



# Test Report: GSM220B20

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220W AC-DC Reliable Green Medical Adaptor

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

ENVIRONMENT TEST

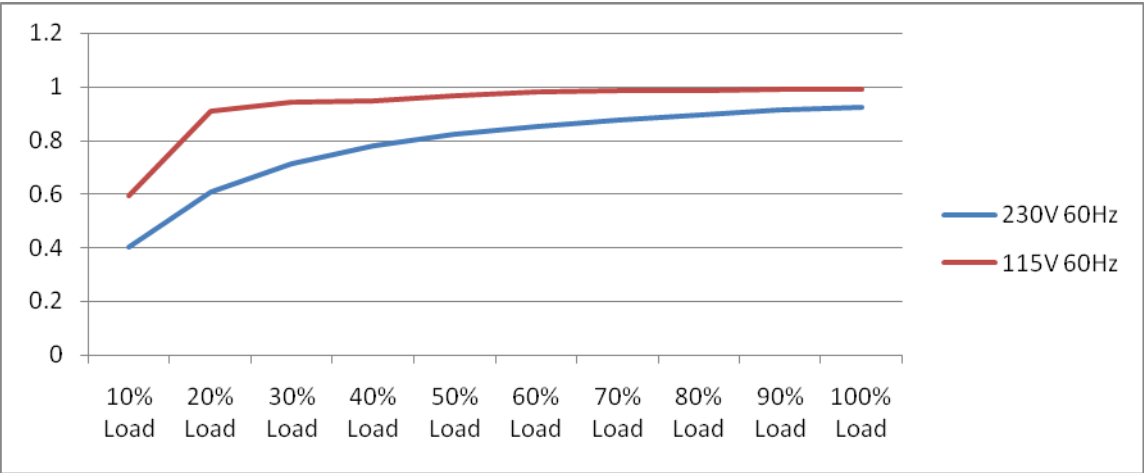
## DESIGN VERIFY TEST

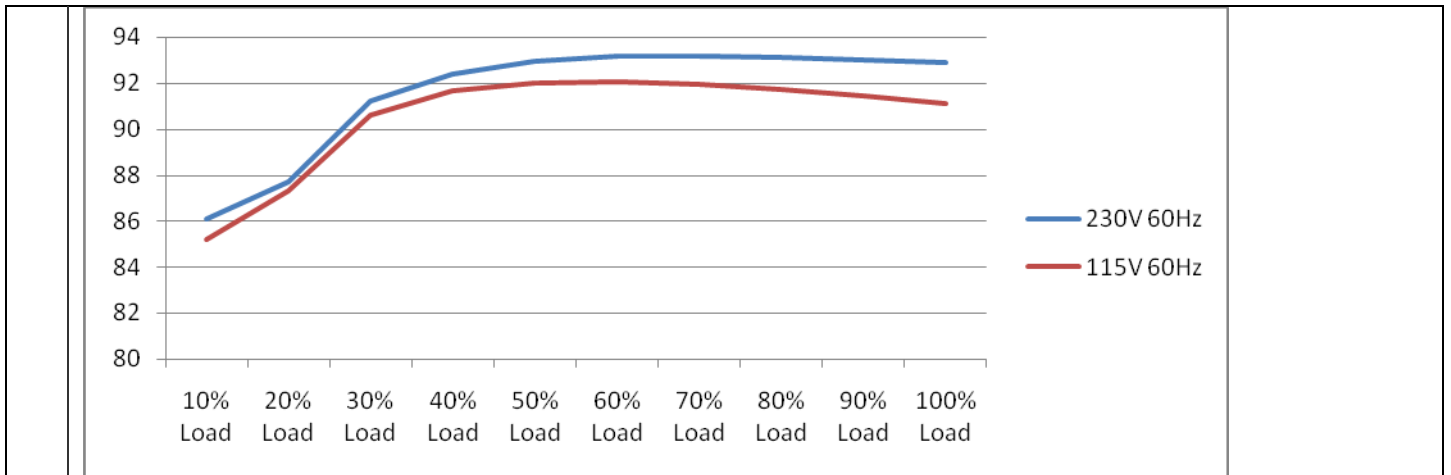
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4%~ 4%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.849%~ 1.199 %
2	LINE REGULATION (Max)	V1: -1%~ 1%	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0% ~ 0%
3	LOAD REGULATION(Max)	V1: -4%~ 4%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.849%~ 1.199 %
4	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	< ±5%
5	RIPPLE & NOISE(Max)	V1: 120mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 14.2mVp-p
		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>high frequency :</p> <p>Ch1 Pk-Pk 14.2mV</p> </div> <div style="text-align: center;"> <p>low frequency :</p> <p>Ch1 Pk-Pk 13.0mV</p> </div> </div>		
6	SET UP TIME(Max)	230VAC/2000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 1144 ms 115VAC/ 1168 ms
		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>Δ: 264 V @: 0.00 V Δ: 1.14 s @: -1.10 s</p> </div> <div style="text-align: center;"> <p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>Δ: 80.0 V @: 8.00 V Δ: 1.17 s @: -1.11 s</p> </div> </div>		
7	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC	230VAC/ 18 ms 115VAC/ 18.2 ms

