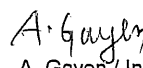



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<b>Auftraggeber:</b> <i>Client:</i>		<b>Hitachi Industrial Equipment Systems Co., Ltd.</b> 1116, Kozono, Ayase-shi, Kanagawa 252-1121 Japan	
<b>Gegenstand der Prüfung:</b> <i>Test Item:</i>		<b>Compact Air Compressor</b>	
<b>Bezeichnung:</b> <i>Identification:</i>	<b>HITACHI Super Oil-Free BEBICON</b> 0.75 LE-8SA	<b>Serien-Nr.:</b> <i>Serial No.:</i>	<b>Pre-production sample</b>
<b>Wareneingangs-Nr.:</b> <i>Receipt No.:</i>	<b>PT0214006029-1-1</b>	<b>Eingangsdatum:</b> <i>Date of Receipt:</i>	<b>2011-01-17</b>
<b>Prüfart:</b> <i>Testing Location:</i>		<b>TÜV Rheinland Japan Ltd. – Global Technology Assessment Center</b> 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan	
<b>Prüfgrundlage:</b> <i>[Emission]</i> <i>Test Specification:</i> <b>EN 61000-6-3:2007</b> EN 55016-1-2:2004, clause 4.3 EN 55016-2-1:2004, clause 7.4.1 EN 55016-2-3:2006 <b>EN 61000-3-2:2006+A1:2009+A2:2009</b> <b>EN 61000-3-3:2008</b> <i>[Immunity]</i> <b>EN 61000-6-2:2005</b> EN 61000-4-2:2009 (contact: level 2 (±4kV), air: level 3 (±8kV)) EN 61000-4-3:2006+A1:2008+A2:2010 (80 - 1000MHz, level 3 (10V/m) / 1.4 - 2.0GHz, level 2 (3V/m) / 2.0 - 2.7GHz, level 1 (1V/m)) EN 61000-4-4:2004+A1:2010 (AC power ports: level 3 (±2kV)) EN 61000-4-5:2006 (AC power ports: class 3) EN 61000-4-6:2009 (AC power ports: level 3 (10V)) EN 61000-4-8:2010 (level 4 (30A/m), continuous field) EN 61000-4-11:2004  Basic standard versions, as required within the relevant appendix ZA of EN 61000-6-2:2005 will not be used; versions as listed above have been used instead.			
<b>Prüfresultat:</b> <i>Test Result:</i>		<b>Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).</b> <i>The test item passed the test specification(s).</i>	
<b>Prüflaboratorium:</b> <i>Testing Laboratory:</i>		<b>TÜV Rheinland Japan Ltd. – Global Technology Assessment Center</b> 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan	
<b>geprüft/ tested by:</b>		<b>kontrolliert/ reviewed by:</b>	
 2011-02-09 A. Gayen / Inspector		 2011-02-09 K. W. Kim / Reviewer	
<b>Datum</b> <i>Date</i>	<b>Name/Stellung</b> <i>Name/Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>
			<b>Name/Stellung</b> <i>Name/Position</i>
			<b>Unterschrift</b> <i>Signature</i>
<b>Sonstiges / Other Aspects:</b>			
<b>Abkürzungen:</b> P(ass) = entspricht Prüfgrundlage F(ail) = entspricht nicht Prüfgrundlage N/A = nicht anwendbar N/T = nicht getestet		<b>Abbreviations:</b> P(ass) = passed F(ail) = failed N/A = not applicable N/T = not tested	
<p>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.  <i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i></p>			

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## TEST SUMMARY

### **5.1.1 HARMONICS ON AC MAINS**

*RESULT: PASS*

### **5.1.2 VOLTAGE FLUCTUATIONS ON AC MAINS**

*RESULT: PASS*

### **5.1.3 CONDUCTED EMISSION ON AC MAINS PORTS**

*RESULT: PASS*

### **5.2.1 RADIATED EMISSION**

*RESULT: PASS*

### **6.1.1 RADIATED RADIO-FREQUENCY ELECTROMAGNETIC FIELDS (RADIATED SUSCEPTIBILITY)**

*RESULT: PASS*

### **6.1.2 CONDUCTED DISTURBANCES INDUCED BY RADIO-FREQUENCY FIELDS (CONDUCTED SUSCEPTIBILITY)**

*RESULT: PASS*

### **6.1.3 POWER FREQUENCY MAGNETIC FIELDS**

*RESULT: PASS*

### **6.2.1 ELECTRICAL FAST TRANSIENTS AND BURSTS**

*RESULT: PASS*

### **6.2.2 SURGES**

*RESULT: PASS*

### **6.2.3 ELECTROSTATIC DISCHARGES**

*RESULT: PASS*

### **6.3.1 VOLTAGE DIPS**

*RESULT: PASS*

### **6.3.2 VOLTAGE INTERRUPTIONS**

*RESULT: PASS*

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## 1. General Remarks

### 1.1 Complementary Materials

All attachments are integral parts of this test report.

## 2. Test Sites

### 2.1 Test Facilities

TÜV Rheinland Japan Ltd. – Global Technology Assessment Center  
 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan

This test site is in accordance with CISPR 16 for measurement of radio interference.

### 2.2 List of Test and Measurement Instruments

**Table 1: List of Test and Measurement Equipment**

Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
<b>For Harmonics and Voltage Fluctuations</b>					
Reference Impedance	Toyo Corporation	REF-IMP 1S	S016	RF-0123	2011-04
Power Analyzer	California Instruments	PACS-1	72517	RF-0125	2011-05
<b>For Conducted Emission (CE)</b>					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2011-02
LISN	Rohde & Schwarz	ENV216	100276	RF-0016	2011-06
<b>For Radiated Emission (RE)</b>					
Receiver	Rohde & Schwarz	ESU 8	100025	RF-0020	2011-02
RF Selector (10m)	Toyo Corporation	NS4900	0703-182	RF-0029	2011-05
Trilog Antenna, 30-1000MHz	Schwarzbeck	VULB9168	0245	RF-0019	2011-05
3dB Attenuator 50Ohm	Tamagawa Electronics	CFA-01	-	RF-0265	2011-05

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Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
<b>For Radiated Susceptibility (RS)</b>					
Signal Generator (9kHz - 1.1GHz)	Rohde & Schwarz	SML01	105325	RF-0073	2011-04
Solid State Amplifier	Bonn Elektronik	BLWA08102 50D	066553	RF-0076	2011-04
Directional Coupler	Werlatone	C3908-10	38498	RF-0077	N/A
Power Meter	Rohde & Schwarz	NRVD	101676	RF-0078	2011-11
Power Sensor (Thermal)	Rohde & Schwarz	NRV-Z51	100441	RF-0079	N/A
Power Sensor (Thermal)	Rohde & Schwarz	NRV-Z51	100438	RF-0080	2011-11
Signal Generator (1GHz - 40GHz)	Rohde & Schwarz	SMR40	100498	RF-0074	2011-07
Amplifier	Milmega	ASO825-65	1020827	RF-0133	2011-04
Amplifier	Milmega	AS2560-50	1020828	RF-0134	2011-04
Directional Coupler	Pulsar	CCS30-B26	0642	RF-0135	2011-04
Band Selector	Toyo Corporation	BS 5000	N/A	RF-0136	2011-04
Power Meter	Rohde & Schwarz	NRVD	101677	RF-0088	2011-11
Power Sensor (Thermal)	Rohde & Schwarz	NRV-Z51	100437	RF-0089	2011-11
Power Sensor (Thermal)	Rohde & Schwarz	NRV-Z51	100436	RF-0090	N/A
Antenna (RS up to 1GHz)	Schwarzbeck	VULP 9118E	814	RF-0068	2011-02
Antenna (RS in GHz Range)	ETS Lindgren	3117	00069166	RF-0066	2011-02
<b>For Conducted Susceptibility (CS)</b>					
Signal Generator	Hewlett Packard	8657B	3630U0910 2	RF-0002	2011-04
Amplifier	Bonn Elektronik	BSA 0140-150	066550	RF-0137	2011-04
Directional Coupler	Werlatone	C5339-10	38003	RF-0108	N/A
Power Meter	Rohde & Schwarz	NRVD	101675	RF-0085	2011-11
Power Sensor	Rohde & Schwarz	NRV-Z51	100439	RF-0087	2011-11
Power Sensor	Rohde & Schwarz	NRV-Z51	100440	RF-0086	N/A
Attenuator (CS:6dB/150W)	Aeroflex / Weinschel	40-6-3	NZ346	RF-0151	2011-04
CDN-M3	Fischer Custom Communications	TCDN-801-M3-16	07012	RF-0102	2011-04
<b>For Electrical Fast Transients (EFT), Surge, Voltage Dip and Voltage Interruption</b>					
Multi-function Generator	Schaffner	Modula 6150	34517	RF-0075	2011-05
Step Transformer	Schaffner	INA 6501	142	RF-0120	2011-05
<b>For Electrostatic Discharges (ESD)</b>					
ESD Simulator	Schaffner	NSG438	739	RF-0063	2011-05
<b>Constant Voltage Constant Frequency Stabilizers</b>					
CVCF (3m chamber)	NF Corporation	ESU2000S	9067195	RF-0208	N/A

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Kind of Equipment	Manufacturer	Model Name	Serial Number	Equipment ID	Calibrated until
CVCF Booster (3m chamber)	NF Corporation	ESU2000B	9072132	RF-0209	N/A
CVCF (Shielded Room)	NF Corporation	ESU2000S	9075612	RF-0210	N/A
CVCF Booster (Shielded Room)	NF Corporation	ESU2000B	9074403	RF-0211	N/A
CVCF (10m chamber)	NF Corporation	ESU2000S	9067307	RF-0212	N/A
CVCF Booster (10m chamber)	NF Corporation	ESU2000B	9074408	RF-0213	N/A
CVCF (Pulse Test lab)	NF Corporation	ESU2000U	9067195	RF-0122	N/A
CVCF Booster (Pulse Test lab)	NF Corporation	ESU2000B	9072108	RF-0121	N/A

