



Test Report : SHP-10K-115

10KW 3 ψ 3W High Efficiency Digital Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Control Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

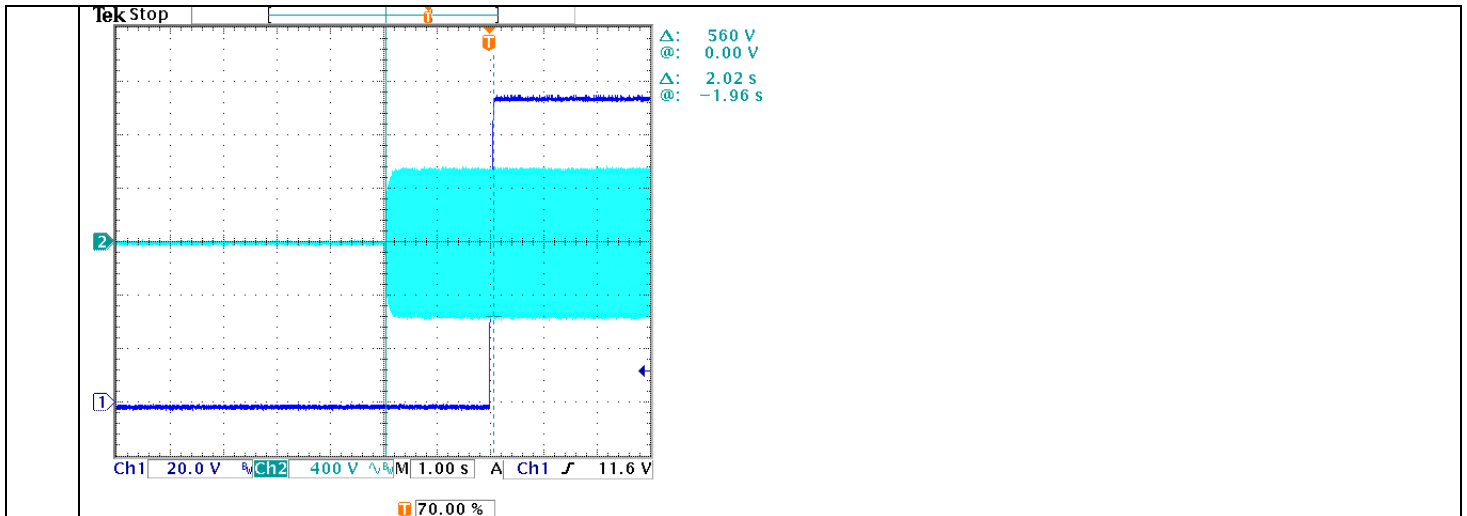
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

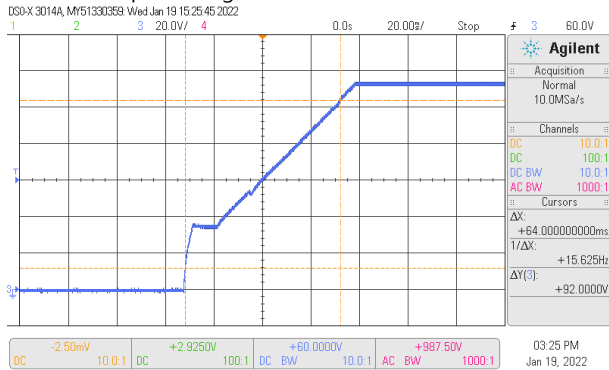
| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|--|-------------------------------|---|--|---|
| 1 | OUTPUT VOLTAGE ADJUST RANGE | CH1 : 90V~ 138 V | I/P : 400VAC I/P : 340 VAC O/P : MIN LOAD Ta : 25°C | 87.27V~142.44V/400VAC 87.27V~142.46V /340VAC |
| 2 | OUTPUT VOLTAGE(Max) TOLERANCE | V1 : 1%~ -1 % | I/P : 340VAC /530VAC O/P : FULL/ MIN. LOAD Ta : 25°C | V1 : 0.26 %~ -0.017 % |
| 3 | LINE REGULATION (Max) | V1 : 0.5%~ -0.5 % | I/P : 340VAC~ 530VAC O/P : FULL LOAD Ta : 25°C | V1 : -0.087 %~ -0.034 % |
| 4 | LOAD REGULATION(Max) | V1 : 0.5%~ -0.5 % | I/P : 400VAC O/P : FULL ~MIN LOAD Ta : 25°C | V1 : 0.095 % ~ -0.078 % |
| 5 | OVER/UNDERSHOOT TEST | < \pm 10% | I/P : 400VAC O/P : FULL LOAD Ta : 25°C | < \pm 10% |
| 6 | RIPPLE & NOISE(Max) | V1 : 0.6Vp-p | I/P : 400VAC O/P : FULL LOAD Ta : 25°C | 0.36V |
| | | <div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>high frequency :</p> </div> <div style="width: 45%;"> <p>low frequency :</p> </div> </div> | | |
| 7 | SET UP TIME(Max) | 400VAC/3000ms | I/P : 400VAC O/P : FULL LOAD Ta : 25°C | 2020ms |
| <p>INPUT=400VAC/50HZ @ FULL LOAD CH3 : Output Voltage CH4 : AC Input Voltage</p> | | | | |



| | | | | |
|---|-----------------|--------------|--|------|
| 8 | RISE TIME (Max) | 400VAC/100ms | I/P : 400VAC O/P : FULL LOAD Ta : 25°C | 64ms |
|---|-----------------|--------------|--|------|

INPUT=400VAC/50HZ @ FULL LOAD

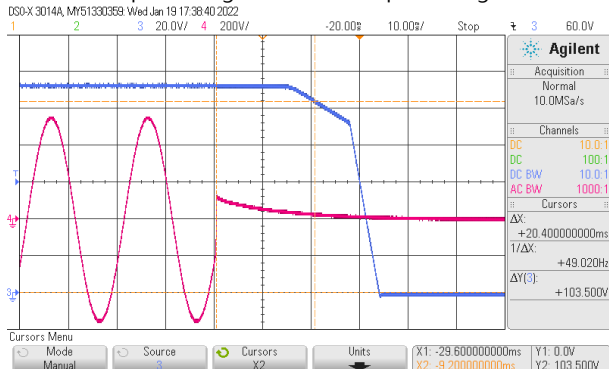
CH1 : Output Voltage



| | | | | |
|---|---------------------|---|--|---|
| 9 | HOLD UP TIME (Typ.) | 20ms / 400VAC at full load 25ms / 400VAC at 75% load | I/P : 400VAC O/P : FULL LOAD 75% load Ta : 25°C | 20.4 ms at full load 28.0 ms at 75% load |
|---|---------------------|---|--|---|

