

# TEST REPORT: GSM90A24-P1M

## 90W AC-DC Reliable Medical Adaptor

### ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

### ■ SAFETY & E.M.C. TEST

Safety Test

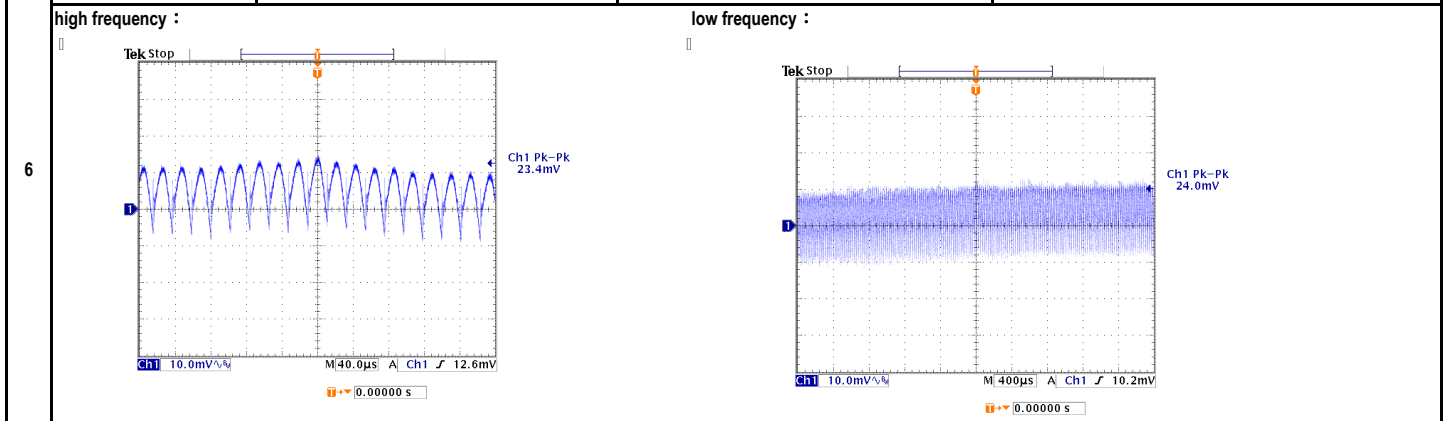
E.M.C. Test

### ■ RELIABILITY TEST

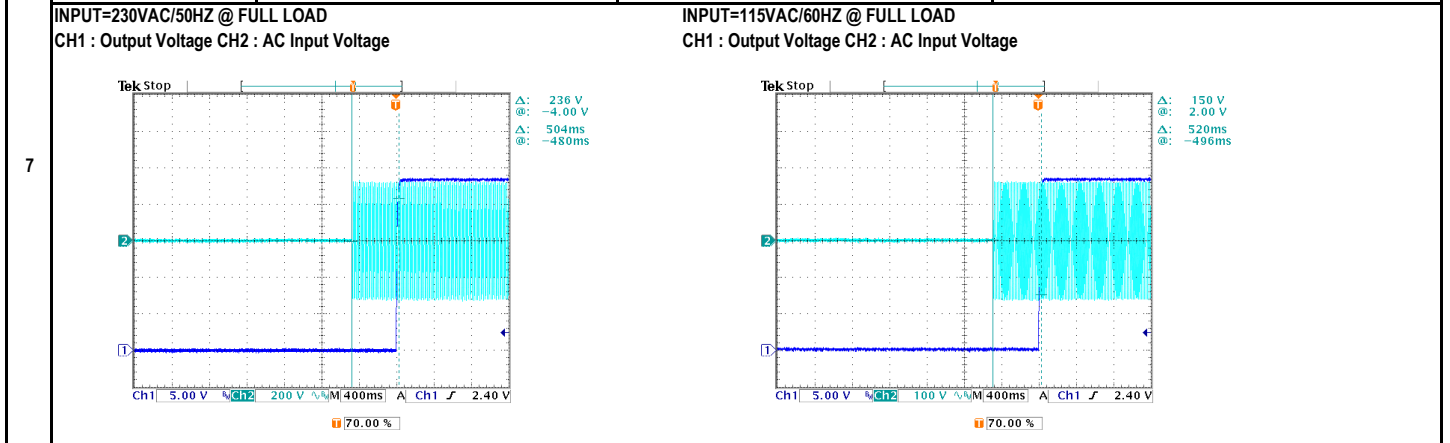
ENVIRONMENT TEST

DESIGN VERIFY TEST  
OUTPUT FUNCTION

| NO | TEST ITEM                      | SPECIFICATION        | TEST CONDITION   | RESULT              |
|----|--------------------------------|----------------------|--|---------------------|
| 1  | OUTPUT VOLTAGE RANGE           | CH1: 23.28V ~ 24.72V | I/P : 230VAC<br>O/P: MIN LOAD<br>TA : 25°C               | CH1: 23.93V         |
| 2  | OUTPUT VOLTAGE TOLERANCE (Max) | V1 : 3.0% ~ -3.0%    | I/P : 100VAC / 264VAC<br>O/P: FULL / MINLOAD<br>TA= 25°C | V1: -0.29% ~ -1.42% |
| 3  | LINE REGULATION (MAX.)         | V1 : 1.0% ~ -1.0%    | I/P : 100VAC / 264VAC<br>O/P: FULL LOAD<br>TA : 25°C     | V1: 0.04% ~ 0.00%   |
| 4  | LOAD REGULATION (MAX.)         | V1 : 3.0% ~ -3.0%    | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA : 25°C   | V1: 0.59% ~ -0.55%  |
| 5  | OVER/UNDERSHOOT TEST           | < ±5%                | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C              | TEST< 1.26 %        |
|    | RIPPLE & NOISE(Max)            | V1 : 180 mVp-p       | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C              | V1 : 24 mVp-p       |



|   |                    |                                    |   |                                  |
|---|--------------------|------------------------------------|---|----------------------------------|
| 7 | SET UP TIME (MAX.) | 230VAC : 1000ms<br>115VAC : 1000ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C | 230VAC : 504ms<br>115VAC : 520ms |
|---|--------------------|------------------------------------|---|----------------------------------|