## 2.3 Measurement Uncertainty

**Table 2: Emission Measurement Uncertainty**

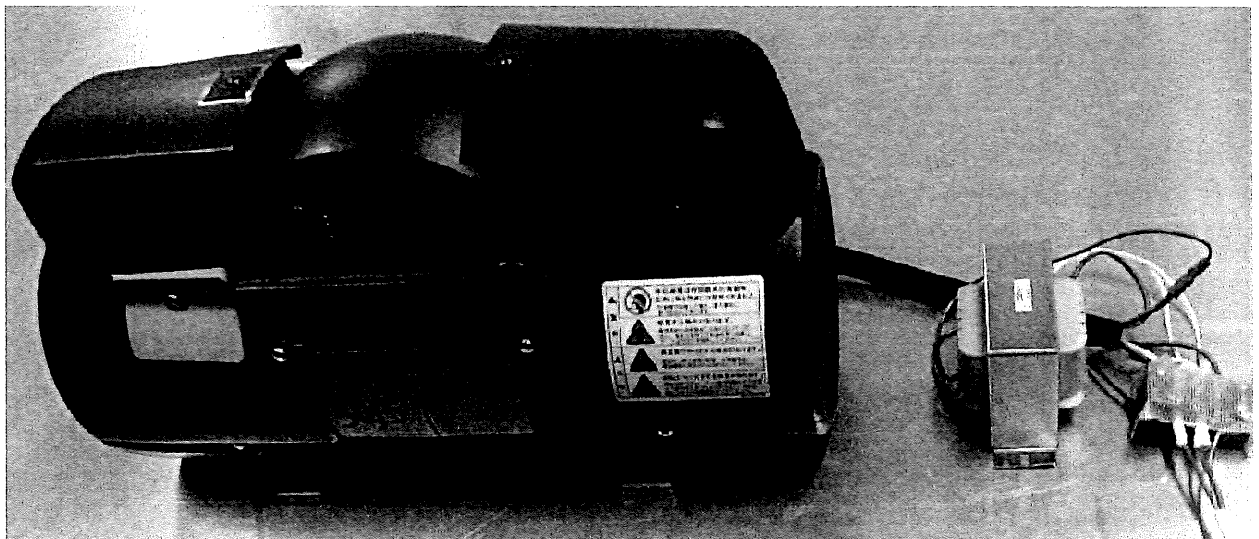
Measurement Type	Frequency	Uncertainty
Conducted Emission on Power Ports	150kHz - 30MHz	±3.0dB
Radiated Emission	30MHz - 1GHz	±4.7dB

### 3. General Product Information

#### 3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is an air compressor unit for use in residential, commercial and light industry environment.

The product consists of air compressor and transformer



#### 3.2 Ratings and System Details

**Transformer: Fukuda Denki, S/N: 10E623**

System Input Voltage: AC 230V  
 System Output Voltage: AC 100V  
 Frequency: 50/60Hz  
 Input Power: 75VA

**Air compressor: 0.75 LE-8SA, S/N: pre-production sample**

System Input Voltage: AC 230V  
 Frequency: 50/60Hz  
 Input Current: 6A

Protection Class: I

Test Voltage: AC 230V  
 Test Frequency: 50Hz

### **3.3 Independent Operation Modes**

The basic operation modes are:

- A. Continuous Compression Mode: Compression motor is running continuously with medium load.
- B. Intermittent Compression Mode: Compression motor is running and stopping frequently by the operation of pressure switch – Air released immediately after motor stop.

During the immunity test EUT operation shall be monitored by monitor lamp and compressor running.

### **3.4 Noise Generating and Noise Suppressing Parts**

Nothing mentioned explicitly.

### **3.5 Submitted Documents**

None.

## 4. Test Set-up and Operation Modes

### 4.1 Principle of Configuration Selection

**Emission:** The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

**Immunity:** The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test modes were adapted accordingly in reference to the instructions for use.

### 4.2 Physical Configuration for Testing

Refer to section: Photographs of the Test Set-Up

### 4.3 Test Operation and Test Software

Refer to the preceding Section 3.3

### 4.4 Special Accessories and Auxiliary Equipment

None.

### 4.5 Countermeasures to achieve EMC Compliance

No additional measures were employed to achieve compliance.

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## 5. Test Results EMISSION

### 5.1 Emission in the Frequency Range up to 30 MHz

#### 5.1.1 Harmonics on AC Mains

RESULT:

PASS

Date of testing: 2011-01-18

Ambient temperature: 23°C

Relative humidity: 28%

Atmospheric pressure: 1002hPa

Reference standards: EN 61000-6-3:2007

Test procedure: EN 61000-3-2:2006+A1:2009+A2:2009

Equipment classification: Class A

Supply voltage during testing: AC 230V, 50Hz

Test mode applied: A

Note:

*Refer to the test data on the following pages.*

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**Table 3: Harmonics on AC Mains**

EUT: Compact Air Compressor 0.75 LE-8SA      Tested by: H.Hayashi  
 Test category: Class-A per Ed. 3.0 (2006) (European limits)      Test Margin: 100  
 Test date: 1/18/2011      Start time: 3:42:20 PM      End time: 3:45:11 PM  
 Test duration (min): 2.5      Data file name: H-000162.cts\_data  
 Comment: AC230V,50Hz : Mode A : 23deg, 28%, 1002hPa  
 Customer: Hitachi Industrial Equipment System Co., Ltd.

Test Result: Pass      Source qualification: Normal  
 THC(A): 0.63      I-THD(%): 29.19      POHC(A): 0.011      POHC Limit(A): 0.309  
 Highest parameter values during test:

V_RMS (Volts):	230.10	Frequency (Hz):	50.00
I_Peak (Amps):	3.786	I_RMS (Amps):	2.274
I_Fund (Amps):	2.179	Crest Factor:	1.674
Power (Watts):	490.7	Power Factor:	0.941

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.038	1.080	3.5	0.046	1.620	2.81	Pass
3	0.604	2.300	26.3	0.621	3.450	17.99	Pass
4	0.011	0.430	2.5	0.014	0.645	2.10	Pass
5	0.181	1.140	15.8	0.183	1.710	10.72	Pass
6	0.003	0.300	0.0	0.004	0.450	0.79	Pass
7	0.047	0.770	6.1	0.047	1.155	4.11	Pass
8	0.001	0.230	0.0	0.001	0.345	0.40	Pass
9	0.006	0.400	1.6	0.006	0.600	1.08	Pass
10	0.001	0.184	0.0	0.002	0.276	0.68	Pass
11	0.010	0.330	3.0	0.010	0.495	2.06	Pass
12	0.002	0.153	0.0	0.002	0.230	0.96	Pass
13	0.013	0.210	6.0	0.013	0.315	4.17	Pass
14	0.002	0.131	0.0	0.003	0.197	1.33	Pass
15	0.013	0.150	9.0	0.014	0.225	6.11	Pass
16	0.003	0.115	0.0	0.004	0.173	2.08	Pass
17	0.021	0.132	15.7	0.021	0.199	10.47	Pass
18	0.002	0.102	0.0	0.002	0.153	1.48	Pass
19	0.009	0.118	7.5	0.009	0.178	5.04	Pass
20	0.002	0.092	0.0	0.002	0.138	1.72	Pass
21	0.011	0.107	10.6	0.012	0.161	7.15	Pass
22	0.001	0.084	0.0	0.002	0.125	1.33	Pass
23	0.002	0.098	0.0	0.002	0.147	1.62	Pass
24	0.001	0.077	0.0	0.001	0.115	0.75	Pass
25	0.003	0.090	0.0	0.003	0.135	2.09	Pass
26	0.001	0.071	0.0	0.001	0.106	1.02	Pass
27	0.002	0.083	0.0	0.002	0.125	1.90	Pass
28	0.001	0.066	0.0	0.001	0.099	1.04	Pass
29	0.002	0.078	0.0	0.002	0.116	1.58	Pass
30	0.001	0.061	0.0	0.001	0.092	0.97	Pass
31	0.001	0.073	0.0	0.001	0.109	1.24	Pass
32	0.001	0.058	0.0	0.001	0.086	1.41	Pass
33	0.001	0.068	0.0	0.001	0.102	0.99	Pass
34	0.001	0.054	0.0	0.001	0.081	1.55	Pass
35	0.001	0.064	0.0	0.001	0.096	0.98	Pass
36	0.001	0.051	0.0	0.001	0.077	1.26	Pass
37	0.001	0.061	0.0	0.001	0.091	0.88	Pass
38	0.001	0.048	0.0	0.001	0.073	0.83	Pass
39	0.001	0.058	0.0	0.001	0.087	0.80	Pass
40	0.000	0.046	0.0	0.000	0.069	0.43	Pass



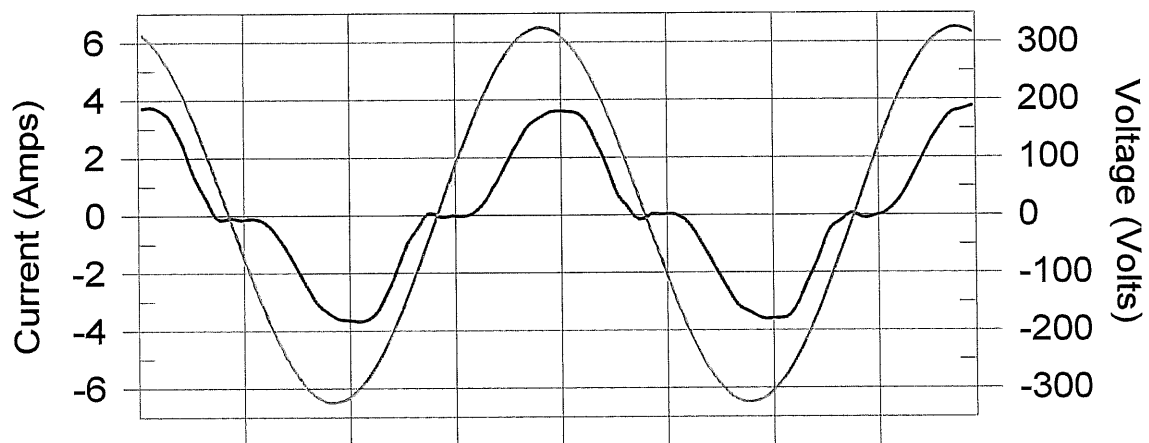
**Figure 1: Harmonics**

EUT: Compact Air Compressor 0.75 LE-8SA  
 Test category: Class-A per Ed. 3.0 (2006) (European limits)  
 Test date: 1/18/2011 Start time: 3:42:20 PM  
 Test duration (min): 2.5 Data file name: H-000162.cts\_data  
 Comment: AC230V,50Hz : Mode A : 23deg, 28%, 1002hPa  
 Customer: Hitachi Industrial Equipment System Co., Ltd.

