



# TEST REPORT: EPP-200-15

## 200W Single Output With PFC Function

### ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

### ■ SAFETY & E.M.C. TEST

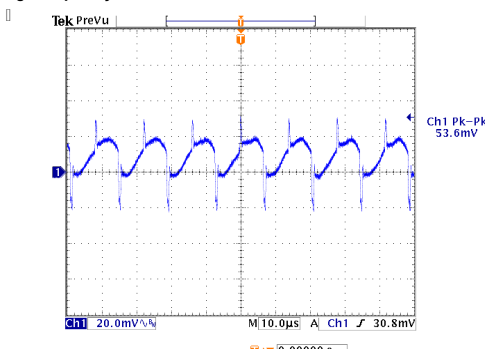
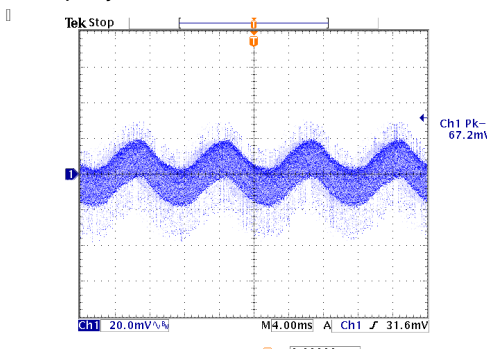
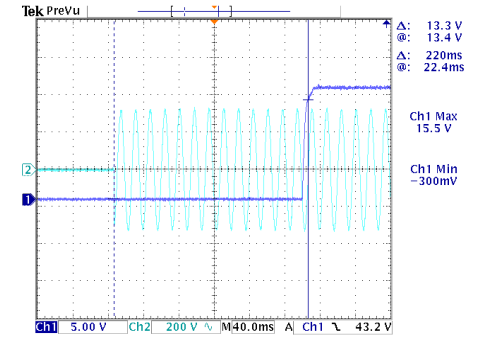
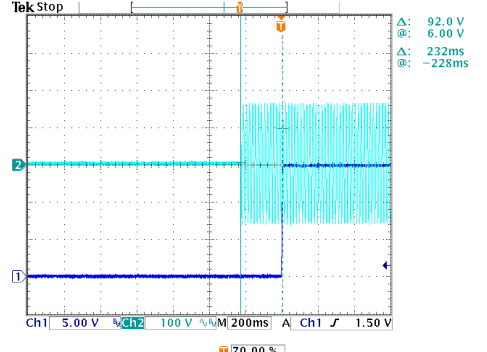
Safety Test

E.M.C. Test

### ■ RELIABILITY TEST

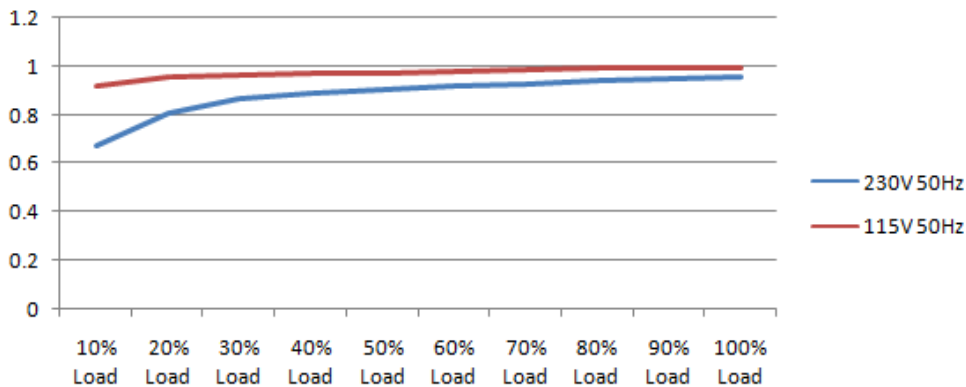
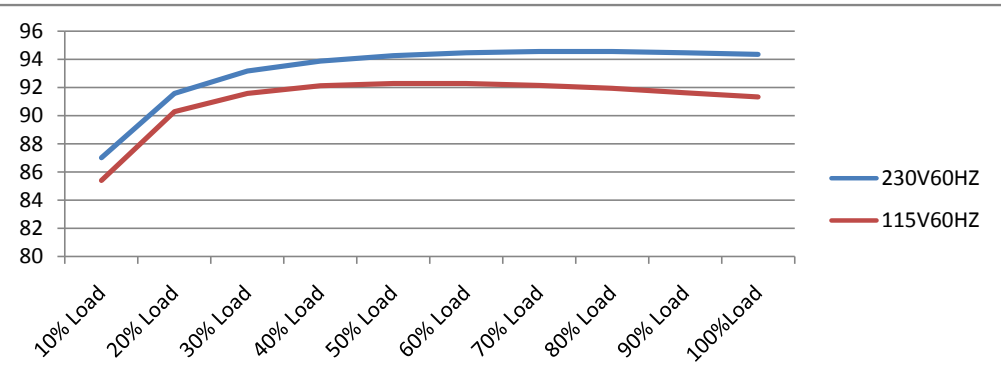
ENVIRONMENT TEST

