



# Test Report: LRS-200 N2-48

---

200W Single Output High Peak 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

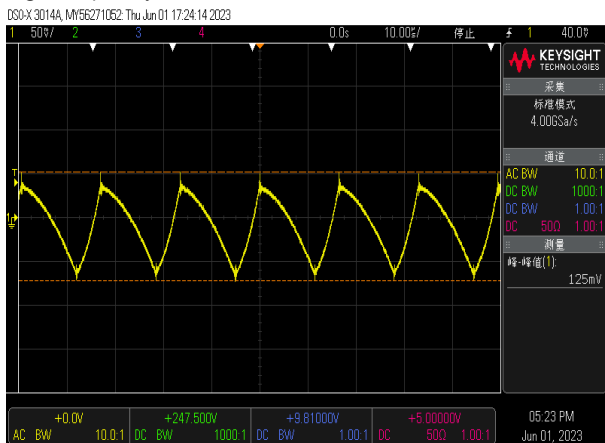
ENVIRONMENT TEST

DESIGN VERIFY TEST

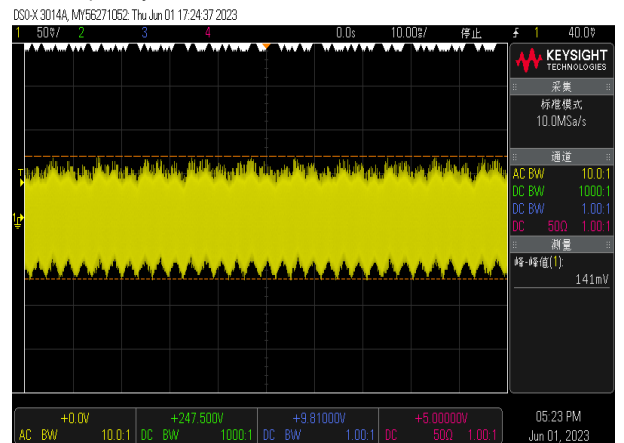
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43.2V~52.8V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	41.62V~55.53V/230VAC 41.63V~55.52V/230VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1.0 %~ 1.0%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.23%~ 0.27%
3	LINE REGULATION	V1: -0.5%~ 0.5%	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0%
4	LOAD REGULATION	V1: -0.5%~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0%~0%
5	OVER/UNDERSHOOT TEST	<± 5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.12%
6	RIPPLE & NOISE (Max)	V1: 200 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 141mVp-p

high frequency :



low frequency :



<p>7</p> <p>SET UP TIME(Max)</p>	<p>230VAC/1300ms 115VAC/1300ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/1096ms 115VAC/1116ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	
<p>8</p> <p>RISE TIME (Max)</p>	<p>230VAC/50ms 115VAC/50ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/ 7.4ms 115VAC/ 7.2ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>	
<p>9</p> <p>HOLD UP TIME (Typ.)</p>	<p>230VAC/16ms 115VAC/12ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/40ms 115VAC/31ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	

10	DYNAMIC LOAD	V1: 4800mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	1010mVp-p 710mVp-p
FULL /50% LOAD 50%DUTY / 120HZ				
FULL /50% LOAD 50%DUTY / 1KHZ				