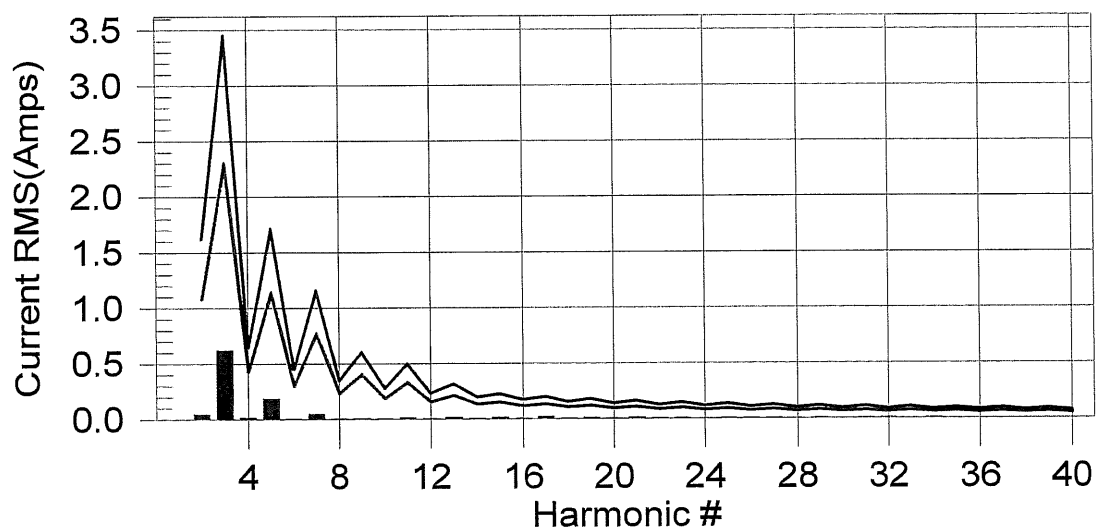
Tested by: H.Hayashi  
 Test Margin: 100  
 End time: 3:45:11 PM

Test Result: Pass Source qualification: Normal

Current & voltage waveforms



Harmonics and Class A limit line      European Limits



Test result: Pass Worst harmonic was #3 with 26.26% of the limit.

### 5.1.2 Voltage Fluctuations on AC Mains

**RESULT:** **PASS**

Date of testing: 2011-01-18

Ambient temperature: 23°C  
 Relative humidity: 28%  
 Atmospheric pressure: 1002hPa

Reference standards: EN 61000-6-3:2007  
 Test procedure: EN 61000-3-3:2008

Frequency range: 0 - 2 kHz  
 Supply voltage during testing: AC 230V, 50Hz  
 Test mode applied: A

**Note:**

The EUT was connected to a reference impedance. The measurement was performed with a flickermeter.

**Table 4: Voltage Fluctuations on AC Mains**

	$P_{st}$	$d_c$ [%]	$d_{max}$ [%]	$d(t) > 3.3\%$ [ms]
<b>Limit</b>	1.000	3.300	4.000	500
<b>Reading</b>	0.064	0.00	0.00	0.0
<b>Result</b>	Pass	Pass	Pass	Pass

**Note:**

1: The EUT doesn't have a manually operated switch, hence no test for manual switching.

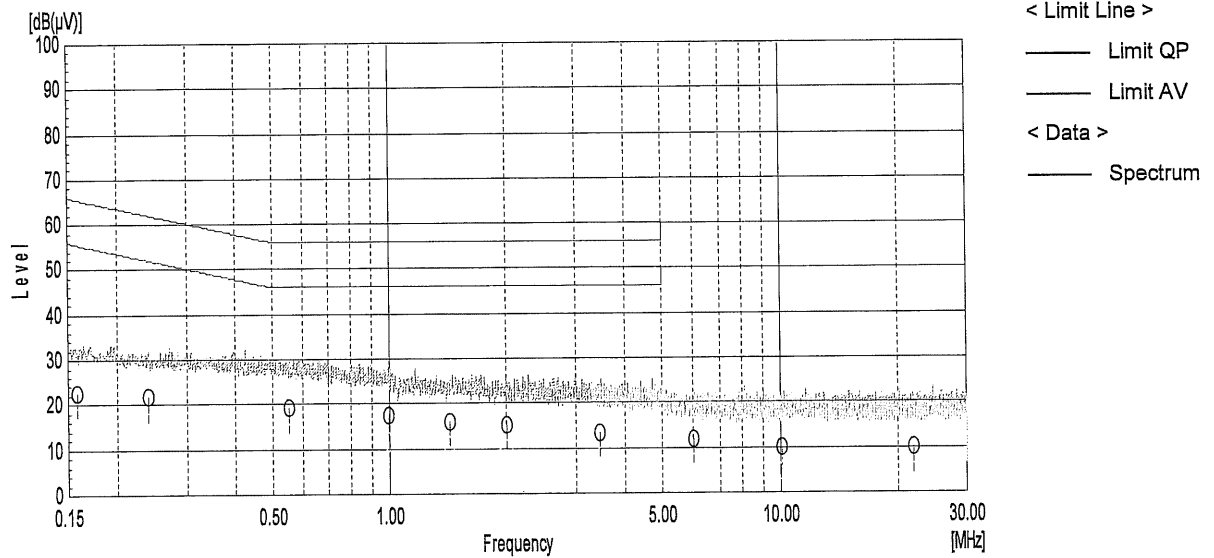
2: Long-term flicker measurements were not performed based on the short-term flicker results and the operation cycle of the product into account. The EUT is unlikely to produce long-term flicker/fluctuations. (Refer to clause 6.1 of EN 61000-3-3).

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Page 15 of 39**5.1.3 Conducted Emission on AC Mains Ports****RESULT:****PASS**

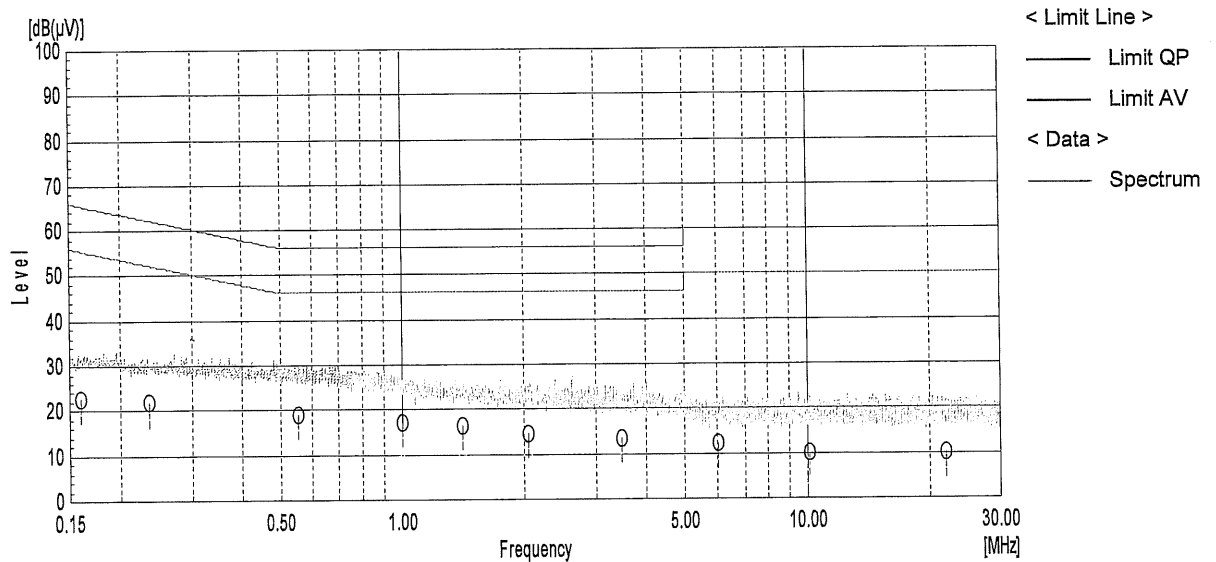
Date of testing:	2011-01-17
Ambient temperature:	23°C
Relative humidity:	27%
Atmospheric pressure:	1005hPa
Reference standards:	EN 61000-6-3:2007
Test procedure:	EN 55016-1-2:2004, clause 4.3 EN 55016-2-1:2004, clause 7.4.1
Frequency range:	0.15 - 30MHz
Kind of test site:	Shielded Room
Supply voltage during testing:	AC 230V, 50Hz
Test mode applied:	A

Disturbances other than those mentioned are small or not detectable. Discontinuous noise emission exceeding the limit for continuous disturbances has not been observed.

**Figure 2: Conducted Emission on AC Mains Port, Spectral Diagram, 0.15 - 30MHz, Phase N (N), Mode A**



**Figure 3: Conducted Emission on AC Mains Port, Spectral Diagram, 0.15 - 30MHz, Phase L1 (L), Mode A**



**Table 5: Conducted Emission on AC Mains Port, Quasi-Peak and Average Data, 0.15 - 30MHz, Phase N (N) and L1 (L), Mode A**

Freq. [MHz]	Phase	Reading QP [dBµV]	Reading AV [dBµV]	Factor [dB]	Level QP [dBµV]	Level AV [dBµV]	Limit QP [dBµV]	Limit AV [dBµV]	Margin QP [dB]	Margin AV [dB]
0.1579	N	13.2	7.7	9.6	22.8	17.3	65.6	55.6	42.8	38.3
0.2380	N	12.1	6.4	9.7	21.8	16.1	62.2	52.2	40.4	36.1
0.5516	N	9.7	4.0	9.7	19.4	13.7	56.0	46.0	36.6	32.3
0.9953	N	7.7	2.2	9.7	17.4	11.9	56.0	46.0	38.6	34.1
1.4301	N	6.6	1.0	9.7	16.3	10.7	56.0	46.0	39.7	35.3
1.9927	N	5.7	0.1	9.7	15.4	9.8	56.0	46.0	40.6	36.2
3.4291	N	3.9	-1.7	9.8	13.7	8.1	56.0	46.0	42.3	37.9
5.9880	N	2.2	-3.5	9.9	12.1	6.4	60.0	50.0	47.9	43.6
10.0434	N	0.3	-5.3	10.1	10.4	4.8	60.0	50.0	49.6	45.2
21.9845	N	-0.1	-5.7	10.3	10.2	4.6	60.0	50.0	49.8	45.4
0.1593	L1	13.3	7.7	9.6	22.9	17.3	65.5	55.5	42.6	38.2
0.2344	L1	12.2	6.5	9.7	21.9	16.2	62.3	52.3	40.4	36.1
0.5540	L1	9.5	4.0	9.7	19.2	13.7	56.0	46.0	36.8	32.3
0.9994	L1	7.6	2.2	9.7	17.3	11.9	56.0	46.0	38.7	34.1
1.4080	L1	6.7	1.1	9.7	16.4	10.8	56.0	46.0	39.6	35.2
2.0457	L1	5.0	-0.6	9.8	14.8	9.2	56.0	46.0	41.2	36.8
3.4687	L1	3.9	-1.9	9.8	13.7	7.9	56.0	46.0	42.3	38.1
6.0085	L1	2.4	-3.4	9.9	12.3	6.5	60.0	50.0	47.7	43.5
10.1496	L1	0.2	-5.4	10.1	10.3	4.7	60.0	50.0	49.7	45.3
22.0160	L1	-0.2	-5.8	10.3	10.1	4.5	60.0	50.0	49.9	45.5

Final test data was taken for the operation mode generating the highest emission only.