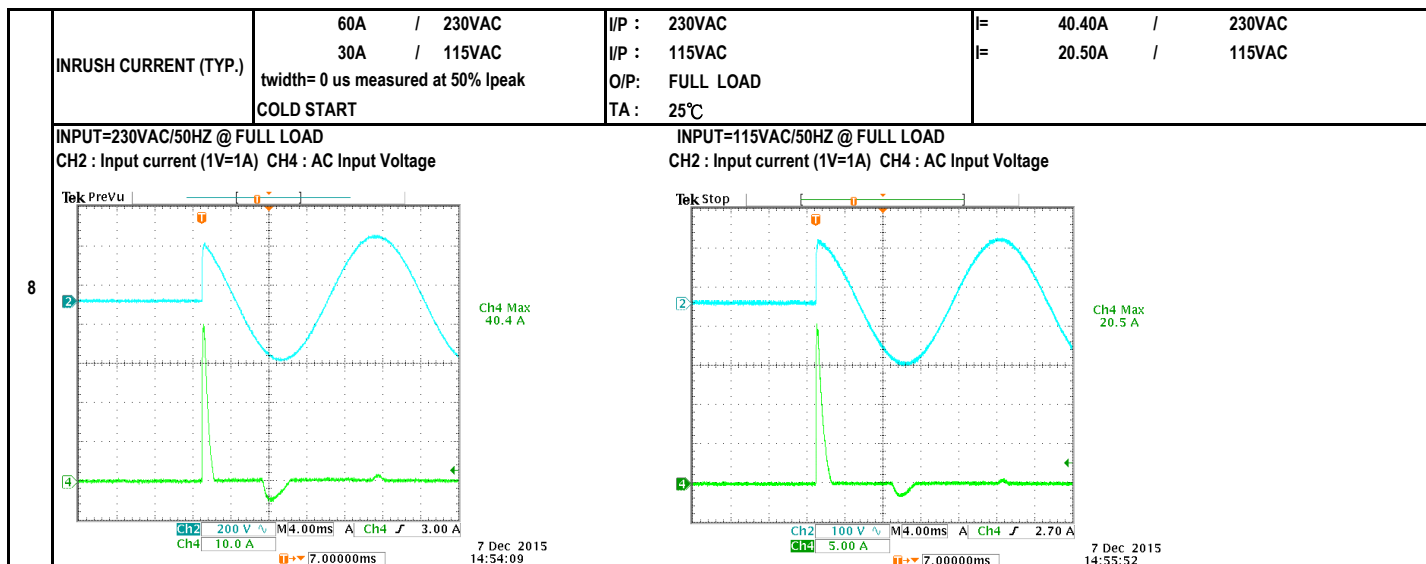
# DESIGN VERIFY TEST OUTPUT FUNCTION

| NO | TEST ITEM                         | SPECIFICATION                                                                                          | TEST CONDITION                                                               | RESULT                       |
|----|-----------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------|
| 1  | OUTPUT VOLTAGE<br>ADJUST RANGE    | CH1: 14.30V ~ 15.80V                                                                                   | I/P : 230VAC<br>O/P: MIN LOAD<br>TA : 25°C                                   | CH1: 13.79V ~ 16.16V         |
| 2  | OUTPUT VOLTAGE<br>TOLERANCE (Max) | V1 : 2.5% ~ -2.5%                                                                                      | I/P : 115VAC / 264VAC<br>O/P: FULL / MINLOAD<br>TA= 25°C                     | V1: 0.73% ~ 0.60%            |
| 3  | LINE REGULATION<br>(MAX.)         | V1 : 0.5% ~ -0.5%                                                                                      | I/P : 115VAC / 264VAC<br>O/P: FULL LOAD<br>TA: 25°C                          | V1: 0.00% ~ 0.00%            |
| 4  | LOAD REGULATION<br>(MAX.)         | V1 : 1.0% ~ -1.0%                                                                                      | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA: 25°C                        | V1: 0.07% ~ -0.07%           |
| 5  | OVER/UNDERSHOOT<br>TEST           | < ±5%                                                                                                  | I/P : 230VAC<br>O/P: FULL LOAD<br>TA: 25°C                                   | TEST< 2.649 %                |
| 6  | RIPPLE & NOISE(Max)               | V1 : 100 mVp-p                                                                                         | I/P : 230VAC<br>O/P: FULL LOAD<br>TA: 25°C                                   | V1 : 67.2 mVp-p              |
|    |                                   | high frequency :<br> |                                                                              |                              |
|    |                                   | low frequency :<br> |                                                                              |                              |
| 7  | SET UP TIME (MAX.)                | 230VAC : 500ms<br>115VAC : 500ms                                                                       | I/P : 230VAC<br>I/P : 115VAC                                                 | 230VAC 220ms<br>115VAC 232ms |
|    |                                   | 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 |                              |
|    |                                   |                    |                                                                              |                              |
|    |                                   |                                                                                                        |                                                                              |                              |

|    |                                                                              |                                                                              |                                                                                                     |                                            |
|----|------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------|
