Test Report: LRS-200N2-24

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

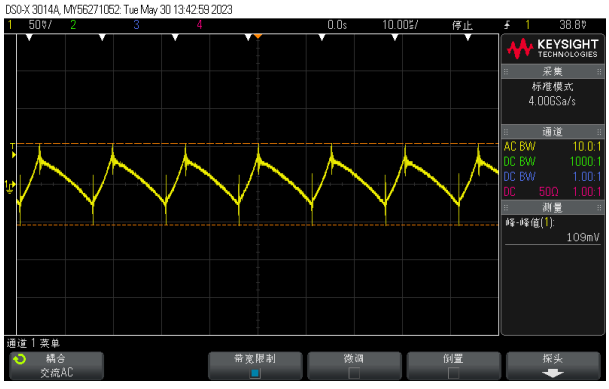
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

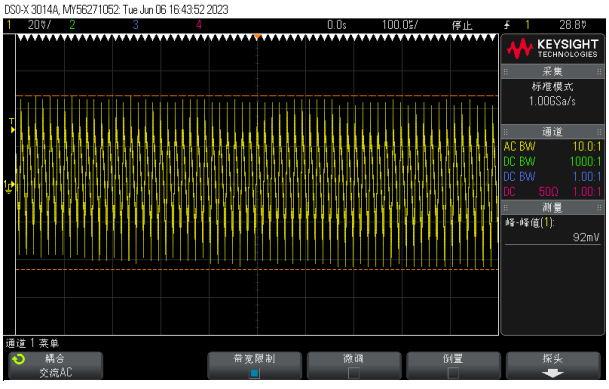
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6V~28.8V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	20.92V~29.72V/230VAC 20.93V~29.73V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1.0 %~ 1.0%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0.38%~0.58%
3	LINE REGULATION	V1: -0.5%~ 0.5%	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0 %~ 0 %
4	LOAD REGULATION	V1: -0.5%~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0.04%~0.08%
5	OVER/UNDERSHOOT TEST	<± 5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	2.79%
6	RIPPLE & NOISE (Max)	V1: 150 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 109mVp-p

high frequency：

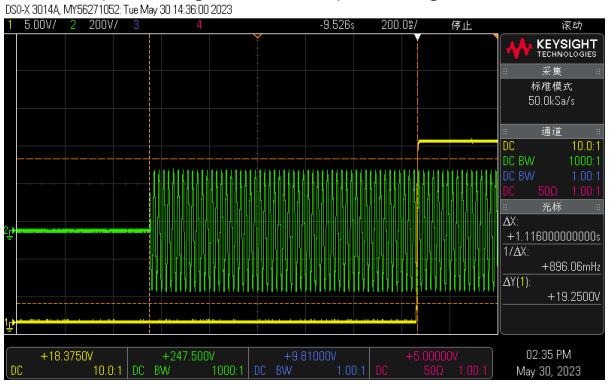


low frequency：

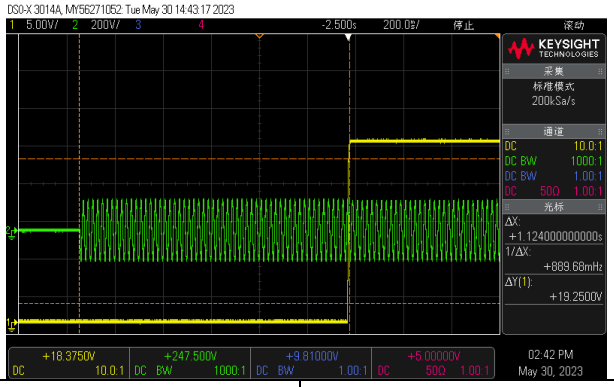


7	SET UP TIME(Max)	230VAC/1300ms 115VAC/1300ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 1116ms 115VAC/ 1124ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