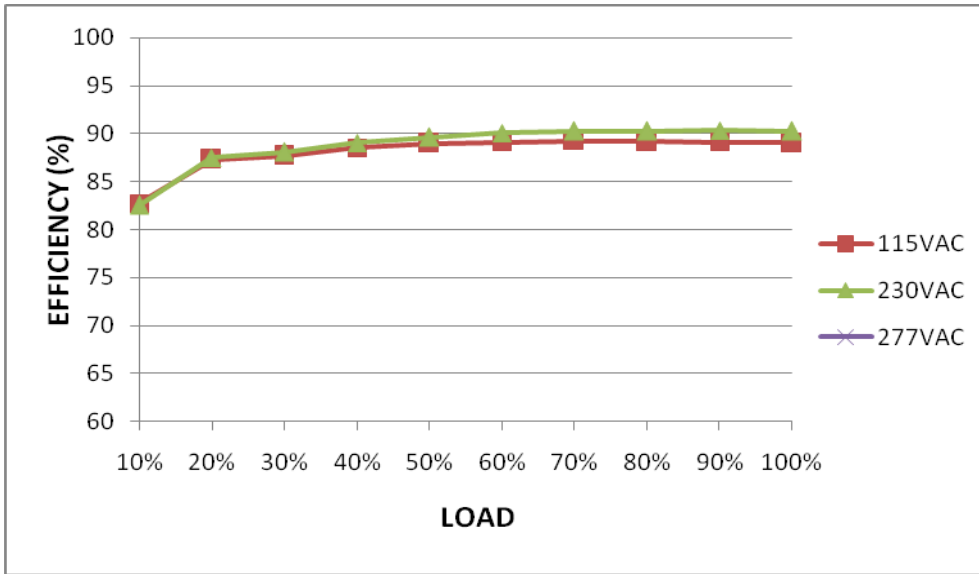
### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch  240 ~ 370VDC (swith on 230VAC)	(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  I/P: LOW-LINE-3V=87 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 )	(1) 87~ 135VAC / 177~ 267VAC by switch (2) 237 Vdc~373Vdc/FULL LOAD 237Vdc~373Vdc/50% LOAD (4) 237 Vdc~373Vdc/FULL LOAD 237Vdc~373Vdc/50% LOAD  TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST:OK
3	INPUT CURRENT (Typ.)	230V/ 2.4A 115V/4.1A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =2.01A/ 230VAC I =3.73A/ 115VAC



4	LEAKAGE CURRENT	< 2mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.752mA N-FG : 0.748mA
5	NO LOAD CONSUMPTION	< 1W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	0.83W/115VAC 0.88W/230VAC
6	EFFICIENCY(Typ.)	90%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	90.29%

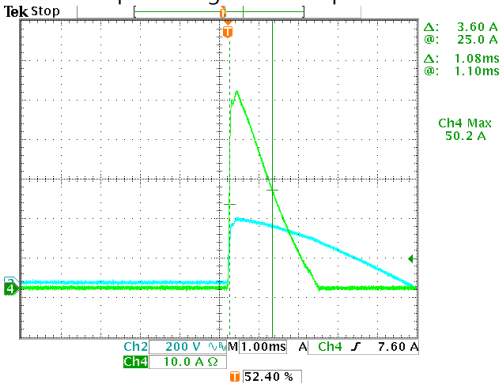
EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/60A 115V/60A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =50.2A/ 230VAC I =48.2A/ 115VAC T50=1080us/230V
---	----------------------	------------------------------------	--	---

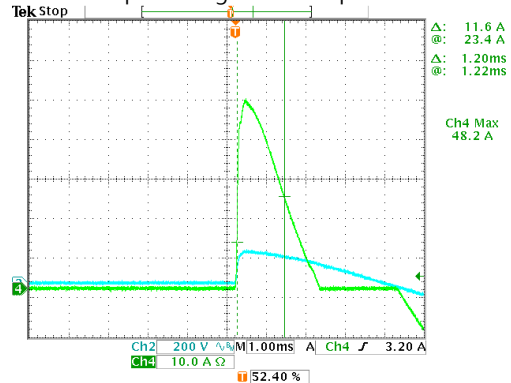
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current

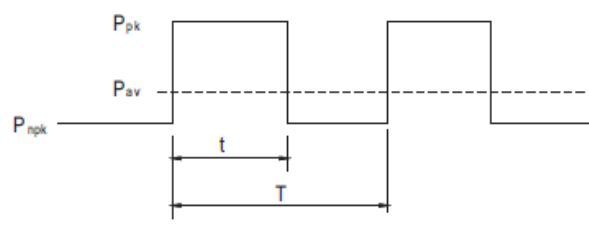


INPUT=115VAC/ 60HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



### FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PEAK POWER	I/P: 230 VAC O/P: PEAK LOAD (1Hour NO DAMGE) Ta:25°C Test Result : PASS <b>Function Manual</b> <b>1. Peak Power</b> $P_{av} = \frac{P_{pk} \times t + P_{ngk} \times (T-t)}{T} \leq P_{rated}$ $Duty = \frac{t}{T} \times 100\% \leq 35\%$ $t \leq 5 \text{ sec}$ 		Pav : Average output power (W) Ppk : Peak output power (W) Pngk : Non-peak output power(W) Prated : Rated output power(W) t : Peak power width(sec) T : Period(sec)