| 8  | RISE TIME (MAX.)                                                             | 230VAC : 30ms<br>115VAC : 30ms                                               | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA: 25°C                                          | 230VAC : 4.8ms<br>115VAC : 4.6ms           |
|    | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1 : Output Voltage                        | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1 : Output Voltage                        |                                                                                                     |                                            |
| 9  | HOLD UP TIME (TYP.)                                                          | 230VAC : 12ms<br>115VAC : 12ms                                               | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA: 25°C                                          | 230VAC : 21.0ms<br>115VAC : 20.8ms         |
|    | 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 : 1500 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 | (1). 956.0mv<br>(2). 702.0mv<br>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<br>113VDC ~ 370VDC | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C                                                                                        | 68.0VAC ~ 264VAC<br>100VDC ~ 370VDC                                                  |
|    |                           |                                   | I/P :<br>LOW-LINE = 77VAC<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 : 115VAC ~ 264VAC<br>O/P : FULL-MIN LOAD<br>Ta : 25°C                                                                            | TEST : OK                                                                            |
| 3  | INPUT CURRENT (TYP.)      | 1 / 230VAC<br>1.8 / 115VAC        | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                         | I= 0.982 / 230VAC<br>I= 1.747 / 115VAC                                               |
| 4  | LEAKAGE CURRENT           | < 0.75mA                          | I/P : 240VAC<br>O/P : MIN LOAD<br>TA : 25°C                                                                                          | L-FG: 0.063 mA<br>N-FG: 0.063 mA<br>O/P-FG: 0.056 mA                                 |
| 5  | NO LOAD POWER CONSUMPTION | < 0.50W                           | I/P : 230VAC<br>O/P : MIN LOAD<br>TA : 25°C                                                                                          | < 0.3443 W                                                                           |
| 6  | POWER FACTOR (TYP.)       | 0.94 / 230VAC<br>0.98 / 115VAC    | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                         | PF= 0.956 / 230VAC<br>PF= 0.993 / 115VAC                                             |
|    |                           |                                   |                                                                                                                                      |  |
| 7  | EFFICIENCY (TYP.)         | 93.0%                             | I/P : 230VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                                         | 94.333 %                                                                             |
|    |                           |                                   |                                                                                                                                      |  |