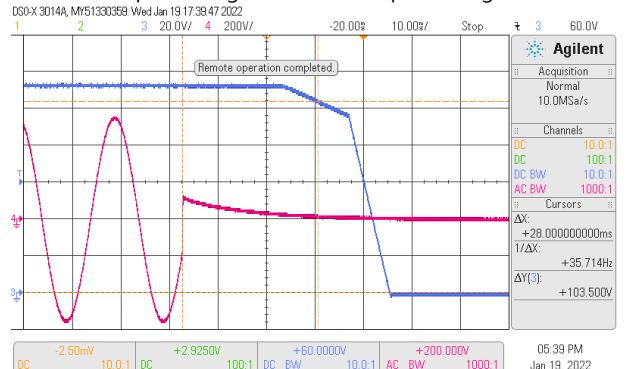
INPUT=400VAC/50HZ @ FULL LOAD

CH3 : Output Voltage CH4 : AC Input Voltage

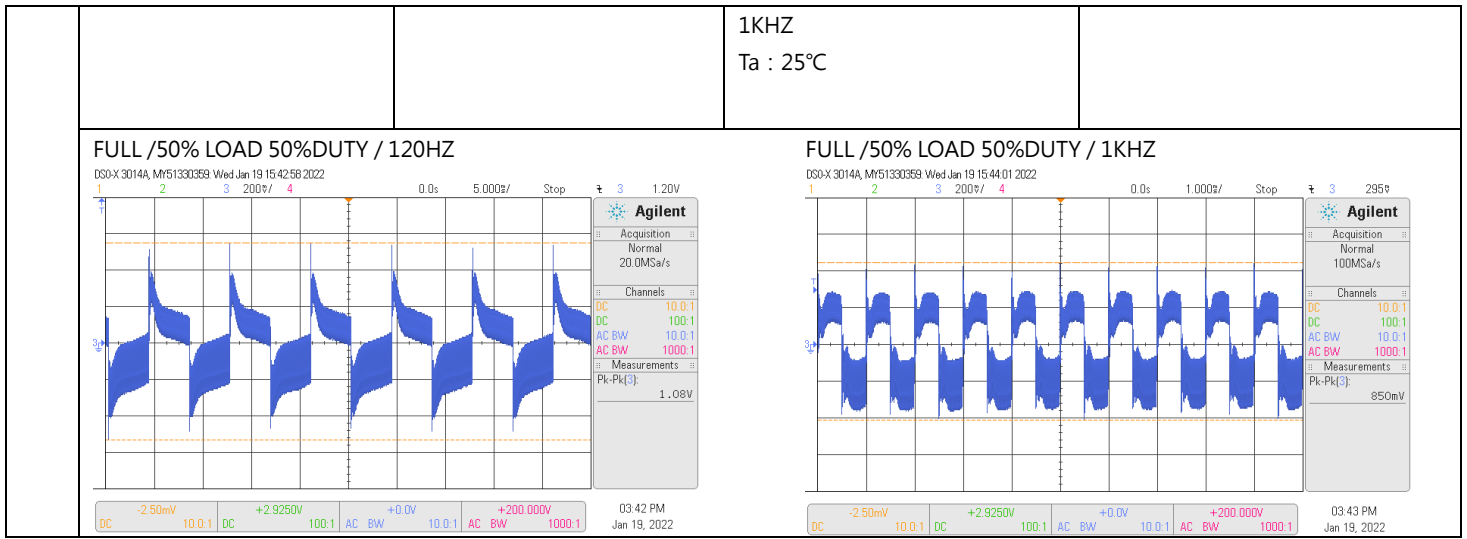


INPUT=400VAC/50HZ @ 75% LOAD

CH3 : Output Voltage CH4 : AC Input Voltage

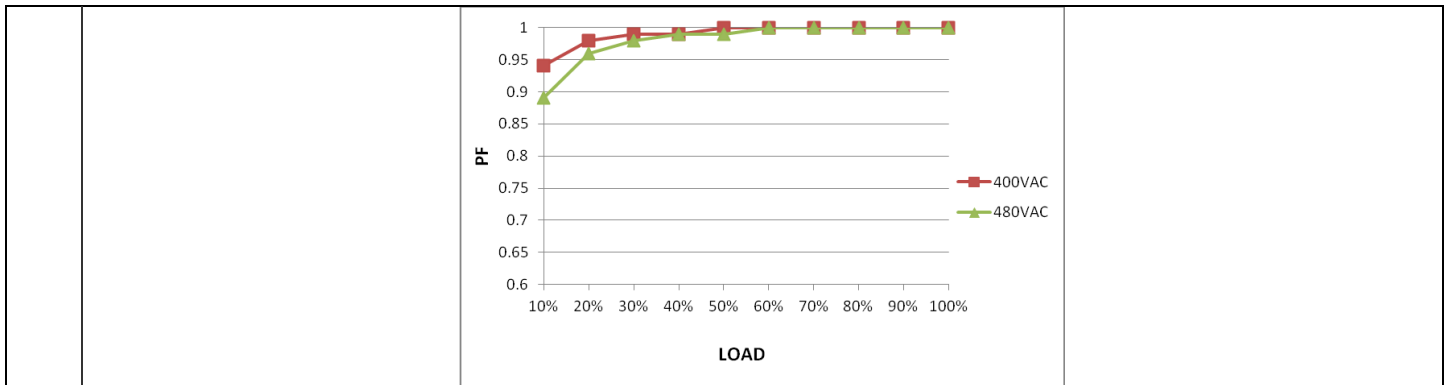


| | | | | |
|----|--------------|---------------|--|-----------------------|
| 10 | DYNAMIC LOAD | V1 : 11.5Vp-p | I/P : 400VAC O/P : (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / | 1080mVp-p 850mVp-p |
|----|--------------|---------------|--|-----------------------|