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~200%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C	120.2%/ 264VAC 119.3%/ 230VAC 119.5%/100VAC PROTECTION TYPE : Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover 220.35%/ 264VAC 218.18%/ 230VAC 216.72%/100VAC PROTECTION TYPE : Ouput power >200% rated, hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	55.2V~64.8V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	56.5V/ 264VAC 56.1V/ 230VAC 56.3V/ 90VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover.

3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 264VAC I/P: 90VAC O/P:FULL LOAD	O.T.P. Active Protection type : Shut down and latch off o/p voltage, re-power on to recover.
---	-----------------------------	-----------	--	---

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q 1 Rated 20 A/ 600V	<p>AC ON/OFF</p> <p>I/P:High-Line +3V =300V</p> <p>VDS:</p> <p>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%→400% Load. (8)PEAK LOAD</p> <p>I/P:Low-Line -3V = 97V</p> <p>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%→400% Load. (8)PEAK LOAD</p> <p>Ta:25°C</p>	<p>VDS:</p> <p>(1) 444V (2) 564V (3) 456V (4) 452V (5) 436V (6) 452V (7) 484V (8) 456V</p> <p>VDS:</p> <p>(1) 291V (2) 376V (3) 295V (4) 295V (5) 291V (6) 295V (7) 380V (8) 323V</p>

2	Diode Peak Voltage	<p>D102 Rated 20A/ 400V</p> <p>D103 Rated 20A/ 400V</p>	<p>AC ON/OFF I/P:High-Line +3V =300 V 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%→400% Load. (8).NO LOAD</p> <p>Ta:25°C</p>	<p>D102 VDS: (1) 259V (2) 223V (3) 267V (4) 267V (5) 251V (6) 251V (7) 285V (8) 156V</p> <p>D103 VDS: (1) 377V (2) 329V (3) 373V (4) 373V (5) 369V (6) 373V (7) 329V (8) 365V</p>
3	Input Capacitor Voltage	<p>C5 Rated: 560uf/ 200V Surge voltage:250V</p>	<p>I/P:High-Line +3V =300V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change (4)Full load continue</p> <p>Ta:25°C</p>	<p>(1)212V (2)212V (3)212V (4) 206V</p>
4	Control IC Voltage Test	<p>U1 Rated 10V~ 28V</p> <p>U102 3V-36V</p>	<p>AC ON/OFF I/P:High-Line +3V =300V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(Low LINE) Ta:25°C</p>	<p>(1) 19.5V (2) 16.5V (3) 19.5V (4) 16.9V (5) 18.9V</p> <p>(1) 13V (2) 6V (3) 13V (4) 12.8V (5) 12.6V</p>



## ■ 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:0.5KVAC/min	I/P-O/P: 4.125 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P:3.212mA I/P-FG:2.815mA O/P-FG:4.04m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	11 mΩ