#### PROTECTION FUNCTION TEST

| NO | TEST ITEM                   | SPECIFICATION                          | TEST CONDITION                                                         | RESULT                                                                   |
|----|-----------------------------|----------------------------------------|------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 1  | OVER LOAD PROTECTION        | 110% ~ 140%                            | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 115VAC<br>O/P: TESTING<br>TA : 25°C | 123.4% 264VAC<br>123.4% 230VAC<br>123.4% 115VAC<br>Hiccup Mode           |
| 2  | OVER VOLTAGE PROTECTION     | 16.50V ~ 19.50V                        | I/P: 264VAC<br>I/P: 230VAC<br>I/P: 80VAC<br>O/P: MIN LOAD<br>TA : 25°C | 18.50V 264VAC<br>18.50V 230VAC<br>18.50V 80VAC<br>Shut down Re- power ON |
| 3  | 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                                                 |
| 4  | OVER TEMPERATURE PROTECTION | Shut down Re- power ON                 | I/P: 264VAC<br>I/P: 80VAC<br>O/P: FULL LOAD                            | O.T.P. Active<br>Shut down Re- power ON                                  |

#### CONTROL FUNCTION TEST

| NO | TEST ITEM       | SPECIFICATION                                             | TEST CONDITION                             | RESULT                                                          |
|----|-----------------|-----------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------|
| 1  | AUXILIARY POWER | 12V / 0.5A<br>ripple & noise: * mv<br>Tolerance: -15~15 % | I/P: 230VAC<br>O/P: FULL LOAD<br>TA : 25°C | 11.532 V/ 0.4993 A<br>ripple & noise: * mv<br>Tolerance: -3.9 % |

#### COMPONENT STRESS TEST

| NO | TEST ITEM            | SPECIFICATION                                                               | TEST CONDITION                                                                                                            | RESULT                                                                                                              |
|----|----------------------|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| 1  | PWM Power Transistor | Q5 Rated : 500V 13.0A<br>Q6 Rated : 500V 13.0A                              | I/P : 267VAC<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                      | Q5 Q6<br>(1). 492.00V 494.00V<br>(2). 492.00V 494.00V<br>(3). 442.00V 454.00V                                       |
| 2  | Input Capacitor      | C5 Rated : 100uf 420V                                                       | 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). 417.00V<br>(2). 415.00V<br>(3). 417.00V                                                                        |
| 3  | Control IC           | U1 Rated : 38.0V (max)<br>13.0V (min)<br>U101 Rated : 24V (max)<br>6V (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 | U1 U101<br>(1). 33.70V 12.40V<br>(2). 20.10V 2.48V<br>(3). 20.10V 2.48V<br>(4). 33.00V 13.60V<br>(5). 25.50V 10.60V |

|   |                      |                                                |                                                                                                                                                                          |                                                                             |
|---|----------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 4 | O/P Diode (MOSFET)   | Q101 Rated : 60V 100A                          | I/P : 267VAC<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                                                                     | Q101 Q102<br>(1). 36.30V 36.70V<br>(2). 11.90V 13.20V<br>(3). 36.10V 33.80V |
| 5 | PFC Power Transistor | Q102 Rated : 60V 100A<br>Q1 Rated : 600V 20.2A | I/P : 267VAC<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                                                                     | (1). 544.00V<br>(2). 546.00V<br>(3). 502.00V                                |
| 6 | PFC Diode            | D1 Rated : 600V 5.0A                           | 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). 500.00V<br>(2). 490.00V<br>(3). 494.00V<br>(4). 506.00V                |