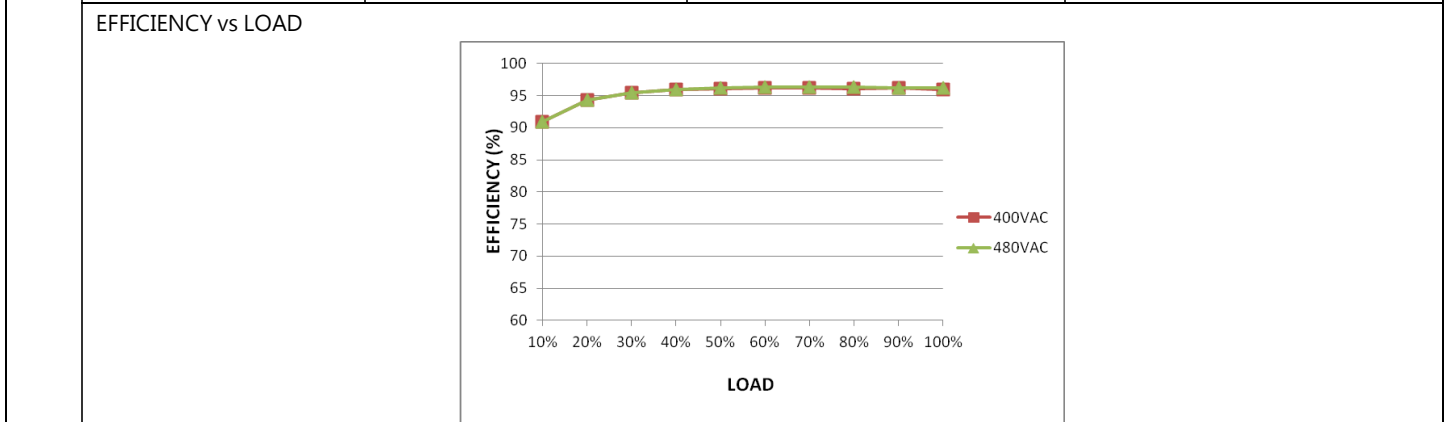


INPUT FUNCTION TEST

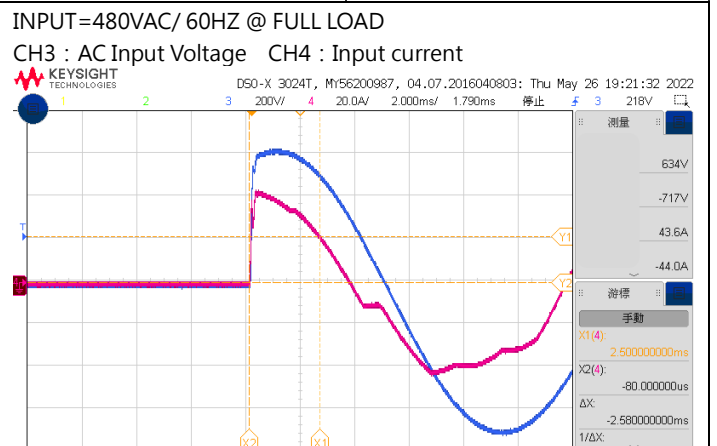
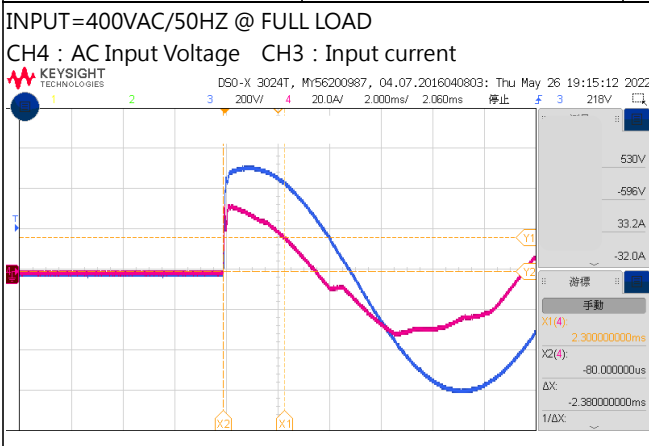
| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------|---|---|--|
| 1 | INPUT VOLTAGE RANGE | 340VAC~530VAC | (1) I/P : TESTING O/P : FULL LOAD Ta : 25°C | (1) 335V~530V |
| | | | I/P : LOW-LINE-3V=337V HIGH-LINE+10V=540 V O/P : FULL/MIN LOAD (PLEASE CHECK DERATING 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 : 340 VAC ~530 VAC O/P : FULL~MIN LOAD Ta : 25°C | TEST : PASS |
| 3 | INPUT CURRENT (Typ.) | 400V / 15.7 A 480V/ 13 A | I/P : 400VAC I/P : 480 VAC O/P : FULL LOAD Ta : 25°C | I =15.23A/ 400VAC I =12.85A/ 480VAC |
| 4 | LEAKAGE CURRENT | < 6.5mA / 530 VAC | I/P : 530 VAC O/P : Min LOAD Ta : 25°C | L1-FG : 5.2mA peak L2-FG : 5.2mA peak L3-FG : 5.1mA peak |
| 5 | POWER FACTOR (Typ.) | $\geq 0.98/ 400VAC$ $\geq 0.98/480VAC$ | I/P : 400VAC I/P : 480 VAC O/P : FULL LOAD Ta : 25°C | PF= 0.999 PF= 0.998 |
| | P.F vs LOAD | | | |



| | | | | |
|---|------------------|-----|--|--------|
| 6 | EFFICIENCY(Typ.) | 96% | I/P : 480VAC O/P : FULL LOAD Ta : 25°C | 96.02% |
|---|------------------|-----|--|--------|



| | | | | |
|---|----------------------|--|---|--|
| 7 | INRUSH CURRENT(Typ.) | 40A@400VAC 65A@480VAC COLD START | I/P : 400VAC I/P : 480 VAC O/P : FULL LOAD Ta : 25°C | I = 33.2A/ 400VAC T50=2.38ms I = 43.6A/ 480VAC T50=2.58ms |
|---|----------------------|--|---|--|



PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|-----------------------------|---|---|---|
| 1 | OVER LOAD PROTECTION | 100%~ 105 % PROTECTION TYPE : Constant current limiting, unit will shutdown after 5 sec. re-power on to recover | I/P : 530 VAC I/P : 400VAC I/P : 340VAC O/P : TESTING Ta : 25°C | 104.14% 104.14% 103.62% PROTECTION TYPE : Constant current limiting, unit will shutdown after 5 sec. re-power on to recover |
| 2 | OVER VOLTAGE PROTECTION | 145V~166V PROTECTION TYPE : Shut down o/p voltage, re-power on to recover | I/P : 530 VAC I/P : 400VAC I/P : 340 VAC O/P : MIN LOAD Ta : 25°C | 154.86V/ 530 VAC 154.9V/ 400VAC 154.41V/ 340VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover |
| 3 | OVER TEMPERATURE PROTECTION | Protection type : Shut down o/p voltage, recovers automatically after temperature goes down | I/P : 530 VAC I/P : 340 VAC 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 : 530 VAC I/P : 340 VAC O/P : FULL LOAD Ta : 25°C | NO DAMAGE PROTECTION TYPE : Constant current limiting, unit will shutdown after 5 sec. re-power on to recover |

CONTROL FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | |
|----------|-----------------------|---|---|--------|-----|-----------|--------|-------------|----------|------------|----------|---|
| 1 | AUXILIARY POWER (AUX) | Auxiliary voltage output, 11.4~12.6V, referenced to GND-AUX (pin15 & 16). The maximum load current is 1A. This output is not controlled by "Remote ON-OFF" . I/P : 400VAC O/P : FULL LOAD Ta : 25°C Test Result : PASS | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>AUX</th> <th>TOLERANCE</th> <th>RIPPLE</th> <th>TEST RESULT</th> </tr> </thead> <tbody> <tr> <td>12V / 1A</td> <td>11.4~12.6V</td> <td>150mVp-p</td> <td>No Load : 12.058V Full Load : 11.689V Ripple : 18mV</td> </tr> </tbody> </table> | | | AUX | TOLERANCE | RIPPLE | TEST RESULT | 12V / 1A | 11.4~12.6V | 150mVp-p | No Load : 12.058V Full Load : 11.689V Ripple : 18mV |
| AUX | TOLERANCE | RIPPLE | TEST RESULT | | | | | | | | | |
| 12V / 1A | 11.4~12.6V | 150mVp-p | No Load : 12.058V Full Load : 11.689V Ripple : 18mV | | | | | | | | | |

2 REMOTE ON/OFF CONTROL

4.Remote ON-OFF Control

※ The power supply can be turned ON-OFF by using the "Remote ON-OFF" function.

| Between Remote ON-OFF(CN86 pin1) and 5V-AUX(CN86 pin2) | Output Status |
|--|------------------|
| Switch close (Short) | power supply ON |
| Switch open (Open) | power supply OFF |

Table 4.1

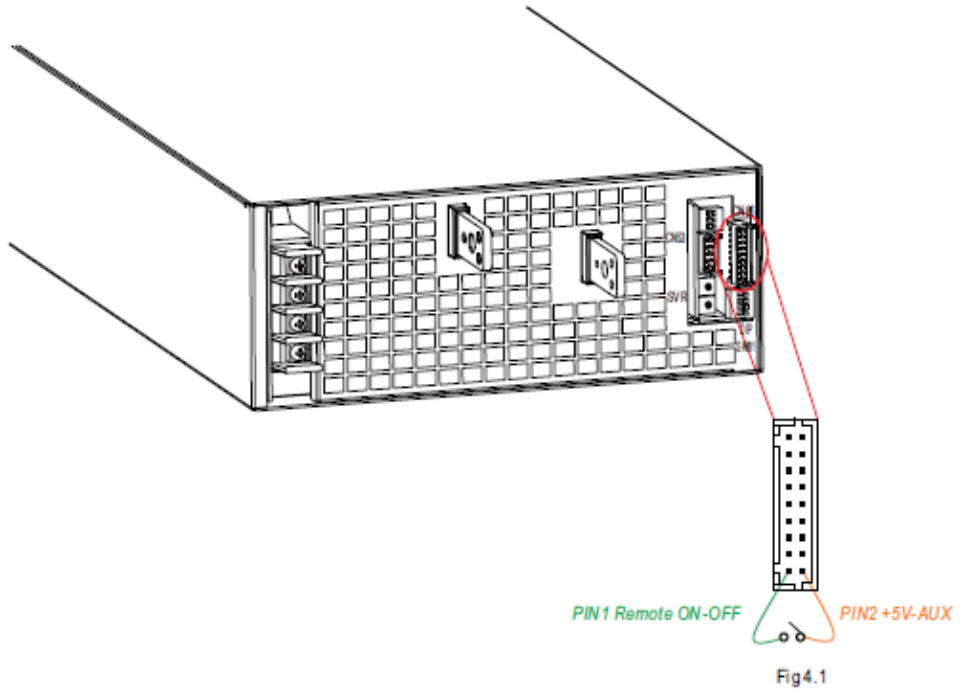


Fig4.1

I/P : 400VAC
 O/P : FULL LOAD
 Ta : 25°C
 Test Result : PASS

| Between Remote ON-OFF(CN86 pin1) and 5V-AUX(CN86 pin2) | Output Status |
|--|------------------|
| Switch close (Short) | power supply ON |
| Switch open (Open) | power supply OFF |

3 ALARM SIGNAL

5. Alarm Signal Output

※ There are 4 alarm signals, DC-OK, T-ALARM, Fan Fail and AC-OK, in TTL signal form, on CN86. These signals are isolated from output.

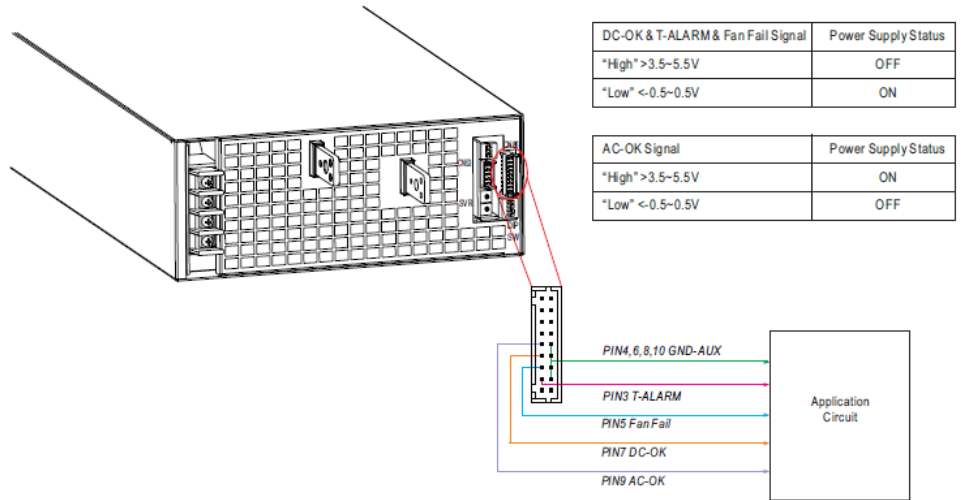


Fig 5.1

※ DC OK might mis-triggered when the voltage difference between PSU and the load, please minimized the unnecessary voltage difference.