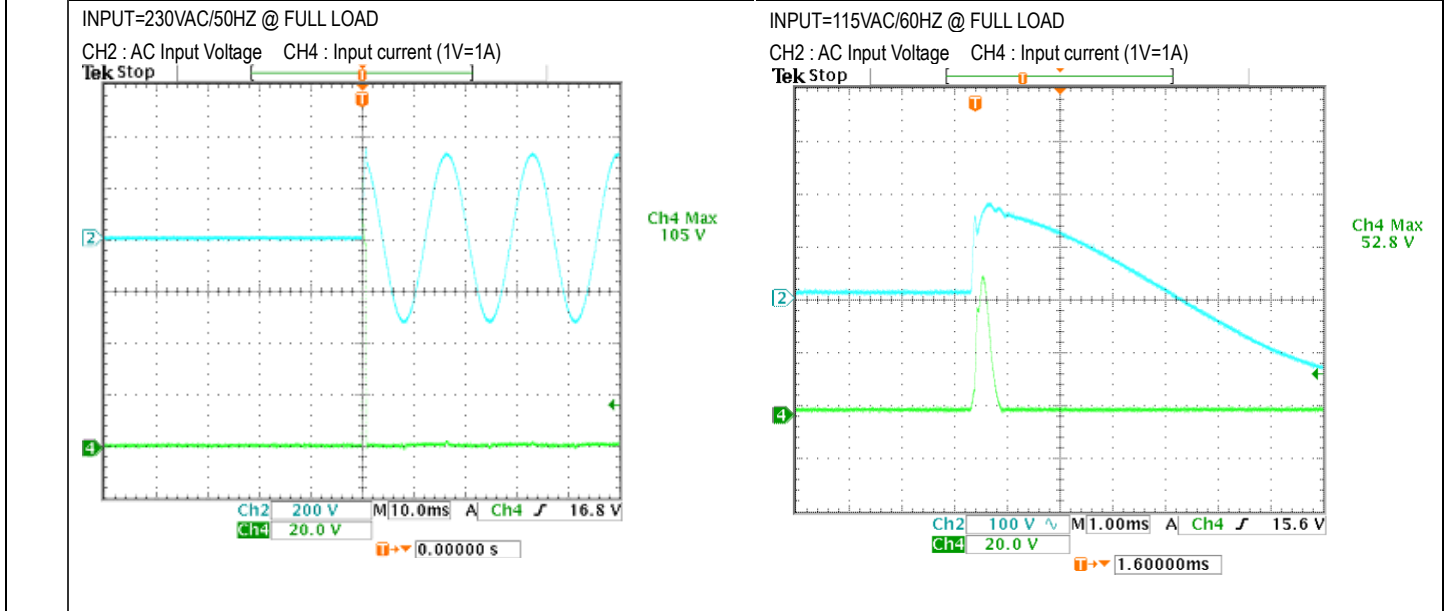
		O/P : FULL LOAD Ta : 25°C	
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage	
8	HOLD UP TIME (Typ.)	230VAC/24ms 115VAC/24ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C
		230VAC/ 28.8 ms 115VAC/ 28.8 ms	
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	
9	DYNAMIC LOAD	V1: 1500mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /90%DUTY / 1KHZ Ta:25°C
FULL /50% LOAD 50%DUTY / 120HZ		FULL /50% LOAD 50%DUTY / 1KHZ	