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## 5.2 Emission in the Frequency Range above 30 MHz

### 5.2.1 Radiated Emission

**RESULT:****PASS**

Date of testing:	2011-01-17
Ambient temperature:	23°C
Relative humidity:	27%
Atmospheric pressure:	1005hPa
Reference standards:	EN 61000-6-3:2007
Test procedure:	EN 55016-2-3:2006
Frequency range:	30MHz - 1GHz
Measurement distance:	10m
Kind of test site:	Semi Anechoic Chamber
Supply voltage during testing:	AC 230V, 50Hz
Test mode applied:	A

Note: Disturbances other than those mentioned are small or not detectable.

Figure 4: Radiated Emission, Spectral Diagram, 30 – 1GHz, Horizontal Antenna Orientation, Mode A

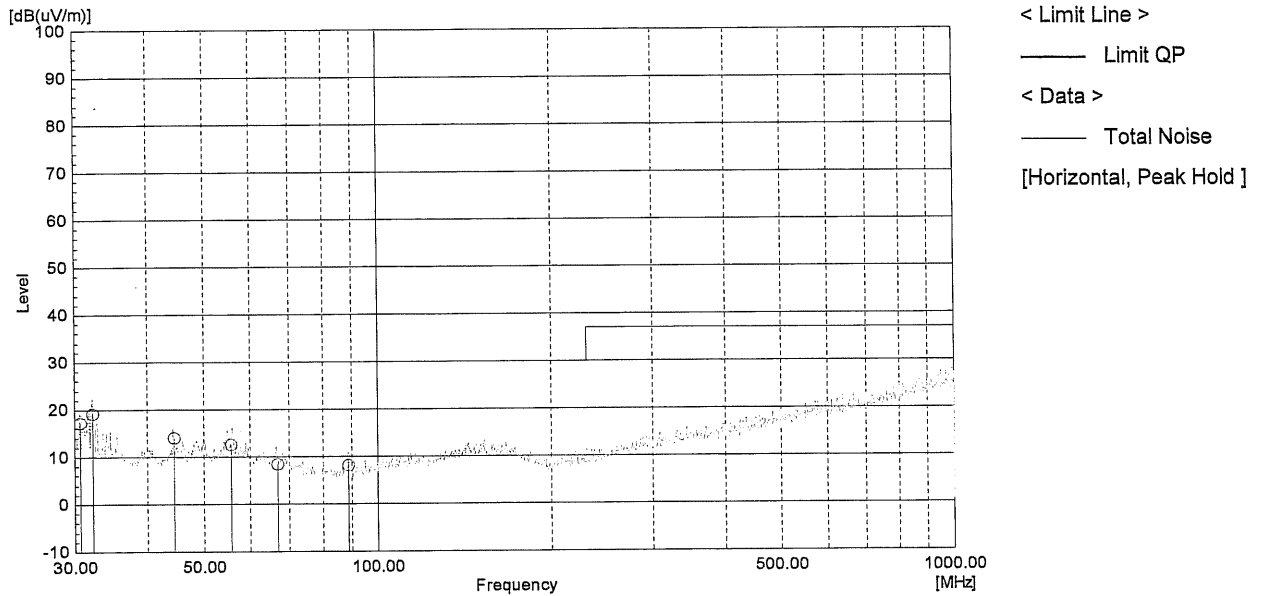
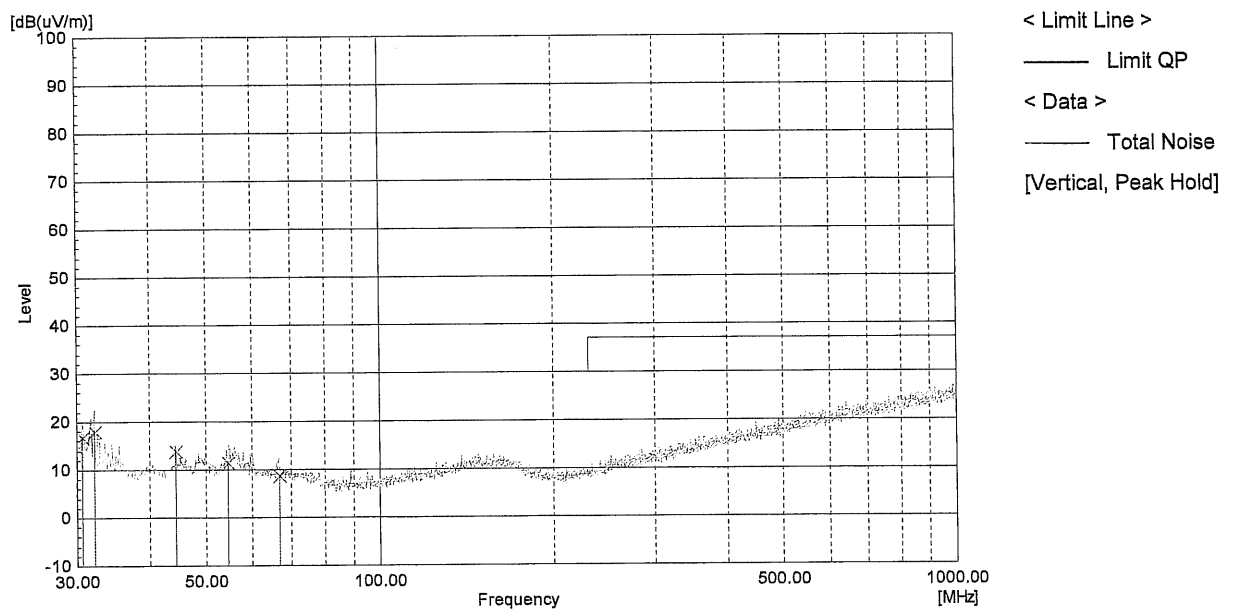


Figure 5: Radiated Emission, Spectral Diagram, 30 – 1GHz, Vertical Antenna Orientation, Mode A



**Table 6: Radiated Emission, Quasi-Peak Data, 30MHz - 1GHz, Horizontal and Vertical Antenna Orientations, Mode A**

Freq. [MHz]	Antenna Orientation	Reading QP [dB $\mu$ V]	Factor [dB(1/m)]	Level QP [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin QP [dB]	Height [cm]	Angle [°]
30.593	H	41.8	-24.5	17.3	30.0	12.7	101	332
32.037	H	43.7	-24.4	19.3	30.0	10.7	101	1
44.237	H	37.4	-23.1	14.3	30.0	15.7	107	216
55.592	H	35.9	-23.1	12.8	30.0	17.2	140	359
66.710	H	33.1	-24.5	8.6	30.0	21.4	160	4
88.508	H	35.4	-27.2	8.2	30.0	21.8	211	313
30.583	V	41.8	-24.9	16.9	30.0	13.1	100	105
32.064	V	42.7	-24.7	18.0	30.0	12.0	207	359
44.249	V	37.2	-23.4	13.8	30.0	16.2	321	110
54.598	V	34.9	-23.4	11.5	30.0	18.5	399	102
66.722	V	33.1	-24.3	8.8	30.0	21.2	133	260

Final test data was taken for the operation mode generating the highest emission only.



## 6. Test Results IMMUNITY

### 6.1 Continuous Disturbances

#### 6.1.1 Radiated Radio-frequency Electromagnetic Fields (Radiated Susceptibility)

**RESULT:** **PASS**

Date of testing: 2011-01-18

Ambient temperature: 21°C  
 Relative humidity: 26%  
 Atmospheric pressure: 1002hPa

Reference standards: EN 61000-6-2:2005  
 Test procedure: EN 61000-4-3:2006+A1:2008+A2:2010

Frequency range: 80 - 1000MHz  
 Test level: 3 (10V/m) (unmodulated, rms.)

Frequency range: 1.4 - 2.0GHz  
 Test level: 2 (3V/m) (unmodulated, rms.)

Frequency range: 2.0 - 2.7GHz  
 Test level: 1 (1V/m) (unmodulated, rms.)

Modulation: 80% AM, 1kHz  
 Step size: 1%  
 Dwell time: 1s  
 Supply voltage during testing: AC 230V, 50Hz

Test mode applied: A  
 Performance criterion: A

**Table 7: Immunity against Radiated Radio-frequency Electromagnetic Fields**

Field Polarization	Frequency	Side of EUT	Result	Remark
Horizontal / Vertical	(80 - 2700)MHz	Left / Right Front / Rear	Pass	EUT operated as intended.

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### 6.1.2 Conducted Disturbances induced by Radio-frequency Fields (Conducted Susceptibility)

**RESULT: PASS**

Date of testing: 2011-01-19  
 Ambient temperature: 23°C  
 Relative humidity: 32%  
 Atmospheric pressure: 1010hPa  
 Reference standards: EN 61000-6-2:2005  
 Test procedure: EN 61000-4-6:2009  
 Severity level: 3 (10V) for AC power ports (unmodulated, rms.)  
 Source impedance: 150Ω  
 Frequency range: 150kHz - 80MHz  
 Modulation: 80% AM, 1kHz  
 Sweep mode: Automatic  
 Step size: 1%  
 Dwell time: 1s  
 Supply voltage during testing: AC 230V, 50Hz  
 Test mode applied: A  
 Performance criterion: A

**Table 8: Immunity against Conducted Disturbances induced by Radio-frequency Fields**

Coupling Port	Coupling Method	Result	Remark
AC mains: N (N), L1 (L), PE	CDN M-3	Pass	EUT operated as intended, no degradation of function.