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	EAC TP TC 020	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
2	RADIATION	EAC TP TC 020	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
4	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	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 : LRS-200N2-48 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=29.5 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50.8 °C																																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=29.5 °C</th> <th>HIGH AMBIENT Ta=50.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>RTH1</td><td>90.1°C</td><td>111.4°C</td></tr> <tr><td>2</td><td>RTH2</td><td>95.9°C</td><td>117.2°C</td></tr> <tr><td>3</td><td>BD1</td><td>63.8°C</td><td>85.1°C</td></tr> <tr><td>4</td><td>C6</td><td>62.0°C</td><td>83.3°C</td></tr> <tr><td>5</td><td>Q1</td><td>73.2°C</td><td>94.5°C</td></tr> <tr><td>6</td><td>Q2</td><td>70.6°C</td><td>91.9°C</td></tr> <tr><td>7</td><td>C36</td><td>68.0°C</td><td>89.3°C</td></tr> <tr><td>8</td><td>C37</td><td>70.6°C</td><td>91.9°C</td></tr> <tr><td>9</td><td>U1</td><td>63.9°C</td><td>85.2°C</td></tr> <tr><td>10</td><td>T1</td><td>96.1°C</td><td>117.4°C</td></tr> <tr><td>11</td><td>C201</td><td>73.2°C</td><td>94.5°C</td></tr> <tr><td>12</td><td>L100</td><td>102.4°C</td><td>123.7°C</td></tr> <tr><td>13</td><td>D102</td><td>76.5°C</td><td>97.8°C</td></tr> <tr><td>14</td><td>D103</td><td>83.6°C</td><td>104.9°C</td></tr> <tr><td>15</td><td>C107</td><td>61.3°C</td><td>82.6°C</td></tr> <tr><td>16</td><td>R112</td><td>99.1°C</td><td>120.4°C</td></tr> <tr><td>17</td><td>RTH3</td><td>90.2°C</td><td>111.5°C</td></tr> <tr><td>18</td><td>TC(D103)</td><td>60.2°C</td><td>81.5°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=29.5 °C	HIGH AMBIENT Ta=50.8 °C	1	RTH1	90.1°C	111.4°C	2	RTH2	95.9°C	117.2°C	3	BD1	63.8°C	85.1°C	4	C6	62.0°C	83.3°C	5	Q1	73.2°C	94.5°C	6	Q2	70.6°C	91.9°C	7	C36	68.0°C	89.3°C	8	C37	70.6°C	91.9°C	9	U1	63.9°C	85.2°C	10	T1	96.1°C	117.4°C	11	C201	73.2°C	94.5°C	12	L100	102.4°C	123.7°C	13	D102	76.5°C	97.8°C	14	D103	83.6°C	104.9°C	15	C107	61.3°C	82.6°C	16	R112	99.1°C	120.4°C	17	RTH3	90.2°C	111.5°C	18	TC(D103)	60.2°C	81.5°C
NO	Position	ROOM AMBIENT Ta=29.5 °C	HIGH AMBIENT Ta=50.8 °C																																																																													
1	RTH1	90.1°C	111.4°C																																																																													
2	RTH2	95.9°C	117.2°C																																																																													
3	BD1	63.8°C	85.1°C																																																																													
4	C6	62.0°C	83.3°C																																																																													
5	Q1	73.2°C	94.5°C																																																																													
6	Q2	70.6°C	91.9°C																																																																													
7	C36	68.0°C	89.3°C																																																																													
8	C37	70.6°C	91.9°C																																																																													
9	U1	63.9°C	85.2°C																																																																													
10	T1	96.1°C	117.4°C																																																																													
11	C201	73.2°C	94.5°C																																																																													
12	L100	102.4°C	123.7°C																																																																													
13	D102	76.5°C	97.8°C																																																																													
14	D103	83.6°C	104.9°C																																																																													
15	C107	61.3°C	82.6°C																																																																													
16	R112	99.1°C	120.4°C																																																																													
17	RTH3	90.2°C	111.5°C																																																																													
18	TC(D103)	60.2°C	81.5°C																																																																													
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 120 %/219%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=-30/-25 °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 : 272 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 : 230 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	-25~50°C	1. Thermal shock Temperature : -30°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:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test
8	VIBRATION TEST	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C107 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta=25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta=50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta=50 °C LIFE TIME	(1) 412452HRS (2) 72911HRS (3) 119344HRS (4) 163908HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 2089.1K hrs min. Telcordia SR-332 (Bellcore) ; 243.6K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	WUWQ/HUANGMK	WENF	LINKX

2020.10.1 TAG-QA-009