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																	
1	INPUT VOLTAGE RANGE	80VAC~264VAC 113VDC~370VDC	(1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta:25°C	(1) 73V~264V (2) 106.3Vdc~370Vdc/FULL LOAD 106.3Vdc~370Vdc/50% LOAD (3) 106.3Vdc~370Vdc/FULL LOAD 106.3Vdc~370Vdc/50% LOAD																																	
			I/P: LOW-LINE-3V=92 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK																																	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:100 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK																																	
3	INPUT CURRENT (Typ.)	230V/ 2A 115V/ 4A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I=1.05A/ 230VAC I=2.06A/ 115VAC																																	
4	LEAKAGE CURRENT	<0.1 mA / 264 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.0733 mA N-FG : 0.0733 mA																																	
5	NO LOAD CONSUMPTION	< 0.15W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	< 0.0801 W < 0.1135 W																																	
6	POWER FACTOR (Typ.)	0.91/ 230VAC 0.98/115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.957/230VAC PF= 0.993/115VAC																																	
<p><b>PF vs LOAD</b></p>  <table border="1"> <caption>PF vs LOAD Data</caption> <thead> <tr> <th>Load (%)</th> <th>230V 60Hz PF</th> <th>115V 60Hz PF</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.40</td><td>0.60</td></tr> <tr><td>20%</td><td>0.60</td><td>0.90</td></tr> <tr><td>30%</td><td>0.70</td><td>0.95</td></tr> <tr><td>40%</td><td>0.78</td><td>0.96</td></tr> <tr><td>50%</td><td>0.82</td><td>0.97</td></tr> <tr><td>60%</td><td>0.85</td><td>0.98</td></tr> <tr><td>70%</td><td>0.87</td><td>0.98</td></tr> <tr><td>80%</td><td>0.88</td><td>0.99</td></tr> <tr><td>90%</td><td>0.90</td><td>0.99</td></tr> <tr><td>100%</td><td>0.92</td><td>1.00</td></tr> </tbody> </table>					Load (%)	230V 60Hz PF	115V 60Hz PF	10%	0.40	0.60	20%	0.60	0.90	30%	0.70	0.95	40%	0.78	0.96	50%	0.82	0.97	60%	0.85	0.98	70%	0.87	0.98	80%	0.88	0.99	90%	0.90	0.99	100%	0.92	1.00
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7	EFFICIENCY(Typ.)	92%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	92.87%																																	
<p><b>EFFICIENCY vs LOAD</b></p>																																					



8	INRUSH CURRENT(Typ.)	230V/110A 115V/90A COLD START	I/P : 230 VAC/115VAC O/P : FULL LOAD Ta : 25°C	I = 105A/ 230VAC I = 52.8A/ 115VAC
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### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	OVER LOAD PROTECTION	105%~ 135%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C	107.3%/ 264VAC 107.4%/ 230VAC 107.4%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	21V~27V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	23.4V/ 264VAC 23.4V/ 230VAC 23.4V/ 90VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	Protection type :	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD	O.T.P. Active Protection type : Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) <b>Peak Voltage</b>	Q5 Rated : 18A/ 600V	I/P: High-Line +3V =267V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta:25°C	VDS: (1) 494V (2) 500V (3) 448V
2	P.F.C Transistor (D to S) or (C to E) <b>Peak Voltage</b>	Q1 Rated : 15.8 A/ 600 V	I/P: High-Line +3V =267V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta:25°C	VDS: (1) 540V (2) 538V (3) 486V
3	P.F.C DIODE	D2 Rated : 15 A/ 600 V	I/P: High-Line +3V =267 V AC ON/OFF O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	(1) 442V (2) 452V (3) 454V (4) 454V
4	Diode <b>Peak Voltage</b>	Q101 Rated : 80 A/ 75V	I/P: High-Line +3V =267 V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Full Load Continue Ta:25°C	Q101: VDS: (1) 47.0V (2) 6.2 V (3) 46.8V
5	<b>Input Capacitor Voltage</b>	C5 Rated: : 220 μ /450 V 105 °C	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Min load input on /Off	(1) 434V (2) 422V (3) 434V