### 6.1.3 Power Frequency Magnetic Fields

**RESULT: PASS**

Reference standards: EN 61000-6-2:2005  
 Test procedure: EN 61000-4-8:2010  
 Severity level: 4 (30A/m)  
 Frequency: 50Hz

As the EUT does not contain components susceptible to magnetic fields of 30A/m.  
 The EUT is deemed to fulfill the above requirements without physical testing.

## 6.2 Transient Disturbances

### 6.2.1 Electrical Fast Transients and Bursts

**RESULT:** **PASS**

Date of testing:	2011-01-19
Ambient temperature:	24°C
Relative humidity:	40%
Atmospheric pressure:	1010hPa
Reference standards:	EN 61000-6-2:2005
Test procedure:	EN 61000-4-4:2004+A1:2010
Severity level:	3 (±2kV) for AC power ports
Repetition rate:	5kHz
Test duration:	≥60s
Supply voltage during testing:	AC 230V, 50Hz
Test mode applied:	A
Performance criterion:	B

**Table 9: Immunity against Electrical Fast Transients and Bursts, on AC Power Ports**

<b>Coupling Method: Direct Injection</b>			
<b>Coupling Port</b>	<b>Test Voltage</b>	<b>Result</b>	<b>Remark</b>
AC mains: N (N), L1 (L), PE	±0.5kV ±1.0kV ±2.0kV	Pass	EUT operated as intended, no degradation of function.

### 6.2.2 Surges

**RESULT:**
**PASS**

Date of testing:	2011-01-19
Ambient temperature:	24°C
Relative humidity:	40%
Atmospheric pressure:	1010hPa
Reference standards:	EN 61000-6-2:2005
Test procedure:	EN 61000-4-5:2006
Installation class:	3 ( $\pm 2$ kV line to ground, $\pm 1$ kV line to line) for AC power ports
Source impedance:	2 $\Omega$ , 12 $\Omega$
Test voltages:	$\pm 500$ V, $\pm 1$ kV, $\pm 2$ kV
Coupling phases:	0, $\pi/2$ , $\pi$ , $3\pi/2$ , (0°, 90°, 180°, 270°)
Number of surges:	5 (for each parameter combination)
Time between pulses:	$\leq 60$ s
Supply voltage during testing:	AC 230V, 50Hz
Test mode applied:	A
Performance criterion:	B

**Table 10: Immunity against Surges, on AC Power Port**

Coupling Port	Test Voltage	Coupling Phase	Result	Remark
AC mains: N (N) - L1 (L) Differential (Line to Line)	$\pm 500$ V $\pm 1000$ V	0, $\pi/2$ , $\pi$ , $3\pi/2$	Pass	EUT operated as intended, no degradation of function.
AC mains: N (N) - PE Common (Line to Ground)	$\pm 500$ V $\pm 1000$ V $\pm 2000$ V	0, $\pi/2$ , $\pi$ , $3\pi/2$	Pass	EUT operated as intended, no degradation of function.
AC mains: L1 (L) - PE Common (Line to Ground)	$\pm 500$ V $\pm 1000$ V $\pm 2000$ V	0, $\pi/2$ , $\pi$ , $3\pi/2$	Pass	EUT operated as intended, no degradation of function.

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### 6.2.3 Electrostatic Discharges

**RESULT: PASS**

Date of testing: 2011-01-19

Ambient temperature: 24°C  
 Relative humidity: 40%  
 Atmospheric pressure: 1010hPa

Reference standards: EN 61000-6-2:2005  
 Test procedure: EN 61000-4-2:2009

Severity level: 2 (±4kV) (contact discharge)  
 3 (±8kV) (air discharge)

Number of discharges per test point: ≥ 10 for each test voltage and polarity  
 Supply voltage during testing: AC 230V, 50Hz

Test mode applied: A  
 Performance criterion: B

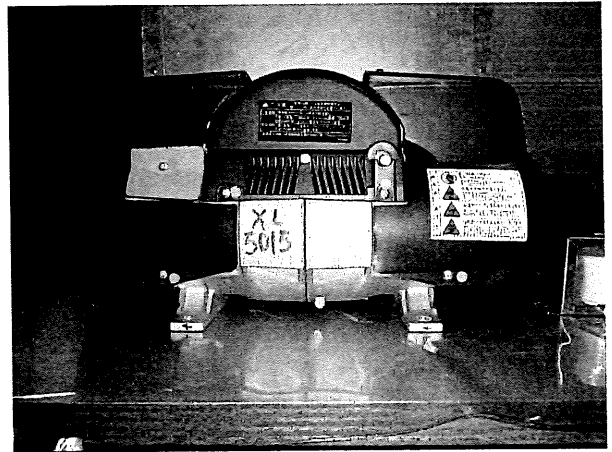
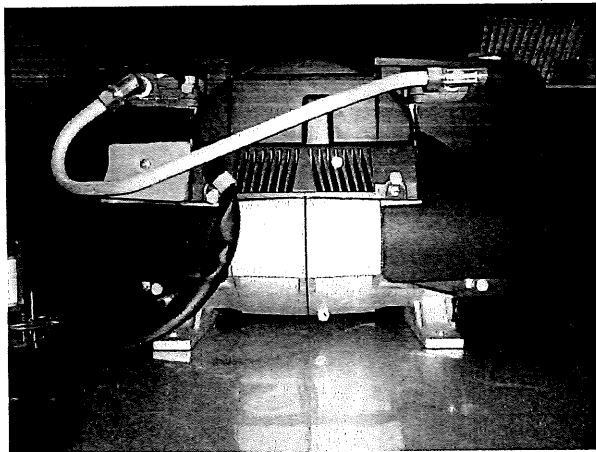
**Table 11: Immunity against Electrostatic Discharges, both Polarities**

Discharge Points	Type of Discharge	Test Voltages	Result	Remark
<b>Front / Left / Right / Rear / Upper Enclosure:</b>				
See note below	Contact	±2, 4kV	Pass	EUT operated as intended, no degradation of function.
	Air	±2, 4, 8kV	Pass	
	VCP & HCP	±2, 4kV	Pass	

**VCP = Vertical Coupling Plane**  
**HCP = Horizontal Coupling Plane**

**Note:**  
 For detailed location of discharge points refer to the photographs below.

**Photograph 1: Electrostatic Discharges, Contact and Air Discharge Points, for both Polarities**



● Contact discharge points

Air discharge points

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## 6.3 Power Supply Alterations

### 6.3.1 Voltage Dips

**RESULT:**
**PASS**

Date of testing: 2011-01-19

Ambient temperature: 24°C

Relative humidity: 40%

Atmospheric pressure: 1010hPa

Reference standards: EN 61000-6-2:2005

Test procedure: EN 61000-4-11:2004

 Test parameters:
 

- 100%, 1 cycle, 20ms @ 50Hz  
Performance criterion: B
- 60%, 10 cycles, 200ms @ 50Hz  
Performance criterion: C
- 30%, 25 cycles, 500ms @ 50Hz  
Performance criterion: C

Supply voltage during testing: AC 230V, 50Hz

Test mode applied: A

**Table 12: Immunity against Voltage Dips, AC 230V, 50Hz Input Voltage**

Voltage Reduction	Applied Voltage	Duration	Starting Phase [rad]	Result	Remark
-100%	0V	20ms	0, $\pi$	Pass	EUT operated as intended, no degradation of function.
-60%	92V	200ms	0, $\pi$	Pass	EUT operated as intended, no degradation of function.
-30%	161V	500ms	0, $\pi$	Pass	EUT operated as intended, no degradation of function.

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### 6.3.2 Voltage Interruptions

**RESULT:**
**PASS**

Date of testing: 2011-01-19

Ambient temperature: 24°C

Relative humidity: 40%

Atmospheric pressure: 1010hPa

Reference standards: EN 61000-6-2:2005

Test procedure: EN 61000-4-11:2004

Test parameters: -100%, 250 cycles, 5000ms @ 50Hz

Supply voltage during testing: AC 230V, 50Hz

Test mode applied: A

Performance criterion: C

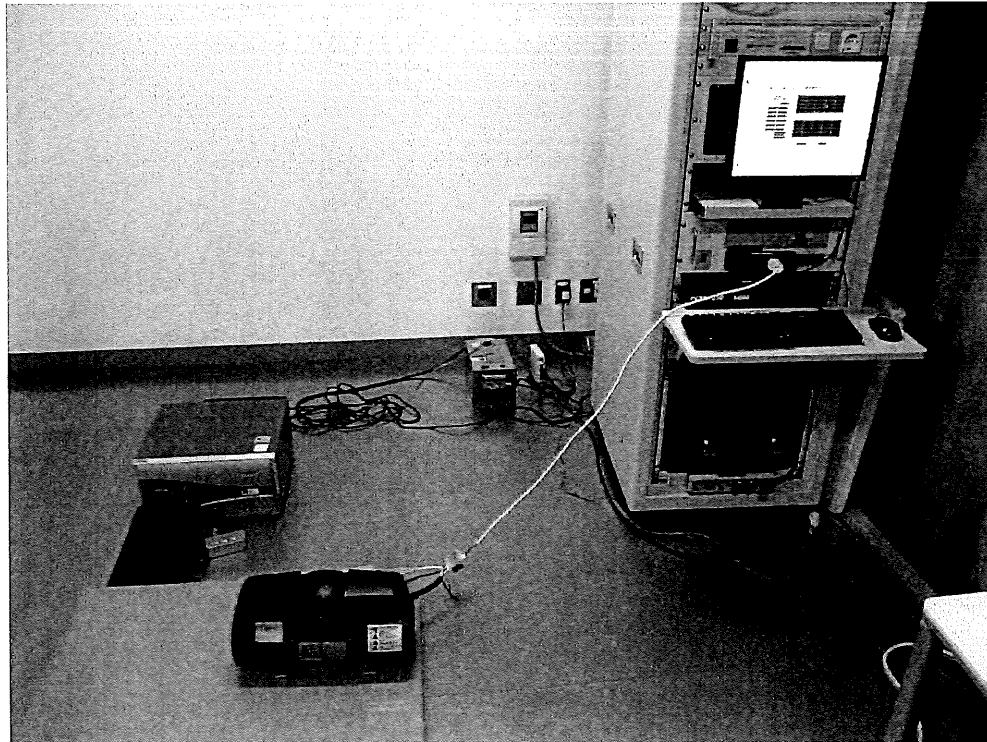
**Table 13: Immunity against Voltage Interruptions, AC 230V, 50Hz Input Voltage**

Voltage Reduction	Applied Voltage	Duration	Starting Phase [rad]	Result	Remark
-100%	0V	5s	0, $\pi$	Pass	EUT operated as intended, no degradation of function.