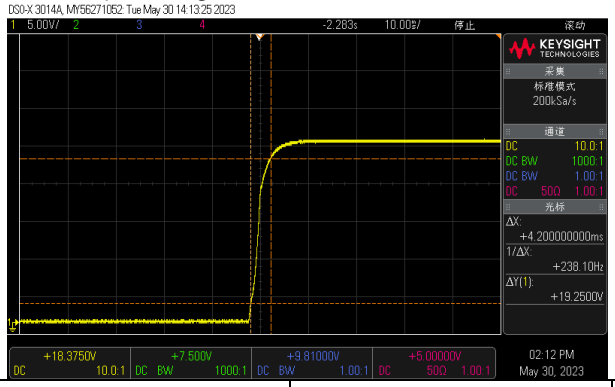


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

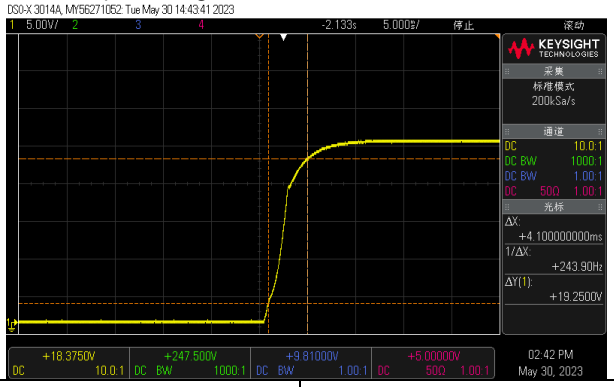


8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/4.2ms 115VAC/4.1ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage

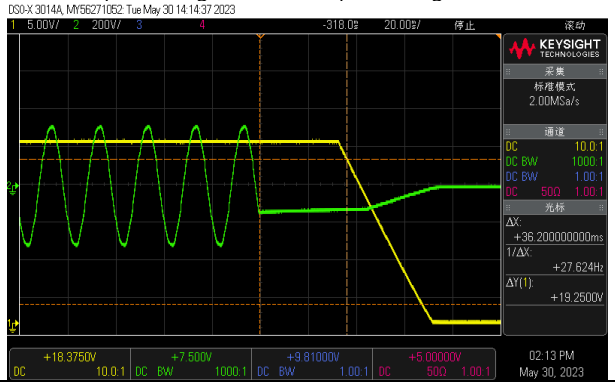


INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage

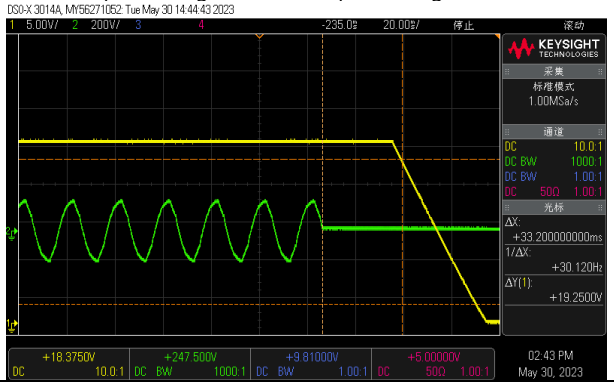


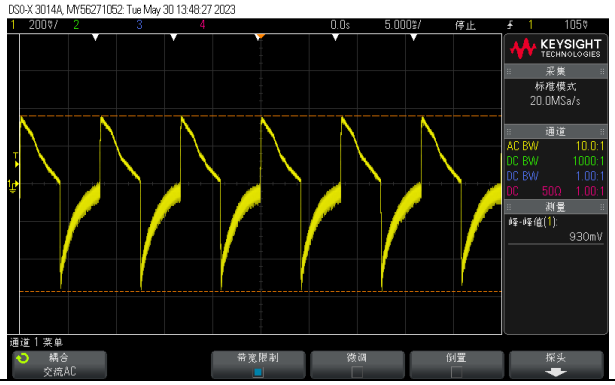
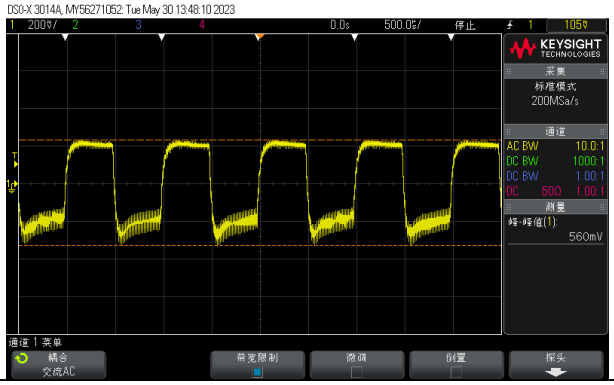
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/12ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/36.2ms 115VAC/ 33.2ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



