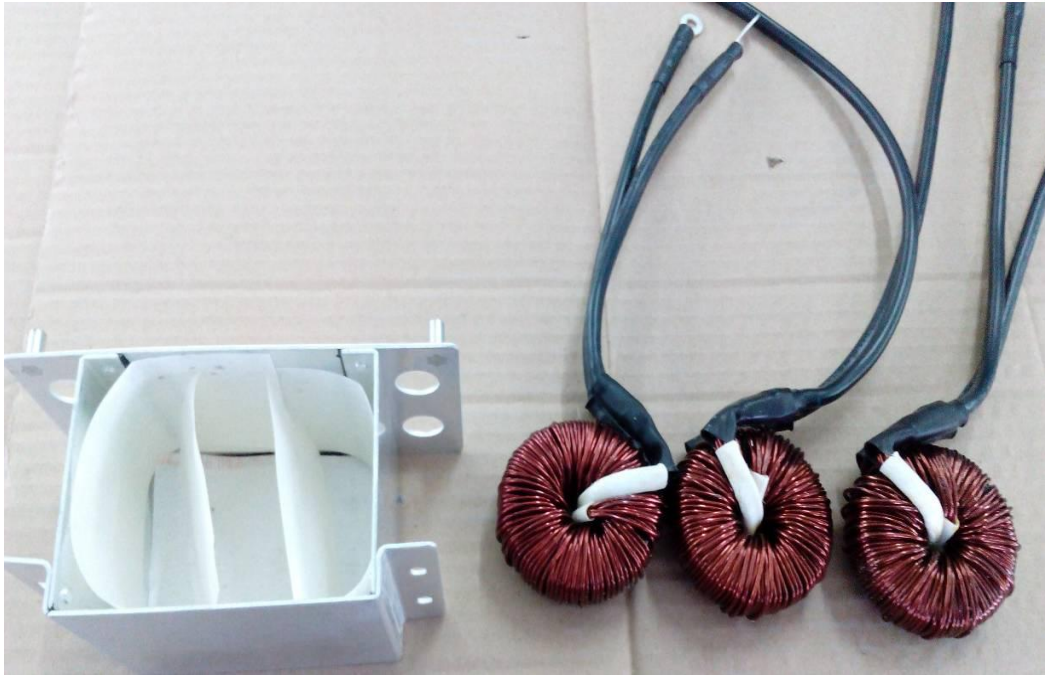
Picture 31: PCB top view of the adapter board for SMPS



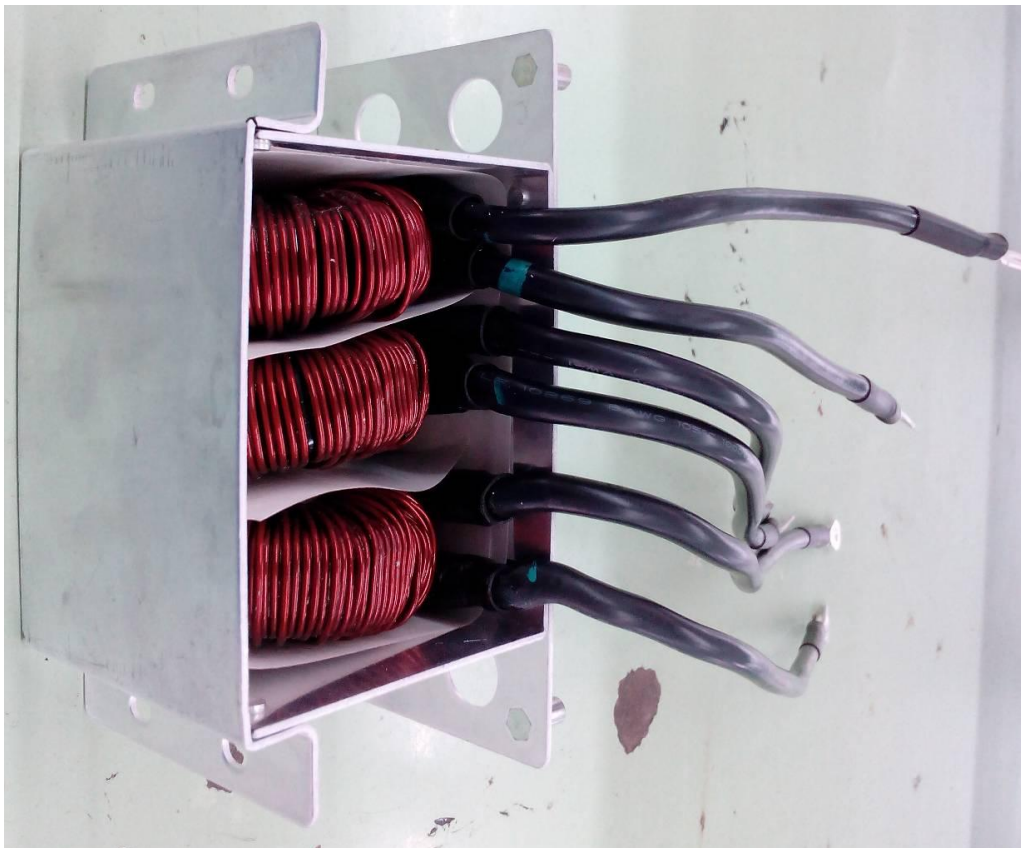
Picture 32: Internal view of the boost / invert inductor



Picture 33: Internal view of the boost / invert inductor



Picture 34: Internal view of the AC output EMI inductor



Picture 35: Internal view of the AC output EMI inductor