## 7. Photographs of the Test Set-Up

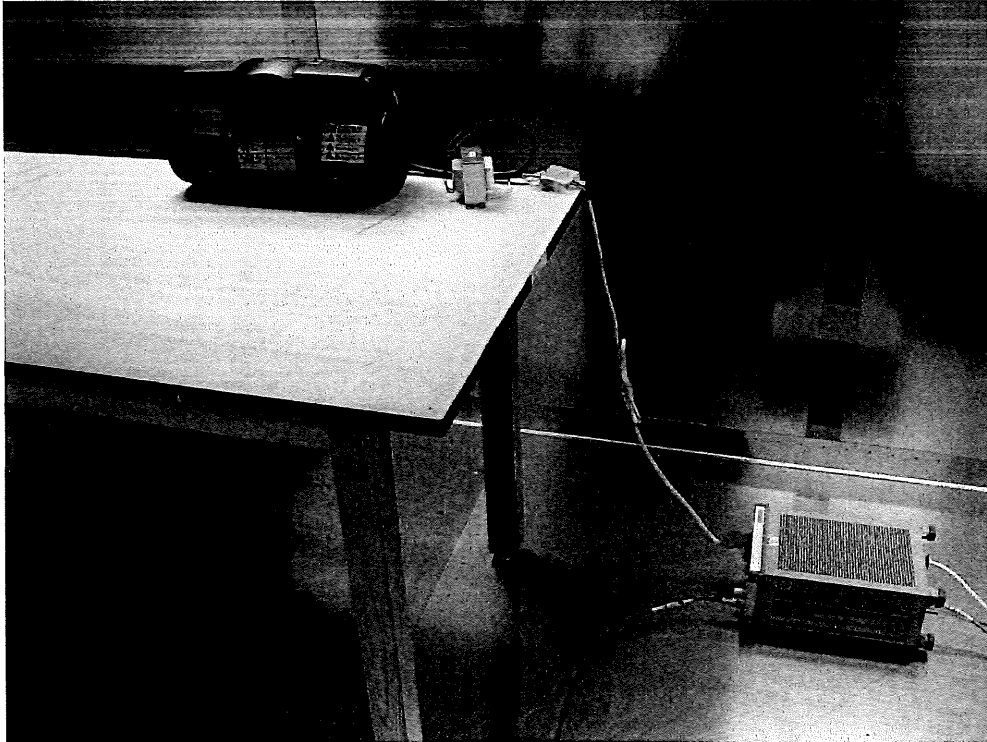
Photograph 2: Set-up for Harmonics and Flickers, on AC Mains



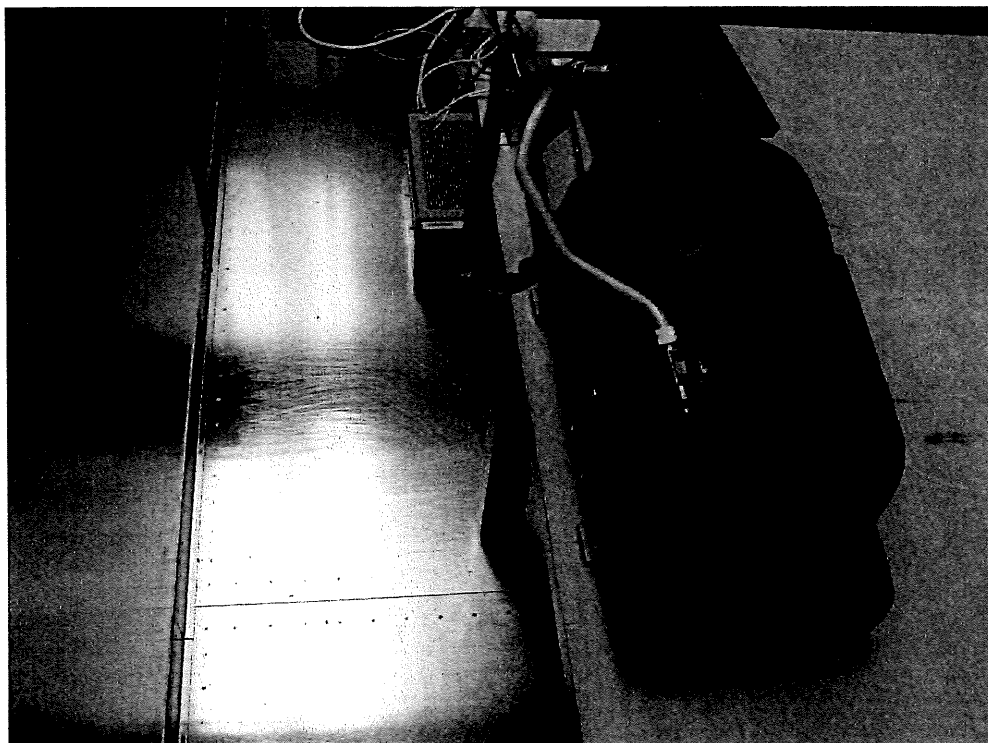
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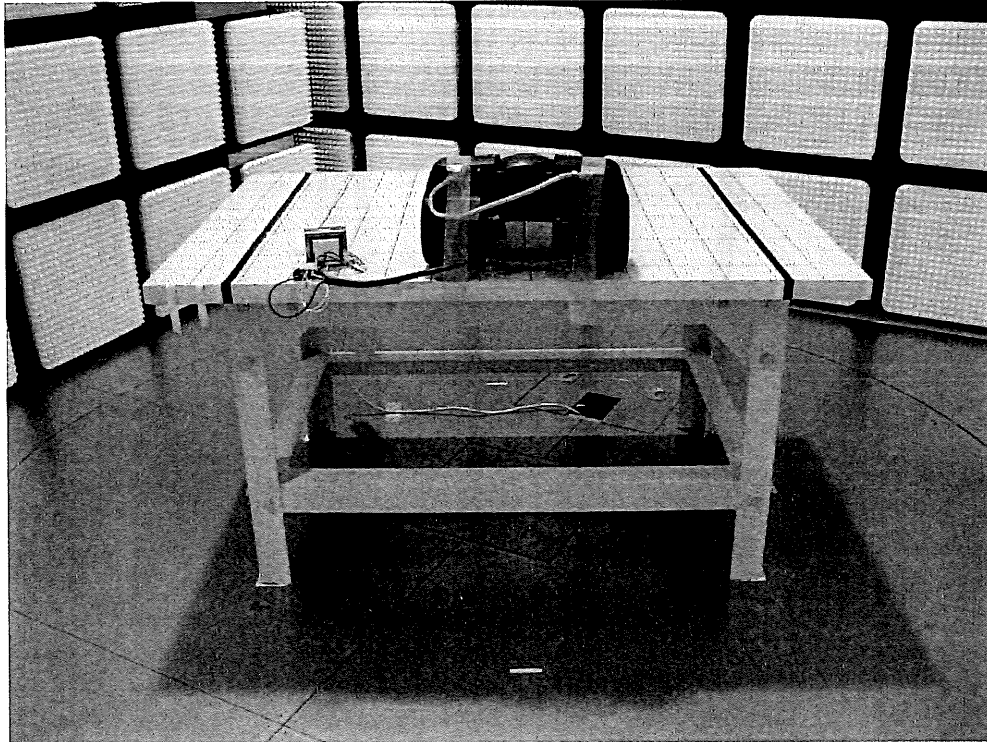
**Photograph 3: Set-up for Conducted Emission on AC Mains Ports, Front View**



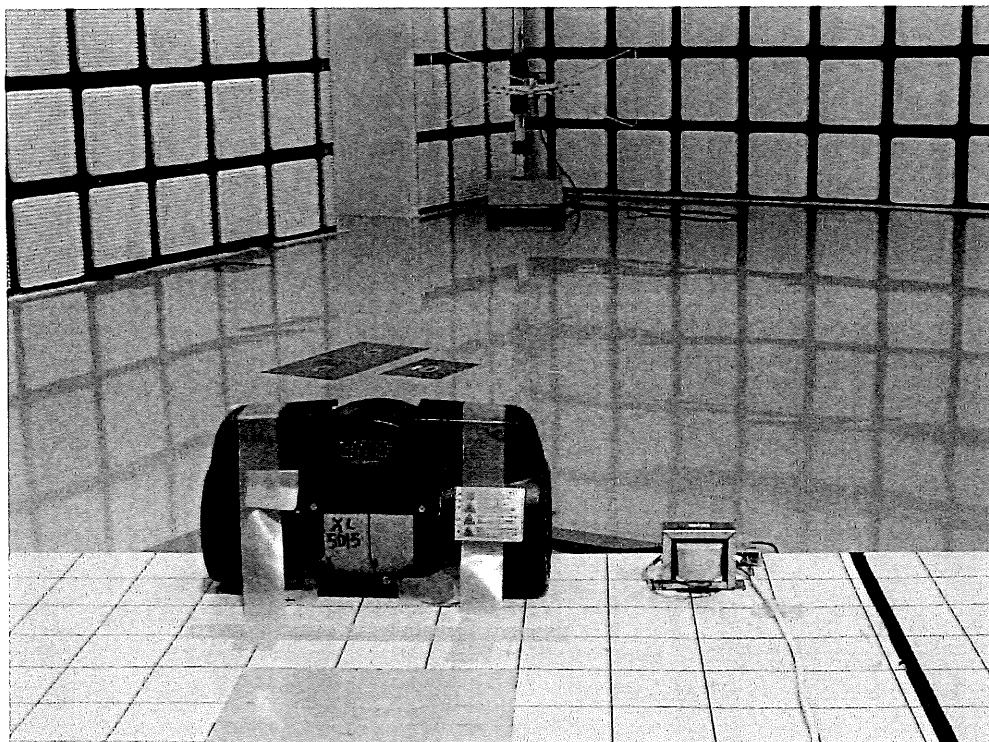
**Photograph 4: Set-up for Conducted Emission on AC Mains Ports, Rear View**