			(3)Full Load /Min load Change Ta:25°C	
6	Control IC Voltage Test	PWM IC U1 Rated : 38V -0.4 V(MIN.)	I/P:High-Line +3V =267 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	(1) 27.1V (2) 20.0V (3) 20.0V (4) 29.1V

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min	I/P-O/P: 4.4 KVAC/min Ta:25°C	I/P-O/P:1.981 mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 600 VDC Ta:25°C	I/P-O/P:9999 MΩ NO DAMAGE

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	BS EN/EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	PASS
2	CONDUCTION	BS EN/EN55011 (CISPR11), FCC PART 15 /CISPR22, CAN ICES-3(B)/NMB-3(B) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55011 (CISPR11), FCC PART 15 /CISPR22, CAN ICES-3(B)/NMB-3(B) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	BS EN/EN61000-4-2 AIR : 15KV / Contact : 8KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	BS EN/EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	BS EN/EN61000-4-5 L-N : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	TEMPERATURE RISE TEST	<p>MODEL : GSM220B20</p> <p>1. ROOM AMBIENT BURN-IN : 1HRS I/P : 230VAC O/P : FULL LOAD Ta= 17.7°C</p> <p>2. HIGH AMBIENT BURN-IN : 1HRS I/P : 230VAC O/P : FULL LOAD Ta=39.5 °C</p> <table border="1" data-bbox="504 434 1455 1279"> <thead> <tr> <th>NO</th> <th>Position</th> <th>OOM AMBIENT Ta= 17.7 °C</th> <th>HIGH AMBIENT Ta=39.5 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>40.9°C</td><td>65.2°C</td></tr> <tr><td>2</td><td>LF2</td><td>49.1°C</td><td>73.5°C</td></tr> <tr><td>3</td><td>L2</td><td>50.9°C</td><td>76.0°C</td></tr> <tr><td>4</td><td>D3</td><td>53.0°C</td><td>77.1°C</td></tr> <tr><td>5</td><td>Q2</td><td>53.4°C</td><td>77.0°C</td></tr> <tr><td>6</td><td>D2</td><td>54.5°C</td><td>78.2°C</td></tr> <tr><td>7</td><td>L1</td><td>55.0°C</td><td>79.7°C</td></tr> <tr><td>8</td><td>C5</td><td>57.0°C</td><td>80.5°C</td></tr> <tr><td>9</td><td>Q5</td><td>53.1°C</td><td>76.9°C</td></tr> <tr><td>10</td><td>T1</td><td>72.6°C</td><td>101.8°C</td></tr> <tr><td>11</td><td>C81</td><td>54.5°C</td><td>78.7°C</td></tr> <tr><td>12</td><td>RTH2</td><td>52.0°C</td><td>75.6°C</td></tr> <tr><td>13</td><td>C13</td><td>58.5°C</td><td>82.6°C</td></tr> <tr><td>14</td><td>Q101</td><td>60.2°C</td><td>83.9°C</td></tr> <tr><td>15</td><td>C109</td><td>59.6°C</td><td>83.4°C</td></tr> <tr><td>16</td><td>U1</td><td>61.4°C</td><td>84.7°C</td></tr> <tr><td>17</td><td>C101</td><td>58.2°C</td><td>81.7°C</td></tr> <tr><td>18</td><td>R5</td><td>53.3°C</td><td>77.9°C</td></tr> <tr><td>19</td><td>TSW1</td><td>49.0°C</td><td>72.5°C</td></tr> <tr><td>20</td><td>C11</td><td>51.0°C</td><td>75.4°C</td></tr> <tr><td>21</td><td>U4</td><td>55.4°C</td><td>79.2°C</td></tr> <tr><td>22</td><td>BD1</td><td>52.1°C</td><td>75.7°C</td></tr> <tr><td>23</td><td>C1</td><td>46.4°C</td><td>71.0°C</td></tr> <tr><td>24</td><td>CASE</td><td>43.2°C</td><td>64.1°C</td></tr> </tbody> </table>			NO	Position	OOM AMBIENT Ta= 17.7 °C	HIGH AMBIENT Ta=39.5 °C	1	LF1	40.9°C	65.2°C	2	LF2	49.1°C	73.5°C	3	L2	50.9°C	76.0°C	4	D3	53.0°C	77.1°C	5	Q2	53.4°C	77.0°C	6	D2	54.5°C	78.2°C	7	L1	55.0°C	79.7°C	8	C5	57.0°C	80.5°C	9	Q5	53.1°C	76.9°C	10	T1	72.6°C	101.8°C	11	C81	54.5°C	78.7°C	12	RTH2	52.0°C	75.6°C	13	C13	58.5°C	82.6°C	14	Q101	60.2°C	83.9°C	15	C109	59.6°C	83.4°C	16	U1	61.4°C	84.7°C	17	C101	58.2°C	81.7°C	18	R5	53.3°C	77.9°C	19	TSW1	49.0°C	72.5°C	20	C11	51.0°C	75.4°C	21	U4	55.4°C	79.2°C	22	BD1	52.1°C	75.7°C	23	C1	46.4°C	71.0°C	24	CASE	43.2°C	64.1°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 120 % LOAD Ta : 25°C	TEST : OK																																																																																																				
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -35 °C	TEST : OK																																																																																																				
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																				
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.009 %/°C (0~50°C)																																																																																																				
6	STORAGE TEMPERATURE TEST	<p>1. Thermal shock Temperature : -40°C ~ +85°C</p> <p>2. Temperature change rate : 25°C / MIN</p> <p>3. Dwell time low and high temperature : 30 MIN/EACH</p> <p>4. Total test cycle : 5 CYCLE</p> <p>5. Input/Output condition : STATIC</p>		OK																																																																																																				