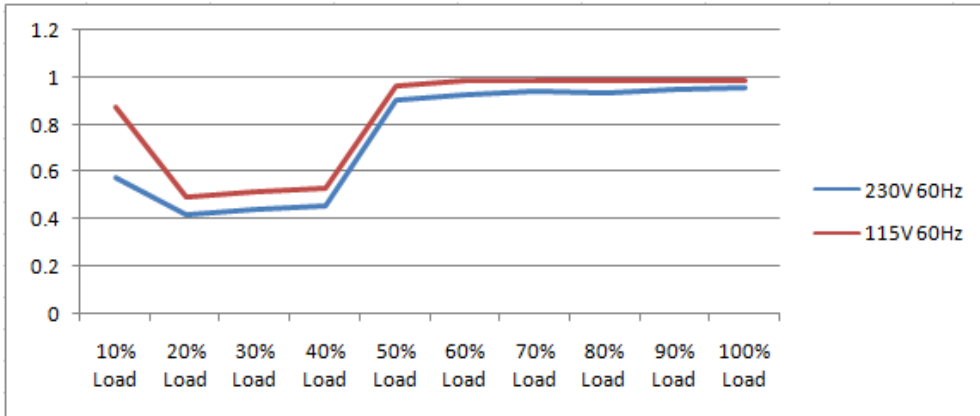


|    |  |                                |  |                                       |  |
|----|--|--------------------------------|--|---------------------------------------|--|
| 8  | RISE TIME (MAX.)   | 230VAC : 50ms<br>115VAC : 50ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C  | 230VAC : 19.8ms<br>115VAC : 19.6ms    |  |
|    | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1 : Output Voltage                        |                                | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1 : Output Voltage  |                                       |  |
|    |  |                                |  |                                       |  |
| 9  | HOLD UP TIME (TYP.)  | 230VAC : 40ms<br>115VAC : 25ms | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C  | 230VAC : 44.0ms<br>115VAC : 27.2ms    |  |
|    | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1 : Output Voltage CH2 : AC Input Voltage |                                | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1 : Output Voltage CH2 : AC Input Voltage                         |                                       |  |
|    |  |                                |  |                                       |  |
| 10 | DYNAMIC LOAD   | V1 : 2400 mVp-p                | I/P : 230VAC<br>O/P:<br>(1)Full/Min load 50%duty/120HZ<br>(2)Full/Min load 50%duty/1KHZ<br>TA : 25°C | V1: (1). 1010mv (2). 788mv unit:mVp-p |  |
|    | FULL /Min LOAD 50%DUTY / 120HZ   |                                | FULL /Min LOAD 50%DUTY / 1KHZ  |                                       |  |
|    |  |                                |  |                                       |  |

INPUT FUNCTION TEST

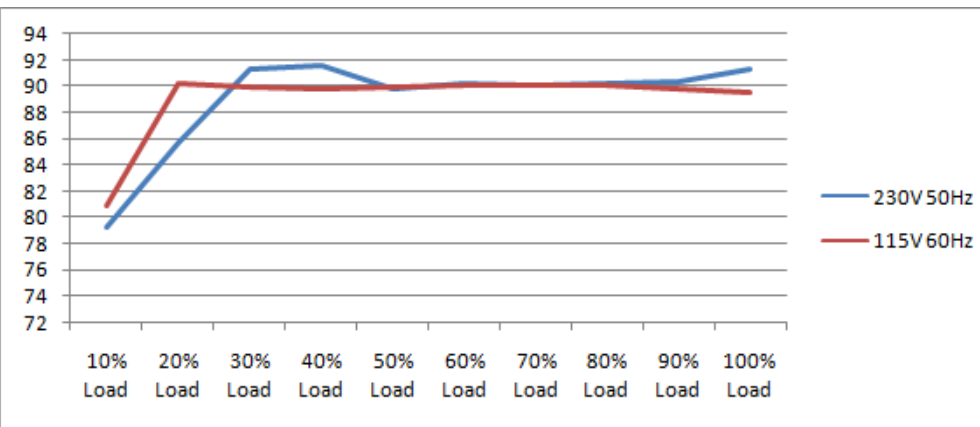
| NO | TEST ITEM                 | SPECIFICATION                  | TEST CONDITION   | RESULT                                   |
|----|---------------------------|--------------------------------|--|--|
| 1  | INPUT VOLTAGE RANGE       | 80VAC ~ 264VAC                 | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C  | 60.0VAC ~ 264VAC                         |
|    |                           |                                | I/P :<br>LOW-LINE = 97VAC<br>HIGH-LINE = 300VAC<br>O/P : FULL/MIN LOAD<br>ON:30 Sec ; OFF:30 Sec 10MIN<br>(POWER ON/OFF NO DAMAGE) | TEST : OK                                |
| 2  | INPUT FREQUENCY RANGE     | 47HZ ~ 63HZ<br>NO DAMAGE       | I/P : 100VAC ~ 264VAC<br>O/P : FULL-MIN LOAD<br>Ta : 25°C  | TEST : OK                                |
| 3  | INPUT CURRENT (TYP.)      | 0.6 / 230VAC<br>1.3 / 115VAC   | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C   | I= 0.4412 / 230VAC<br>I= 0.8716 / 115VAC |
| 4  | LEAKAGE CURRENT           | <125uA for earth leakage       | I/P : 264VAC<br>O/P : MIN LOAD<br>TA : 25°C  | L-FG: 79 uA                              |
|    |                           | <100uA for touch leakage       |  | N-FG: 80 uA<br>L-V: 80 uA<br>N-V: 81 uA  |
| 5  | NO LOAD POWER CONSUMPTION | < 0.15W                        | I/P : 230VAC<br>O/P : MIN LOAD<br>TA : 25°C  | < 0.0946 W                               |
|    | POWER FACTOR (TYP.)       | 0.91 / 230VAC<br>0.95 / 115VAC | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C   | PF= 0.9628 / 230VAC                      |
|    |                           |                                |  | PF= 0.9886 / 115VAC                      |