# SAFETY & E.M.C. TEST

## SAFETY TEST

| NO | TEST ITEM            | SPECIFICATION                                                                  | TEST CONDITION                                                                           | RESULT                                                           |
|----|----------------------|--------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 3.000KVAC /min<br>I/P-FG : 2.000KVAC /min<br>O/P-FG : 0.500KVAC /min | I/P-O/P: 3.600KVAC /min<br>I/P-FG: 2.400KVAC /min<br>O/P-FG: 0.600KVAC /min<br>Ta : 25°C | I/P-O/P: 1.00mA<br>I/P-FG: 1.38mA<br>O/P-FG: 0.57mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ<br>I/P-FG : 500VDC>100MΩ                                | I/P-O/P: 500VDC<br>I/P-FG: 500VDC<br>Ta : 25°C/70%RH                                     | I/P-O/P: 9999MΩ<br>I/P-FG: 9999MΩ<br>NO DAMAGE                   |

## E.M.C. TEST

| NO | TEST ITEM  | SPECIFICATION                                   | TEST CONDITION                                                | RESULT                        |
|----|------------|-------------------------------------------------|---------------------------------------------------------------|-------------------------------|
| 1  | HARMONIC   | EN61000-3-2<br>CLASS A                          | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | PASS                          |
| 2  | CONDUCTION | EN55022<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  | EN55022<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>INDUSTRY AIR: 8KV / Contact: 4KV | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |
| 5  | E.F.T      | EN61000-4-4<br>INDUSTRY INPUT: 2KV              | I/P : 230VAC /50HZ<br>O/P : FULL LOAD<br>Ta : 25°C            | CRITERIA A                    |
| 6  | SURGE      | IEC61000-4-5<br>INDUSTRY L-N: 2KV;L/N-PE: 4KV   | 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 : EPP-200-12                                                                           |                                                                   |                    |
|    |                                                        | 1. ROOM AMBIENT BURN-IN : 1.0hrs                                                             |                                                                   |                    |
|    |                                                        | IP: 230VAC O/P: 100% LOAD TA= 18.5℃                                                          |                                                                   |                    |
|    |                                                        | 2. HIGH AMBIENT BURN-IN : 1.0hrs                                                             |                                                                   |                    |
|    |                                                        | IP: 230VAC O/P: 100% LOAD TA= 49.3℃                                                          |                                                                   |                    |
|    |                                                        |                                                                                              | NO. Position ROOM AMBIENT 18.5℃ HIGH AMBIENT Ta: 49.3℃            |                    |
|    |                                                        |                                                                                              | 1 RTH1 66.8℃ 84.9℃                                                |                    |
|    |                                                        |                                                                                              | 2 LF1 46.5℃ 70.3℃                                                 |                    |
|    |                                                        |                                                                                              | 3 LF2 40.3℃ 62.2℃                                                 |                    |
|    |                                                        |                                                                                              | 4 L2 52.1℃ 73.4℃                                                  |                    |
|    |                                                        |                                                                                              | 5 BD1 56.2℃ 81.0℃                                                 |                    |
|    |                                                        |                                                                                              | 6 Q1 58.4℃ 83.5℃                                                  |                    |
|    |                                                        |                                                                                              | 7 C5 53.4℃ 73.4℃                                                  |                    |
|    |                                                        |                                                                                              | 8 C81 42.6℃ 69.3℃                                                 |                    |
|    |                                                        |                                                                                              | 9 RTH2 50.6℃ 75.2℃                                                |                    |
|    |                                                        |                                                                                              | 10 T1 COIL 75.1℃ 96.8℃                                            |                    |
| 2  | OVER LOAD BURN-IN TEST                                 | NO DAMAGE                                                                                    | I/P : 230VAC                                                      | TEST : OK          |
|    |                                                        | 1 HOUR ( MIN )                                                                               | O/P : 142.70% LOAD<br>Ta : 25℃                                    |                    |
| 3  | LOW TEMPERATURE TURN ON TEST                           | NO DAMAGE<br>1 HOUR ( MIN )                                                                  | I/P : 264VAC / 115VAC<br>O/P : FULL LOAD<br>Ta : -30.0℃           | TEST : OK          |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE TEST | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 50℃<br>NO DAMAGE                                  | I/P : 272VAC<br>O/P : FULL LOAD<br>Ta : 50℃<br>HUMIDITY= 95.0% RH | TEST : OK          |