7	THERMAL SHOCK TEST	<ol style="list-style-type: none"> <li>1. Thermal shock Temperature : -30°C~ +70°C</li> <li>2. Temperature change rate : 25°C / MIN</li> <li>3. Dwell time low and high temperature : 30 MIN/EACH</li> <li>4. Total test cycle : 10 CYCLE</li> <li>5. Input/Output condition : 230VAC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec</li> </ol>	OK
8	VIBRATION TEST	<p>1 Carton &amp; 1 Set</p> <ol style="list-style-type: none"> <li>(1) Waveform : Sine Wave</li> <li>(2) Frequency : 10~500Hz</li> <li>(3) Sweep Time : 12min/sweep cycle</li> <li>(4) Acceleration : 2G</li> <li>(5) Test Time : 60min in each axis (X.Y.Z)</li> <li>(6) Ta : 25°C</li> </ol>	TEST : OK
9	CAPACITOR LIFE CYCLE	<p>SUPPOSE C 109 IS THE MOST CRITICAL COMPONENT</p> <ol style="list-style-type: none"> <li>(1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME</li> <li>(2) I/P : 230VAC O/P : FULL LOAD Ta= 40 °C LIFE TIME</li> <li>(3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME</li> <li>(4) I/P : 230VAC O/P : 50% LOAD Ta= 40 °C LIFE TIME</li> </ol>	<ol style="list-style-type: none"> <li>(1) 159661HRS</li> <li>(2) 24580HRS</li> <li>(3) 71921HRS</li> <li>(4) 105265HRS</li> </ol>
10	MTBF	1953.3K hrs min. Telcordia SR-332 (Bellcore) ; 208.7K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 50,000 hours @ TA 50°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014