1. DC OK SIGNAL

High (3.5 ~ 5.5V) : When the $V_{out} \leq 80\% \pm 6\%$.

Low (-0.5 ~ 0.5V) : When the $V_{out} \geq 80\% \pm 6\%$.

The maximum sourcing current is 10mA and only for output.

I/P : 400VAC

O/P : FULL LOAD

Ta : 25°C

Test Result :

| Vout | DC OK SIGNAL |
|---------------------|--------------|
| $V_{out} \leq 74\%$ | 5.05V |
| $V_{out} \geq 86\%$ | 0V |

2. T-ALARM

High (3.5 ~ 5.5V) : When the internal temperature exceeds the limit of temperature alarm.

Low (-0.5 ~ 0.5V) : When the internal temperature is normal.

The maximum sourcing current is 10mA and only for output.(Note)

I/P : 400VAC

O/P : FULL LOAD

Ta : 25°C

Test Result :

| PSU STATUS | T-ALARM SPEC | T-ALARM TEST |
|------------|--------------|--------------|
| NORMAL | -0.5 ~ 0.5V | 0V |
| OTP | 3.5~5.5V | 5.02V |

3. AC OK
 High (3.5 ~ 5.5V): When AC input $\geq 335 \pm 1.5\%$ Vac, PSU works normally.
 Low (-0.5 ~ 0.5V): When AC input $\leq 320 \pm 1.5\%$ Vac, PSU shut down.
 The maximum sourcing current is 10mA and only for output.(Note)
 I/P : 400VAC
 O/P : FULL LOAD
 Ta : 25°C
 Test Result :

| AC | AC OK SIGNAL |
|----------------|--------------|
| $AC \leq 320V$ | 0V |
| $AC \geq 335V$ | 5.06V |

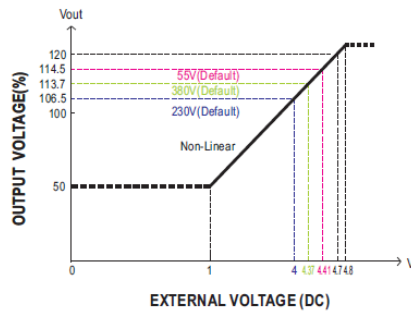
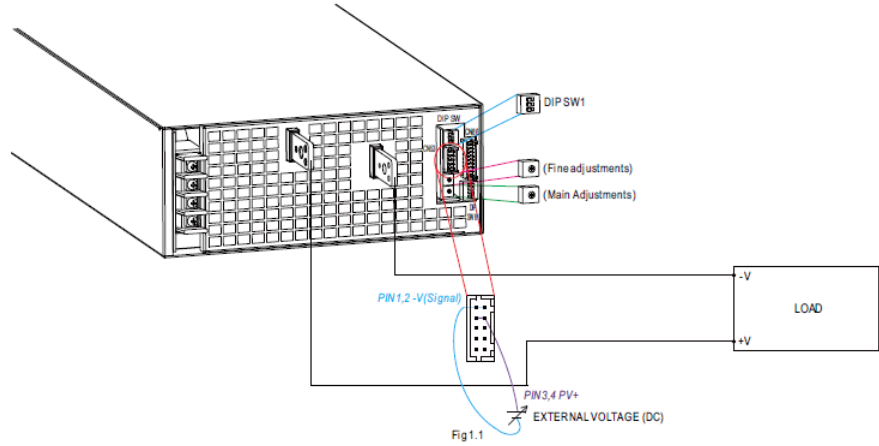
4. FAN FAIL
 High(3.5~5.5V):When the fan fail.
 Low(-0.5~0.5V):When the fan works normally.
 The maximum sourcing current is 10mA and only for output.(Note)
 I/P : 400VAC
 O/P : FULL LOAD
 Ta : 25°C
 Test Result :

| FAN | AC OK SIGNAL |
|-----------|--------------|
| Fan works | 0V |
| Fan lock | 5.05V |

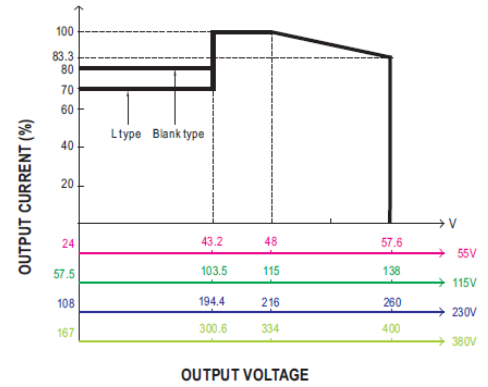
4 OUTPUT VOLTAGE PROGRAMMABLE(PV)

1. Output Voltage Programming (or, PV/ remote voltage programming / remote adjust / margin programming / dynamic voltage trim)

- (1) by potentiometer (SVR)
 - (a) Have the DIP switch position-3 set as
 - (b) Output voltage can be trimmed by SVR.
- (2) by Output Voltage Programming
 - (a) Have the DIP switch position-3 set as
 - (b) The output voltage can be trimmed to 50~120% by applying EXTERNAL VOLTAGE between PV+ and PV- on CN53.



© The 100% output voltage is 48/115/216/334V.



© The rated current should change with the Output Voltage Programming accordingly.