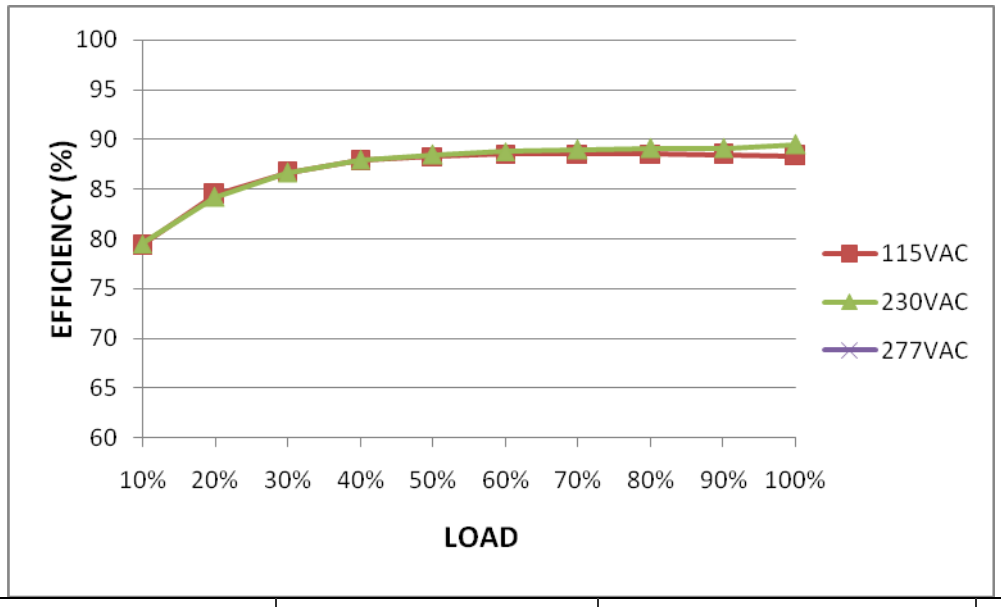
10	DYNAMIC LOAD	V1: 2400mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	930mVp-p 560mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	

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℃	(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
			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)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	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℃	I =1.99A/ 230VAC I =3.81A/ 115VAC

4	LEAKAGE CURRENT	< 2mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG：0.712mA N-FG：0.709mA
5	NO LOAD CONSUMPTION	< 1W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	0.70W/115VAC 0.83W/230VAC
6	EFFICIENCY(Typ.)	89.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	89.61%

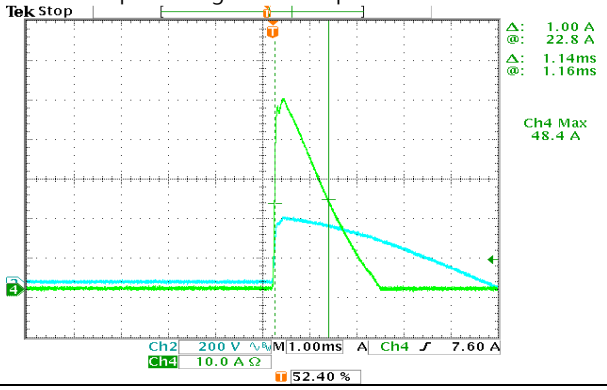
EFFICIENCY vs LOAD



7	INRUSH CURRENT(Typ.)	230V/60A 115V/60A COLD START	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =48.4A/ 230VAC I =48.6A/ 115VAC T50=1140 us/230V

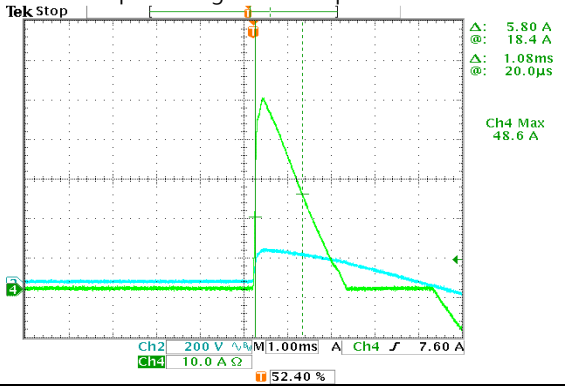
INPUT=230VAC/50HZ @ FULL LOAD

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℃ Test Result：PASS		

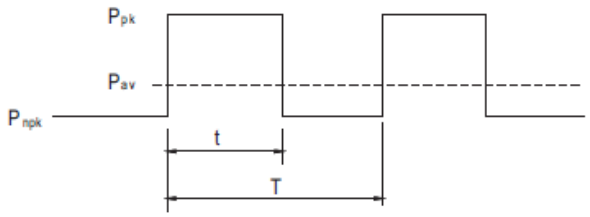
■ Function Manual

1.Peak Power

$$P_{av} = \frac{P_{pk} \times t + P_{npk} \times (T-t)}{T} \leqslant P_{rated}$$

$$Duty = \frac{t}{T} \times 100\% \leqslant 35\%$$

$t \leqslant 5$ sec



P_{av} : Average output power (W)

P_{pk} : Peak output power (W)

P_{npk} : Non-peak output power(W)