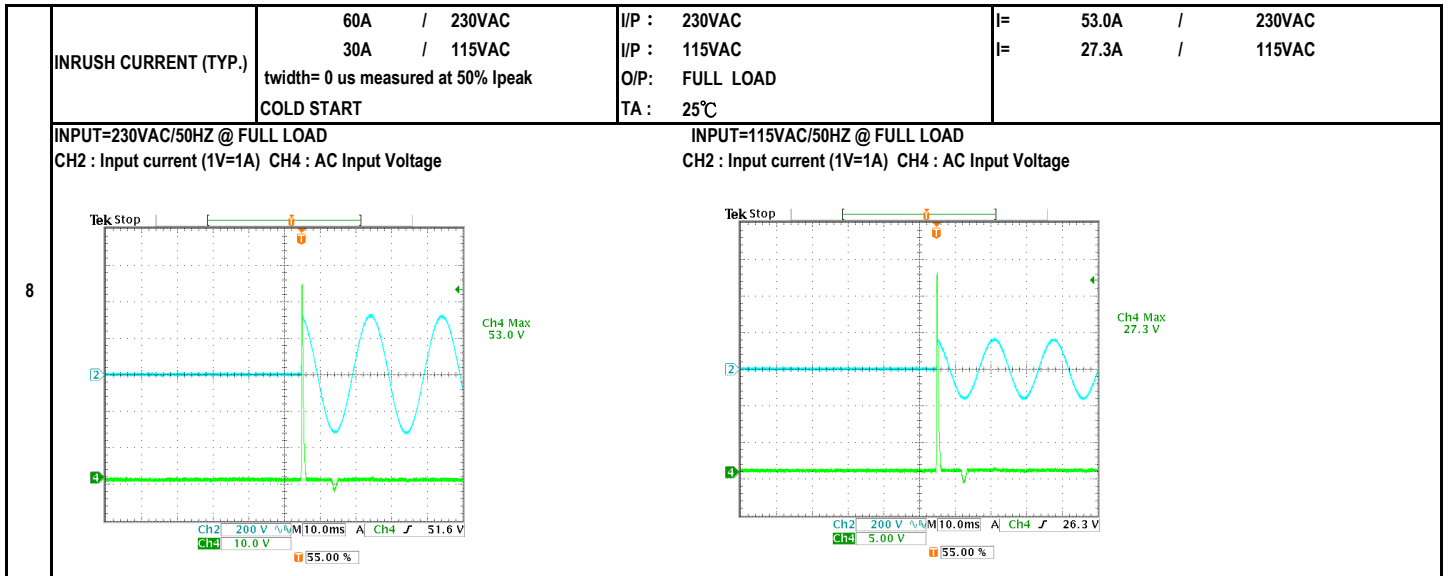
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|                   |       |  |         |
|-------------------|-------|--|---------|
| EFFICIENCY (TYP.) | 90.0% | I/P : 230VAC<br>O/P : FULL LOAD<br>TA : 25°C | 91.36 % |
|-------------------|-------|--|---------|





**PROTECTION FUNCTION TEST**

| NO | TEST ITEM                   | SPECIFICATION                          | TEST CONDITION   | RESULT   |
|----|-----------------------------|--|--|--|
| 1  | OVER LOAD PROTECTION        | 110% ~ 150%                            | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 100VAC<br>O/P: TESTING<br>TA : 25°C | 133% 264VAC<br>133% 230VAC<br>127.10% 100VAC<br>Hiccup Mode              |
| 2  | OVER VOLTAGE PROTECTION     | 25.20V ~ 32.40V                        | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 80VAC<br>O/P: MIN LOAD<br>TA : 25°C | 28.90V 264VAC<br>28.90V 230VAC<br>28.90V 80VAC<br>Shut down Re- power ON |
| 3  | OVER TEMPERATURE PROTECTION | Shut down Re- power ON                 | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD<br>TA : 25°C               | O.T.P. Active<br>Shut down Re- power ON                                  |
| 4  | SHORT PROTECTION            | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD<br>Ta: 25°C                | NO DAMAGE<br>Hiccup Mode   |