I/P: 400VAC
 O/P: FULL LOAD
 Ta: 25°C
 TEST RESULT :

| | | |
|-------|----------|---------|
| | PV | |
| MODEL | 1V | 5V |
| SPEC | 57.5V±5% | 138V±5% |
| Vout | 58.43V | 140.4V |

5 OUTPUT CURRENT PROGRAMMABLE (PC)

2. Constant Current Programming (or, PC / remote current programming / dynamic current trim)

(1) Default Overload Protection(OLP) value

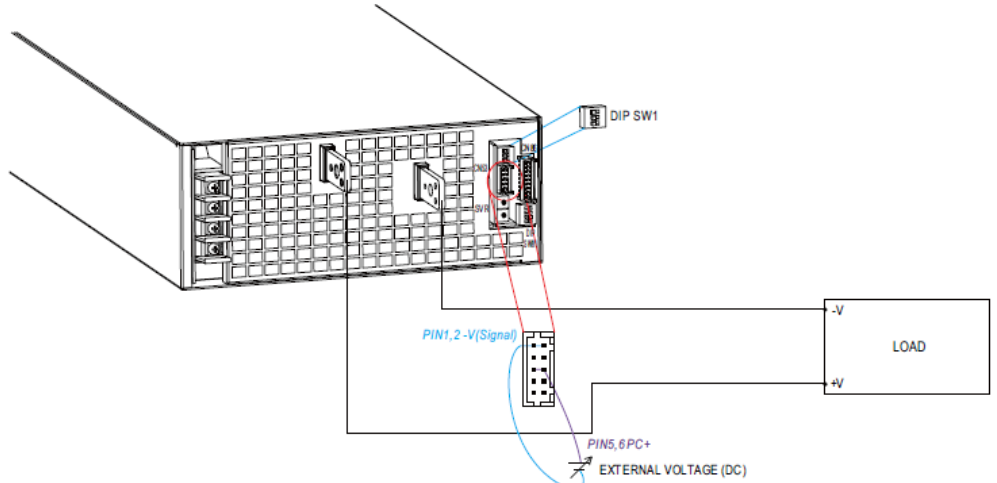
(a) Have the DIP switch position-2 set as

(b) Output current is set default value.

(2) by Constant Current Level Programming

(a) Have the DIP switch position-2 set as

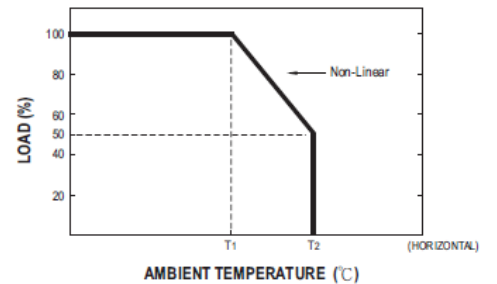
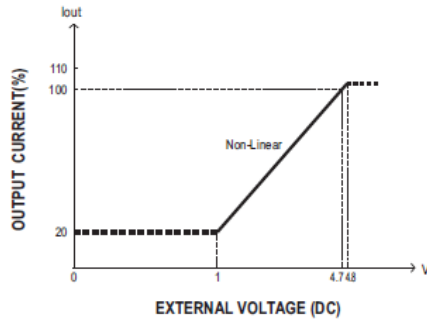
(b) The constant current level can be trimmed to 20~100% of the rated current by applying EXTERNAL VOLTAGE between PC+ and PC- on CN53.



※ Under PC function at wattage < 4KW, the power supply might enter burst mode and cause output unstable, please increase the load to minimized the effect.
 ※ Auto de-rating function covered by over temperature protection, it works either in PC mode or under control by communication protocol.

T₁(Typ.): Maximum ambient temperature of full load.

T₂(Typ.): T₁+5°C.



I/P : 400VAC

O/P : TESTING (factory default)

T_a : 25°C

| | PC | 1V | 5V |
|-------|----|-----------|------------|
| MODEL | | | |
| SPEC | | 17.4A±10% | 88.88A±10% |
| lout | | 16.8A | 88.69A |

| | | | | |
|---|-----------------|--|--|---|
| 6 | CURRENT SHARING | CURRENT SHARING TOLERANCE $<\pm 10\%$ | I/P : 400 VAC O/P : 115V (factory default) 100/50% LOAD Ta : 25°C | O/P : 100% PSU1 : 87.4 A PSU2 : 86.2 A PSU3 : 85.2 A PSU4 : 84.8 A O/P : 50% PSU1 : 43 A PSU2 : 43.2 A PSU3 : 43.6 A PSU4 : 43.2 A |
|---|-----------------|--|--|---|

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|--|---|--|
| 1 | PWM Transistor (D to S) or (C to E) Peak Voltage | Q401 Rated : 95A/1200V VGS : -10V~+22V | AC ON/OFF I/P : High-Line +3V =533V VO : 115V O/P : (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→120% Load. Ta : 25°C | Q401 VO : 115V VDS : (1) 946V (2) 954V (3) 930V (4) 938V (5) 930V (6) 938V (7) 946V |
| 2 | P.F.C Transistor (D to S) or (C to E) Peak Voltage | Q163 Rated : 119A/650V VGS : -10~+22V | I/P : High-Line +3V =533V AC ON/OFF VO : 115V O/P : (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→120% Load. | VO : 115V VDS : (1) 493V (2) 493V (3) 489V (4) 521V (5) 485V (6) 461V (7) 533V |

| | | | | | |
|---|--------------------|--|---|--|--|
| | | | Ta : 25°C | | |
| 3 | P.F.C DIODE | D163 Rated : 15A/1200V | I/P : High-Line +3V =533V AC ON/OFF <u>VO : 115V</u> 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 | <u>VO : 115V</u> VD : (1) 897V (2) 897V (3) 889V (4) 857V | |
| 4 | Diode Peak Voltage | D610 Rated : 20A / 650V D613 Rated : 20A / 650V D616 Rated : 20A / 650V D619 Rated : 20A / 650V | AC ON/OFF I/P : High-Line +3V =533V <u>VO : 115V</u> O/P : (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→120% Load. (8).NO LOAD Ta : 25°C | D611 : <u>VO : 115V</u> VD : (1) 308V (2) 308V (3) 308V (4) 308V (5) 308V (6) 308V (7) 308V (8) 280V D613 : <u>VO : 115V</u> VD : (1) 316V (2) 320V (3) 312V (4) 316V (5) 316V (6) 316V (7) 316V (8) 282V | D616 : <u>VO : 115V</u> VD : (1) 316V (2) 320V (3) 316V (4) 316V (5) 316V (6) 316V (7) 316V (8) 284V D619 : <u>VO : 115V</u> VD : (1) 316V (2) 316V (3) 312V (4) 312V (5) 312V (6) 320V (7) 320V (8) 280V |