| 5  | TEMPERATURE COEFFICIENT                                | ±0.03% /(0℃~50℃)                                                                             | I/P : 230VAC<br>O/P : FULL LOAD                                   | ±0.0054% /(0℃~50℃) |
| 6  | STORAGE TEMPERATURE TEST                               | 1. Thermal shock Temperature : -40℃ ~ +85℃                                                   |                                                                   | TEST : OK          |
|    |                                                        | 2. Temperature change rate : 25℃ / MIN                                                       |                                                                   |                    |
| 7  | THERMAL SHOCK TEST                                     | 3. Dwell time low and high temperature : 30 MIN/EACH                                         |                                                                   |                    |
|    |                                                        | 4. Total test cycle : 5 CYCLE                                                                |                                                                   |                    |
| 8  | VIBRATION TEST                                         | 5. Input/Output condition : STATIC                                                           |                                                                   |                    |
|    |                                                        | 1. Thermal shock Temperature : -35℃ ~ +55℃                                                   |                                                                   | TEST : OK          |
| 9  | CAPACITOR LIFE CYCLE                                   | 2. Temperature change rate : 25℃ / MIN                                                       |                                                                   |                    |
|    |                                                        | 3. Dwell time low and high temperature : 30 MIN/EACH                                         |                                                                   |                    |
| 10 | MTBF                                                   | 4. Total test cycle : 10 CYCLE                                                               |                                                                   |                    |
|    |                                                        | 5. Input/Output condition :<br>230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec |                                                                   |                    |
| 11 | DMTBF /Accelerated Life test                           | 1 Carton & 1 Set                                                                             |                                                                   | TEST : OK          |
|    |                                                        | (1) Waveform : Sine Wave                                                                     |                                                                   |                    |
| 12 |                                                        | (2) Frequency : 10~500Hz                                                                     |                                                                   |                    |
|    |                                                        | (4) Acceleration : 2G                                                                        |                                                                   |                    |
| 13 |                                                        | (5) Test Time : 60 min in each axis (X.Y.Z)                                                  |                                                                   |                    |
|    |                                                        | (6) Ta : 25℃                                                                                 |                                                                   |                    |
| 14 |                                                        | :SUPPOSE C105 IS THE MOST CRITICAL COMPONENT                                                 |                                                                   |                    |
|    |                                                        | (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0℃ LIFE TIME                                         | (1). 42029.9 HRS                                                  |                    |
| 15 |                                                        | (2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0℃ LIFE TIME                                         | (2). 11348.7 HRS                                                  |                    |
|    |                                                        | (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0℃ LIFE TIME                                          | (3). 68992 HRS                                                    |                    |
| 16 |                                                        | (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0℃ LIFE TIME                                          | (4). 151383.7 HRS                                                 |                    |
| 17 |                                                        | MIL-HDBK-217F                                                                                |                                                                   |                    |
|    |                                                        | TOTAL FAILURE RATE : 500.2 KHRS                                                              |                                                                   |                    |
| 18 |                                                        | Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS                      | @ TA 50℃                                                          |                    |
|    |                                                        |                                                                                              |                                                                   |                    |

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

2007/3/20 A50-S014