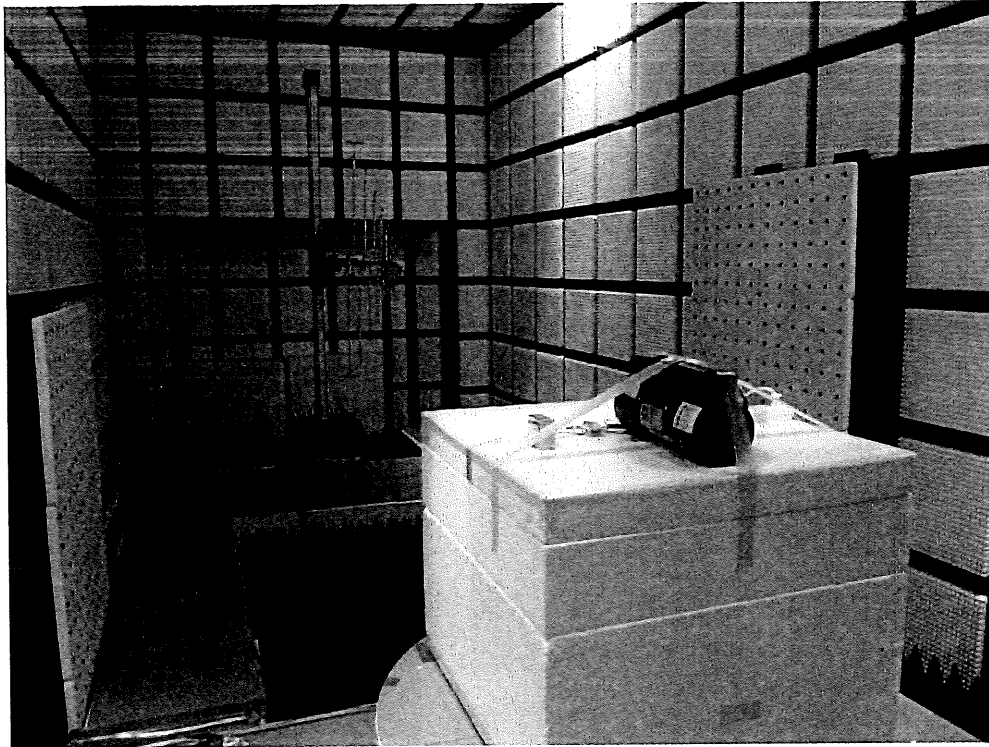
**Photograph 5: Set-up for Radiated Emission, Front View**



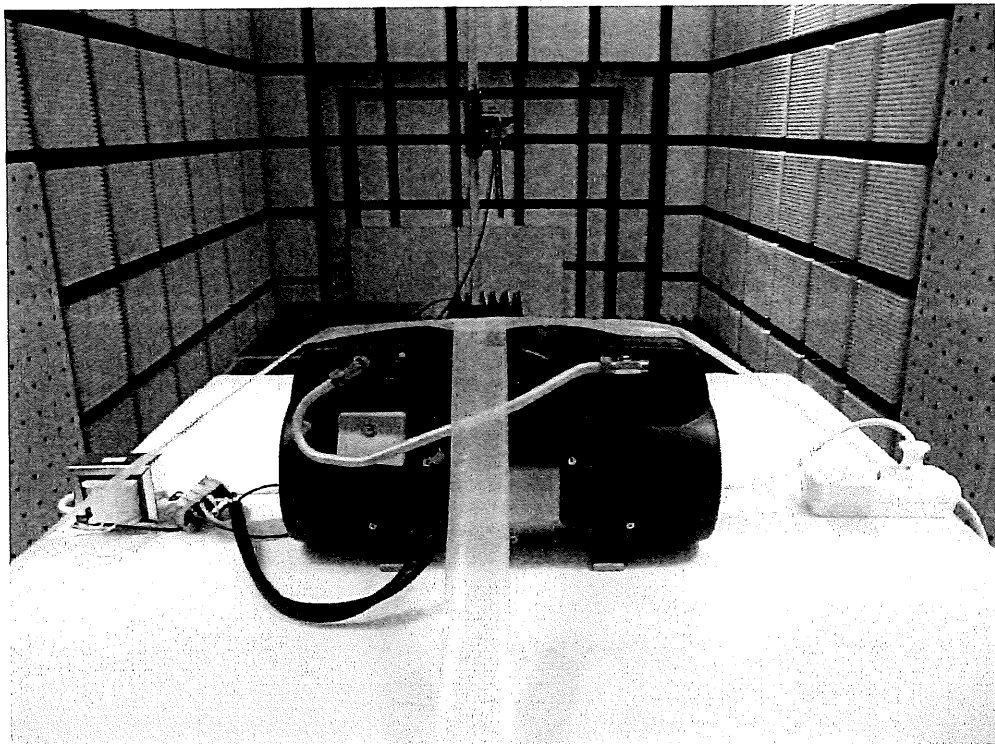
**Photograph 6: Set-up for Radiated Emission, Rear View**