■ SAFETY& E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|----------------------|--|--|--|
| 1 | WITHSTAND VOLTAGE | I/P-O/P : 3.75KVAC/min I/P-FG : 2KVAC/min O/P-FG : 1.25KVAC/min | I/P-O/P : 4.125KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 1.5 KVAC/min Ta : 25°C | I/P-O/P : 18.72mA I/P-FG : 15.09mA O/P-FG : 16.39mA NO DAMAGE |
| 2 | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100M Ω I/P-FG : 500VDC>100M Ω O/P-FG : 500VDC>100M Ω | I/P-O/P : 500 VDC I/P-FG : 500 VDC O/P-FG : 500 VDC Ta : 25°C | I/P-O/P : 6.33 G Ω I/P-FG : 11.4 G Ω O/P-FG : 10.8 G Ω NO DAMAGE |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS OR TRACE < 100 M Ω | 40A / 2min Ta : 25°C | 27 m Ω |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT |
|----|---|--|---|--------|
| 1 | HARMONIC | EN61000-3-2 CLASS A | I/P : 400VAC/50HZ O/P : FULL LOAD Ta : 25°C | PASS |
| 2 | CONDUCTION | EN55032 /EN55011 CLASS B | I/P : 400VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C | PASS |
| 3 | RADIATION | EN55032 /EN55011 CLASS A | I/P : 400VAC (50HZ) O/P : FULL LOAD Ta : 25°C | PASS |
| 4 | E.S.D | EN61000-4-2 <u>INDUSTRY</u> AIR : 8KV / Contact : 4KV | I/P : 400VAC/50HZ O/P : FULL LOAD Ta : 25°C | PASS |
| 5 | E.F.T | EN61000-4-4 <u>INDUSTRY</u> INPUT : 2KV | I/P : 400VAC/50HZ O/P : FULL LOAD Ta : 25°C | PASS |
| 6 | SURGE | IEC61000-4-5 <u>INDUSTRY</u> L-N : 2KV L,N-PE : 4KV | I/P : 400VAC/50HZ O/P : FULL LOAD Ta : 25°C | PASS |
| 7 | Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report | | | |