**COMPONENT STRESS TEST**

| NO | TEST ITEM            | SPECIFICATION          | TEST CONDITION  | RESULT  |
|----|----------------------|------------------------|---|---|
| 1  | PWM Power Transistor | Q32 Rated : 700V 11.0A | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C             | VIN: 267VAC<br>VDS:<br>(1). 598.00V<br>(2). 580.00V<br>(3). 588.00V |
| 2  | O/P Diode (MOSFET)   | Q101 Rated : 150V 43A  | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C             | Q101<br>VDS :<br>(1). 137.00V<br>(2). 122.00V<br>(3). 136.00V       |
| 3  | Input Capacitor      | C5 Rated : 100uf 400V  | I/P : 267VAC<br>O/P : (1)Full Load Turn on /Off<br>(2)Min load Turn on /Off<br>(3)Full Load /Min load Change<br>Ta : 25°C | (1). 399.00V<br>(2). 396.00V<br>(3). 399.00V                        |



|   |                      |  |  |   |   |   |
|---|----------------------|--|--|---|---|---|
| 4 | Control IC           | U2<br>Rated : 28V (max)<br>-0.3V (min) | I/P : 267VAC<br>O/P : (1)Full Load<br>(2)Output Short<br>(3)O.L.P<br>(4)O.V.P<br>(5)Low Line No Load Vo(min)<br>Ta : 25°C  | U101<br>Rated : 38V (max)<br>-0.4V (min)                            | (1). 18.30V<br>(2). 15.10V<br>(3). 17.60V<br>(4). 21.20V<br>(5). 17.50V | U101<br>25.00V<br>0.92V<br>21.20V<br>29.50V<br>24.30V |
| 5 | PFC Power Transistor | Q31<br>Rated : 600V 15.8A              | I/P : 267VAC<br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C  | VIN: 267VAC<br>VDS:<br>(1). 454.00V<br>(2). 410.00V<br>(3). 436.00V |   |   |
| 6 | PFC Diode            | D1<br>Rated : 600V 4.0A                | I/P : 267VAC<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Dynamic Load Full/Min Load 90%Duty/5KHz<br>(4)Dynamic Load Full/Min Load 50%Duty/120Hz<br>Ta : 25°C | (1). 440.00V<br>(2). 418.00V<br>(3). 438.00V<br>(4). 438.00V        |   |   |
| 7 | Clamp Diode          | D30<br>Rated : 800V 2.0A               | I/P : 267VAC<br>O/P : (1)Dynamic Load Full/Min Load 90%Duty/1KHz<br>(2)Full load continue<br>Ta : 25°C   | (1). 542.00V<br>(2). 542.00V  |   |   |

SAFETY & E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM            | SPECIFICATION                              | TEST CONDITION   | RESULT   |
|----|----------------------|--|--|--|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 4.000KVAC /min<br>2.000KVAC /min | I/P-O/P: 4.400KVAC /min<br>I/P-FG: 2.400KVAC /min<br>Ta : 25°C | I/P-O/P: 2.13mA<br>I/P-FG: 2.15mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ                     | I/P-O/P: 500VDC<br>Ta : 25°C/70%RH                             | I/P-O/P: 9999MΩ<br>NO DAMAGE                   |

E.M.C. TEST

| NO | TEST ITEM  | SPECIFICATION                                    | TEST CONDITION  | RESULT                        |
|----|------------|--|---|-------------------------------|
| 1  | HARMONIC   | EN61000-3-2<br>CLASS A<br>CLASS A                | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | PASS                          |
| 2  | CONDUCTION | EN55011<br>CLASS B                               | I/P : 230VAC /50HZ<br>O/P : FULL LOAD / 50% LOAD<br>Ta : 25°C | PASS<br>Test by certified Lab |
| 3  | RADIATION  | EN55011<br>CLASS B                               | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | PASS<br>Test by certified Lab |
| 4  | E.S.D      | EN61000-4-2<br>AIR: 15K AIR: 15KV / Contact: 8KV | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |
| 5  | E.F.T      | EN61000-4-4<br>INPUT: 2 INPUT: 2KV               | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |
| 6  | SURGE      | IEC61000-4-5<br>L-N:1KV;L/N-PE: 2KV              | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |



RELIABILITY TEST

| NO | TEST ITEM  | SPECIFICATION   | TEST CONDITION   | RESULT  |
|----|--|---|--|---|
| 1  | TEMPERATURE RISE TEST                                  | MODEL : GSM90A24-P1M  |  |   |
|    |  | 1. ROOM AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 20.3°C  |  |   |
|    |  | 2. HIGH AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 39.8°C  |  |   |
|    |  |   | NO. Position ROOM AMBIENT 20.3°C HIGH AMBIENT Ta: 39.8°C           |   |
|    |  |   | 1 LF1 59.1°C 74.9°C  |   |
|    |  |   | 2 LF2 76.7°C 86.6°C  |   |
|    |  |   | 3 BD1 61.9°C 78.4°C  |   |
|    |  |   | 4 C5 68.3°C 83.8°C   |   |
|    |  |   | 5 L2 64.4°C 79.7°C   |   |
|    |  |   | 6 LF3 65.8°C 81.5°C  |   |
|    |  |   | 7 Q31 66.7°C 83.4°C  |   |
|    |  |   | 8 Q32 66.7°C 83.3°C  |   |
|    |  |   | 9 T1 COIL 75.3°C 90.8°C  |   |
|    |  |   | 10 Q101 73.7°C 90.7°C  |   |
|    |  |   | 11 U2 68.4°C 84.7°C  |   |
|    | 12 C101 61.5°C 77.9°C                                  |   |  |   |
|    | 13 LF101 54.7°C 72.0°C                                 |   |  |   |
|    | 14 C52 72.1°C 88.4°C                                   |   |  |   |
| 2  | OVER LOAD BURN-IN TEST                                 | NO DAMAGE<br>1 HOUR ( MIN )   | I/P : 230VAC<br>O/P : 128.53% LOAD<br>Ta : 25°C                    | TEST : OK   |
| 3  | LOW TEMPERATURE TURN ON TEST                           | NO DAMAGE<br>1 HOUR ( MIN )   | I/P : 264VAC / 100VAC<br>O/P : FULL LOAD<br>Ta : -30.0°C           | TEST : OK   |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 40°C<br>NO DAMAGE  | I/P : 272VAC<br>O/P : FULL LOAD<br>Ta : 40°C<br>HUMIDITY= 95.0% RH | TEST : OK   |
| 5  | TEMPERATURE COEFFICIENT                                | ±0.03% /(0°C~40°C)  | I/P : 230VAC<br>O/P : FULL LOAD                                    | ±0.0196% /(0°C~40°C)  |
| 6  | STORAGE TEMPERATURE TEST                               | 1. Thermal shock Temperature : -40°C ~ +85°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 5 CYCLE<br>5. Input/Output condition : STATIC  |  | TEST : OK   |
| 7  | THERMAL SHOCK TEST                                     | 1. Thermal shock Temperature : -35°C ~ +45°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 10 CYCLE<br>5. Input/Output condition :<br>230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec |  | TEST : OK   |
| 8  | VIBRATION TEST   | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(4) Acceleration : 2G<br>(5) Test Time : 60 min in each axis (X.Y.Z)<br>(6) Ta : 25°C   |  | TEST : OK   |
| 9  | CAPACITOR LIFE CYCLE                                   | :SUPPOSE C101 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME<br>(2) I/P : 230VAC O/P : FULL LOAD Ta= 40.0°C LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 40.0°C LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta= 40.0°C LIFE TIME    |  | (1). 177817.6 HRS<br>(2). 77916 HRS<br>(3). 152206.9 HRS<br>(4). 270922.4 HRS |
| 10 | MTBF   | 2538.4K hrs min. Telcordia SR-332 (Bellcore) ; 387.5K hrs min. MIL-HDBK-217F (25°C)   |  |   |
| 11 | DMTBF /Accelerated Life test                           | Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 40°C   |  |   |

| TEST RESULT | TESTER | REVIEW | APPROVAL |
|-------------|--------|--------|----------|
| PASS        | FRANK  | GESG   | WANGDZ   |