**Photograph 7: Set-up for Radiated Susceptibility, Below 1GHz**

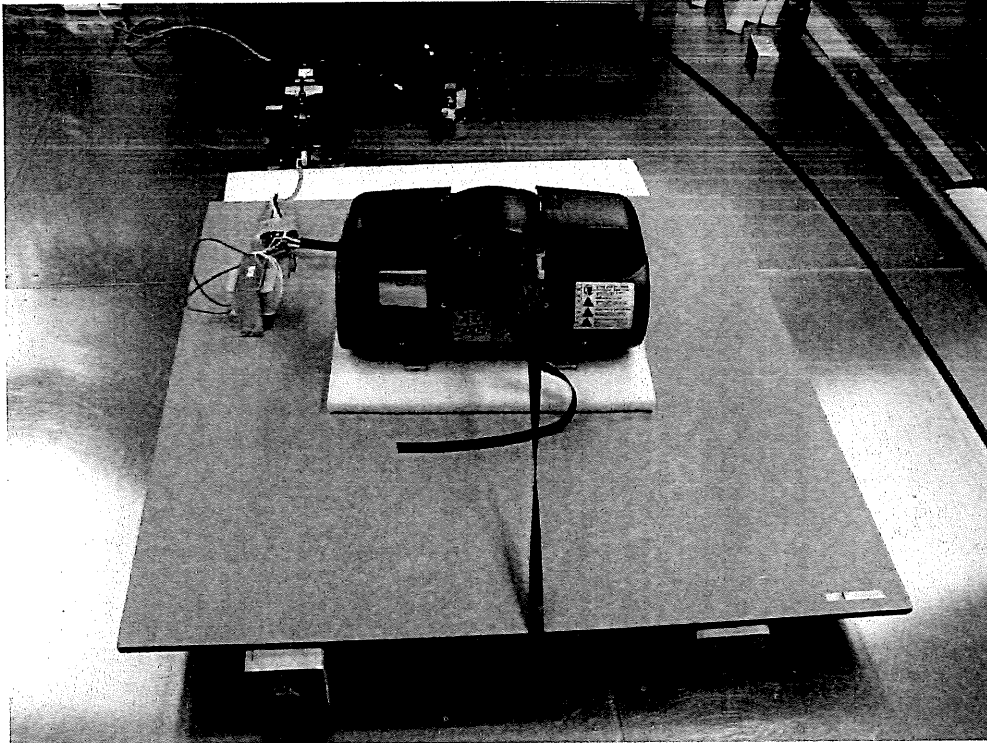


**Photograph 8: Set-up for Radiated Susceptibility, Above 1GHz**

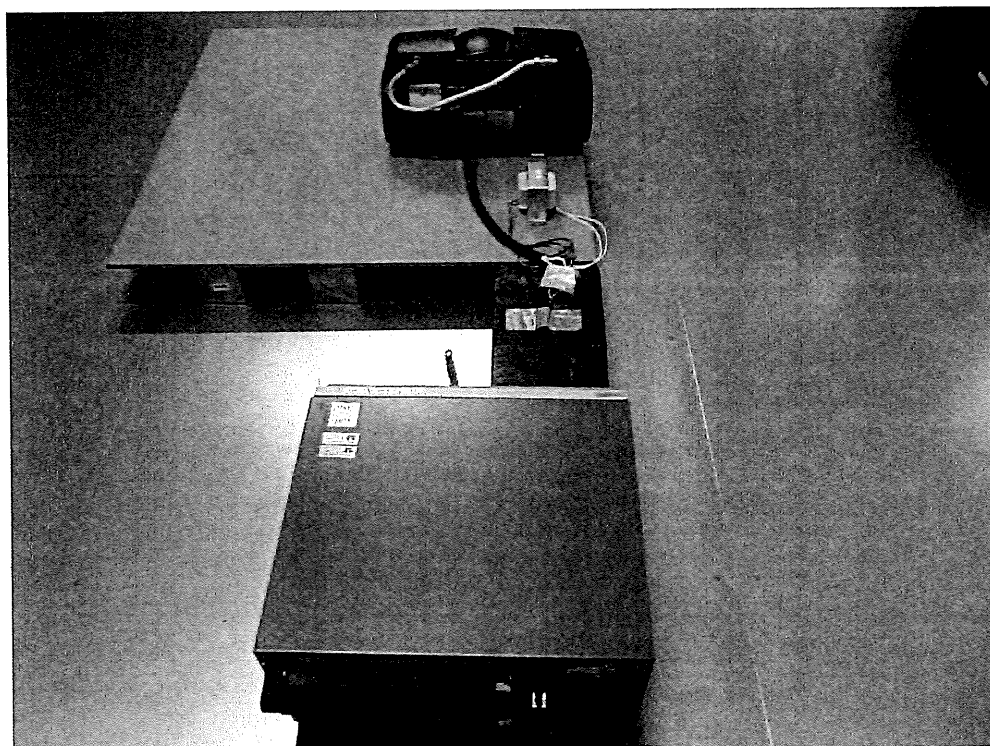




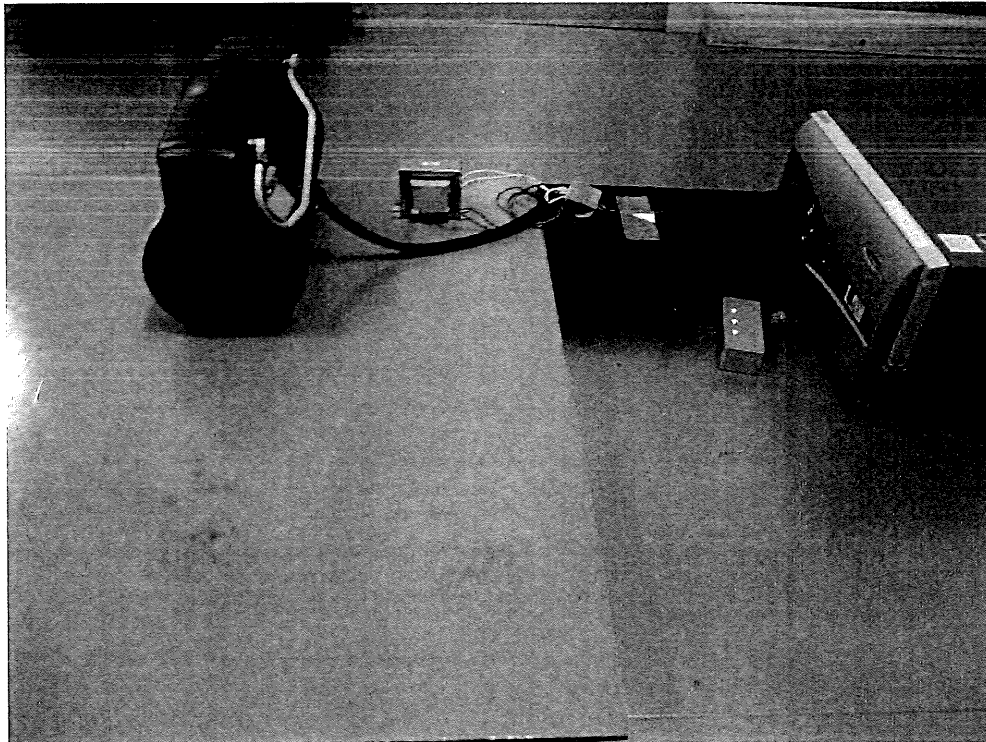
**Photograph 9: Set-up for Conducted Susceptibility, CDN Injection Method**



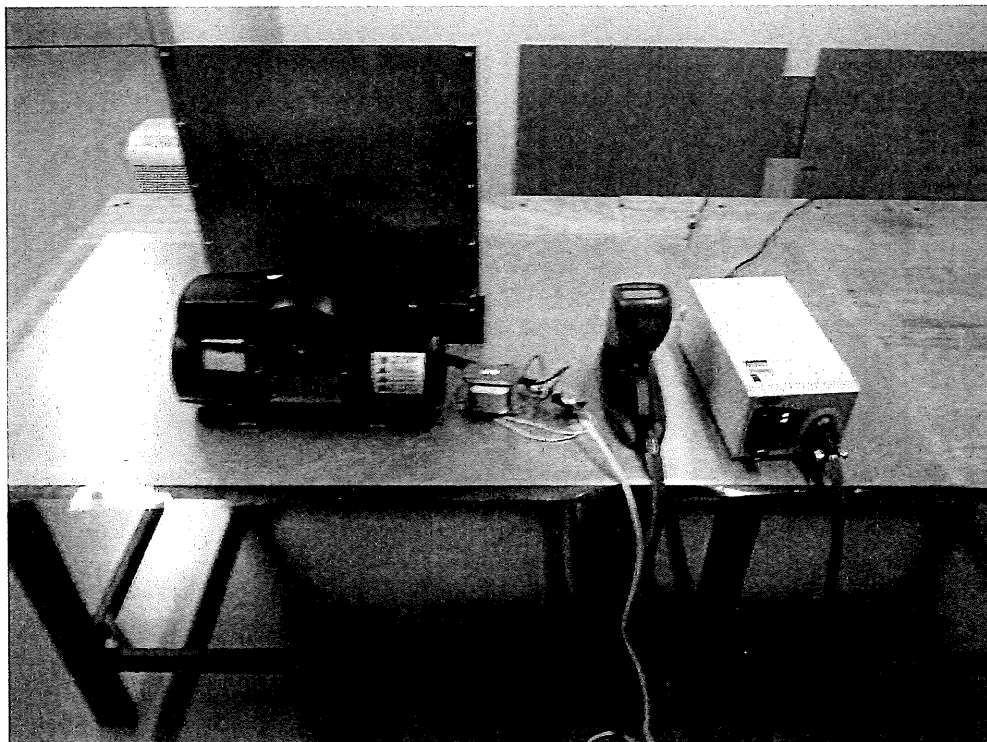
**Photograph 10: Set-up for Electrical Fast Transients and Bursts, on AC Power Ports**



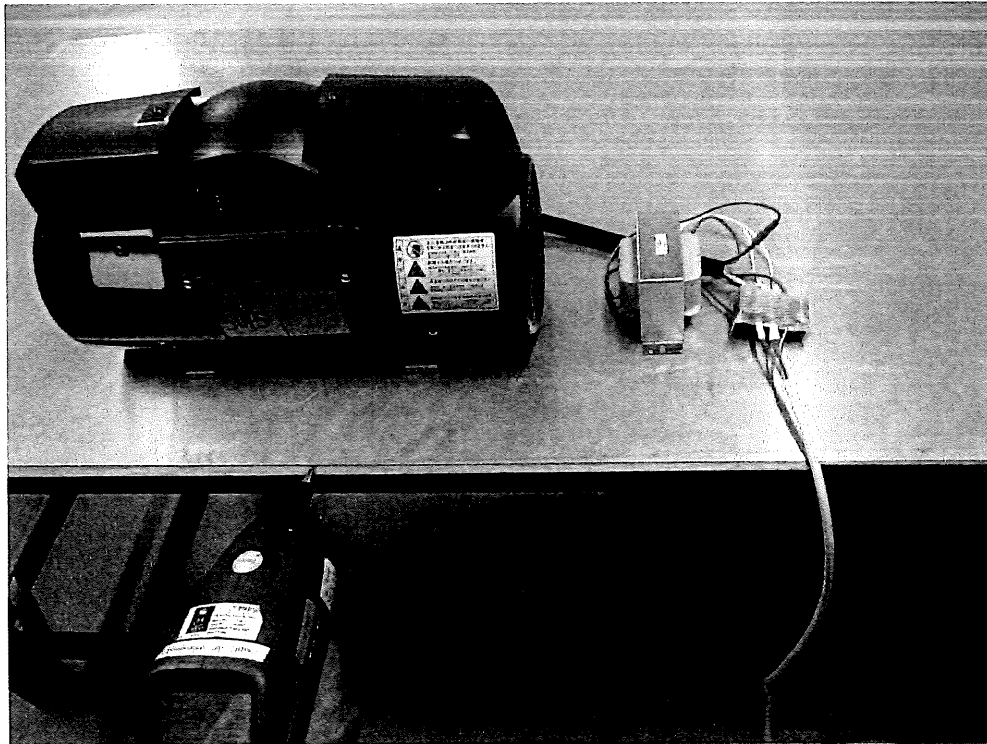
**Photograph 11: Set-up for Surges, on AC Mains Ports**



**Photograph 12: Set-up for Electrostatic Discharges, General View**



Photograph 13: Set-up for Electrostatic Discharges, HCP



Photograph 14: Set-up for Electrostatic Discharges, VCP



Photograph 15: Set-up for Electrostatic Discharges, Contact Discharges

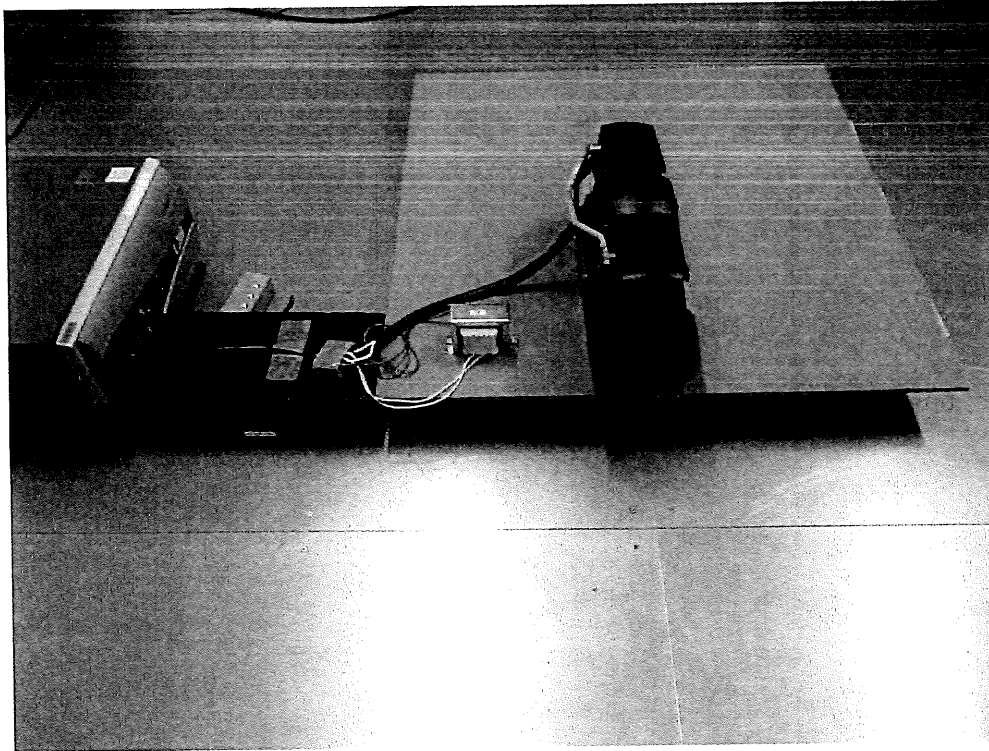


Photograph 16: Set-up for Electrostatic Discharges, Air Discharges





**Photograph 17: Set-up for Voltage Dips and Interruptions**



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## **11. Attachment: Test Plan 12607934 A by TÜV Rheinland Japan Ltd.**

5 pages following