■ **RELIABILITY TEST**

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|-----------------------|--|-----------------------|---|----|----------|-----------------------|-----------------------|---|------|--------|--------|---|------|--------|--------|---|------|--------|--------|---|----|--------|--------|---|------|--------|--------|---|------|--------|--------|---|------|--------|---------|---|------|--------|---------|---|------|--------|---------|----|------|--------|--------|----|-----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|-----|--------|--------|----|-----|--------|--------|----|----|--------|--------|----|-----|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|------|--------|--------|----|---------|--------|--------|----|---------|--------|---------|----|---------|--------|--------|----|---------|--------|--------|----|----------|--------|--------|
| 1 | TEMPERATURE RISE TEST | MODEL : SHP-10K-115 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 400VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 400VAC O/P : FULL LOAD Ta= 50 °C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | <table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25°C</th> <th>HIGH AMBIENT Ta= 50°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C110</td><td>33.0°C</td><td>55.4°C</td></tr> <tr><td>2</td><td>D162</td><td>79.7°C</td><td>97.0°C</td></tr> <tr><td>3</td><td>D163</td><td>75.6°C</td><td>91.4°C</td></tr> <tr><td>4</td><td>L5</td><td>39.0°C</td><td>64.7°C</td></tr> <tr><td>5</td><td>Q160</td><td>74.5°C</td><td>88.6°C</td></tr> <tr><td>6</td><td>Q161</td><td>71.8°C</td><td>82.2°C</td></tr> <tr><td>7</td><td>Q162</td><td>90.7°C</td><td>104.5°C</td></tr> <tr><td>8</td><td>Q163</td><td>81.7°C</td><td>102.1°C</td></tr> <tr><td>9</td><td>Q164</td><td>85.7°C</td><td>103.7°C</td></tr> <tr><td>10</td><td>Q165</td><td>83.7°C</td><td>95.3°C</td></tr> <tr><td>11</td><td>RG2</td><td>32.2°C</td><td>59.8°C</td></tr> <tr><td>12</td><td>U301</td><td>37.4°C</td><td>61.8°C</td></tr> <tr><td>13</td><td>T221</td><td>32.0°C</td><td>58.1°C</td></tr> <tr><td>14</td><td>C173</td><td>29.7°C</td><td>53.0°C</td></tr> <tr><td>15</td><td>C10</td><td>26.1°C</td><td>54.8°C</td></tr> <tr><td>16</td><td>LF2</td><td>45.6°C</td><td>68.7°C</td></tr> <tr><td>17</td><td>C8</td><td>38.2°C</td><td>56.4°C</td></tr> <tr><td>18</td><td>RY1</td><td>31.6°C</td><td>58.5°C</td></tr> <tr><td>19</td><td>C488</td><td>56.6°C</td><td>81.5°C</td></tr> <tr><td>20</td><td>C435</td><td>50.6°C</td><td>84.3°C</td></tr> <tr><td>21</td><td>C438</td><td>52.6°C</td><td>82.7°C</td></tr> <tr><td>22</td><td>C600</td><td>34.8°C</td><td>62.9°C</td></tr> <tr><td>23</td><td>Q403</td><td>62.2°C</td><td>85.4°C</td></tr> <tr><td>24</td><td>Q404</td><td>64.1°C</td><td>85.7°C</td></tr> <tr><td>25</td><td>Q400</td><td>65.2°C</td><td>86.1°C</td></tr> <tr><td>26</td><td>T402</td><td>43.3°C</td><td>74.7°C</td></tr> <tr><td>27</td><td>T1 core</td><td>52.0°C</td><td>81.8°C</td></tr> <tr><td>28</td><td>T1 wire</td><td>78.7°C</td><td>101.3°C</td></tr> <tr><td>29</td><td>T2 core</td><td>63.1°C</td><td>77.2°C</td></tr> <tr><td>30</td><td>T2 wire</td><td>73.4°C</td><td>98.4°C</td></tr> <tr><td>31</td><td>L40 core</td><td>57.5°C</td><td>84.8°C</td></tr> </tbody> </table> | NO | Position | ROOM AMBIENT Ta= 25°C | HIGH AMBIENT Ta= 50°C | 1 | C110 | 33.0°C | 55.4°C | 2 | D162 | 79.7°C | 97.0°C | 3 | D163 | 75.6°C | 91.4°C | 4 | L5 | 39.0°C | 64.7°C | 5 | Q160 | 74.5°C | 88.6°C | 6 | Q161 | 71.8°C | 82.2°C | 7 | Q162 | 90.7°C | 104.5°C | 8 | Q163 | 81.7°C | 102.1°C | 9 | Q164 | 85.7°C | 103.7°C | 10 | Q165 | 83.7°C | 95.3°C | 11 | RG2 | 32.2°C | 59.8°C | 12 | U301 | 37.4°C | 61.8°C | 13 | T221 | 32.0°C | 58.1°C | 14 | C173 | 29.7°C | 53.0°C | 15 | C10 | 26.1°C | 54.8°C | 16 | LF2 | 45.6°C | 68.7°C | 17 | C8 | 38.2°C | 56.4°C | 18 | RY1 | 31.6°C | 58.5°C | 19 | C488 | 56.6°C | 81.5°C | 20 | C435 | 50.6°C | 84.3°C | 21 | C438 | 52.6°C | 82.7°C | 22 | C600 | 34.8°C | 62.9°C | 23 | Q403 | 62.2°C | 85.4°C | 24 | Q404 | 64.1°C | 85.7°C | 25 | Q400 | 65.2°C | 86.1°C | 26 | T402 | 43.3°C | 74.7°C | 27 | T1 core | 52.0°C | 81.8°C | 28 | T1 wire | 78.7°C | 101.3°C | 29 | T2 core | 63.1°C | 77.2°C | 30 | T2 wire | 73.4°C | 98.4°C | 31 | L40 core | 57.5°C | 84.8°C |
| NO | Position | ROOM AMBIENT Ta= 25°C | HIGH AMBIENT Ta= 50°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | C110 | 33.0°C | 55.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | D162 | 79.7°C | 97.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | D163 | 75.6°C | 91.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | L5 | 39.0°C | 64.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Q160 | 74.5°C | 88.6°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Q161 | 71.8°C | 82.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Q162 | 90.7°C | 104.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Q163 | 81.7°C | 102.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Q164 | 85.7°C | 103.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Q165 | 83.7°C | 95.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | RG2 | 32.2°C | 59.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | U301 | 37.4°C | 61.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 13 | T221 | 32.0°C | 58.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14 | C173 | 29.7°C | 53.0°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 15 | C10 | 26.1°C | 54.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16 | LF2 | 45.6°C | 68.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | C8 | 38.2°C | 56.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | RY1 | 31.6°C | 58.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19 | C488 | 56.6°C | 81.5°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 20 | C435 | 50.6°C | 84.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | C438 | 52.6°C | 82.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | C600 | 34.8°C | 62.9°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23 | Q403 | 62.2°C | 85.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | Q404 | 64.1°C | 85.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25 | Q400 | 65.2°C | 86.1°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | T402 | 43.3°C | 74.7°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | T1 core | 52.0°C | 81.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 28 | T1 wire | 78.7°C | 101.3°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29 | T2 core | 63.1°C | 77.2°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 30 | T2 wire | 73.4°C | 98.4°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31 | L40 core | 57.5°C | 84.8°C | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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|---|---|---|---|----------|----------------------|---------|
| | | | 32 | L40 wire | 49.5°C | 90.8°C |
| | | | 33 | D610 | 81.0°C | 101.6°C |
| | | | 34 | D614 | 79.7°C | 99.3°C |
| | | | 35 | D618 | 52.5°C | 98.1°C |
| | | | 36 | D619 | 83.1°C | 77.9°C |
| | | | 37 | RT61 | 38.7°C | 64.4°C |
| | | | 38 | RT64 | 47.6°C | 77.7°C |
| | | | 39 | RT65 | 53.5°C | 72.9°C |
| | | | 40 | RTH6 | 42.2°C | 60.6°C |
| | | | 41 | RTH7 | 35.0°C | 61.3°C |
| | | | 42 | C643 | 28.1°C | 55.2°C |
| | | | 43 | C635 | 26.4°C | 55.1°C |
| | | | 44 | C518 | 27.2°C | 50.1°C |
| | | | 45 | U504 | 27.8°C | 50.6°C |
| | | | 46 | T900 | 33.0°C | 54.3°C |
| | | | 47 | T901 | 30.9°C | 51.3°C |
| | | | 48 | Q930 | 36.4°C | 56.7°C |
| | | | 49 | D951 | 43.2°C | 65.0°C |
| | | | 50 | CK12 | 29.8°C | 50.1°C |
| | | | 51 | C951 | 31.6°C | 52.3°C |
| | | | 52 | C439 | 40.1°C | 62.3°C |
| | | | 53 | C440 | 44.3°C | 66.7°C |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 400 VAC O/P : 101%LOAD Ta : 25°C | | TEST : OK | |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 530VAC/340VAC 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 50 °C/95 %R.H NO DAMAGE | I/P : 540 VAC O/P : FULL LOAD Ta= 50°C HUMIDITY= 95 %R.H | | TEST : OK | |
| 5 | TEMPERATURE COEFFICIENT | ± 0.03 %/°C(0~50°C) | I/P : 400 VAC O/P : FULL LOAD | | ± 0.004 %/°C(0~50°C) | |
| 6 | STORAGE TEMPERATURE TEST | -40~85°C | 1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC | | | |
| 7 | THERMAL SHOCK TEST | -30~50°C | 1. Thermal shock Temperature : -35°C~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:380V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:380V/ FULL LOAD Burn In Test | | | |



| | | | |
|----|--------------------------|---|---|
| 8 | VIBRATION TEST | 10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 3G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C |
| 9 | CAPACITOR LIFE CYCLE | SUPPOSE C643 IS THE MOST CRITICAL COMPONENT (1) I/P : 400VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 400VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME (3) I/P : 400VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 400VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME | (1) 1255888HRS (2) 190611HRS (3) 343879HRS (4) 509875HRS |
| 10 | MTBF | Conducted by Parts Stress Analysis Prediction 281.2K hrs min. Telcordia SR-332 (Bellcore) ; 28K hrs min. MIL-HDBK-217F (25°C) | |
| 11 | Ongoing Reliability Test | I/P : 380VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 50,000 hours | |

| TEST RESULT | TESTER | REVIEW | APPROVAL |
|-------------|------------|------------|---------------|
| PASS | DANIEL GAO | SANFORD SU | VINCENT TSENG |

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