P_{rated} : 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℃	113.8%/ 264VAC 113.6%/ 230VAC 112.9%/100VAC PROTECTION TYPE : Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover 222.1%/ 264VAC 222.7%/ 230VAC 222.1%/100VAC PROTECTION TYPE : Ouput power >200% rated, hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	28.8V~33.6V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P:MIN LOAD Ta:25℃	32.39V/ 264VAC 32.42V/ 230VAC 32.45V/ 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	AC ON/OFF I/P:High-Line +3V =300V VDS: 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 I/P:Low-Line -3V = 97V 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 Ta:25℃	 VDS: (1) 437V (2) 514V (3) 429V (4) 429V (5) 425V (6) 433V (7) 494V (8) 441V VDS: (1) 313V (2) 357V (3) 317V (4) 317V (5) 313V (6) 313V (7) 369V (8) 333V

2	Diode Peak Voltage	D102 Rated 20A/200V D104 Rated 20A/ 200V	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 Ta:25℃	D102 VDS: – (1) 173V (2) 185V (3) 160V (4) 160V (5) 171V (6) 173V (7) 175V (8) 86V D104 VDS: (1) 175V (2) 162V (3) 175V (4) 173V (5) 177V (6) 171V (7) 164V (8) 156 V
3	Input Capacitor Voltage	C5 Rated: 560uf/ 200V Surge voltage:250V	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 Ta:25℃	(1)215V (2)219V (3)219V (4) 211V
4	Control IC Voltage Test	U1 Rated 10V~ 28V U102 3V-36V	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℃	(1) 19.3V (2) 19.7V (3) 19.3V (4) 18.9V (5) 19.3V (1) 13V (2) 7.6V (3) 12.8V (4) 12.6V (5) 12.6V

■ 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℃	I/P-O/P:3.208mA I/P-FG:2.815mA O/P-FG:4.02m 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℃	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℃	8mΩ

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℃	PASS Test by certified Lab
2	RADIATION	EAC TP TC 020	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	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℃	CRITERIA A
4	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	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℃	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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： LRS-200N2-24
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=31.1 ℃
2. HIGH AMBIENT BURN-IN： 2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=50.5 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=31.1 ℃</th><th>HIGH AMBIENT Ta=50.5 ℃</th></tr>
<tr><td>1</td><td>RTH1</td><td>95.1℃</td><td>115.0℃</td></tr>
<tr><td>2</td><td>RTH2</td><td>96.0℃</td><td>115.7℃</td></tr>
<tr><td>3</td><td>BD1</td><td>64.7℃</td><td>85.8℃</td></tr>
<tr><td>4</td><td>C6</td><td>62.4℃</td><td>82.1℃</td></tr>
<tr><td>5</td><td>R23</td><td>72.7℃</td><td>93.1℃</td></tr>
<tr><td>6</td><td>D10</td><td>64.7℃</td><td>87.2℃</td></tr>
<tr><td>7</td><td>Q1</td><td>69.3℃</td><td>91.8℃</td></tr>
<tr><td>8</td><td>Q2</td><td>68.4℃</td><td>90.5℃</td></tr>
<tr><td>9</td><td>U1</td><td>64.8℃</td><td>84.3℃</td></tr>
<tr><td>10</td><td>T1</td><td>92.1℃</td><td>112.0℃</td></tr>
<tr><td>11</td><td>C201</td><td>79.3℃</td><td>100.8℃</td></tr>
<tr><td>12</td><td>L100</td><td>97.1℃</td><td>119.6℃</td></tr>
<tr><td>13</td><td>D102</td><td>76.0℃</td><td>96.2℃</td></tr>
<tr><td>14</td><td>D103</td><td>74.9℃</td><td>95.8℃</td></tr>
<tr><td>15</td><td>C107</td><td>62.9℃</td><td>84.6℃</td></tr>
<tr><td>16</td><td>R112</td><td>102.4℃</td><td>123.8℃</td></tr>
<tr><td>17</td><td>RTH3</td><td>82.9℃</td><td>104.9℃</td></tr>
<tr><td>18</td><td>TC(D104)</td><td>64.7℃</td><td>85.2℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 230 VAC
O/P：114 %/223%LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 264VAC/100VAC
O/P： 100 % LOAD
Ta=-30/-25 ℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 50 ℃/95 %R.H
NO DAMAGE</td><td>I/P： 272 VAC
O/P：FULL LOAD
Ta= 50 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %/℃(0~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.002 %/℃(0~50℃)</td></tr>
</table>

6	STORAGE TEMPERATURE TEST	-40~85℃	1. Thermal shock Temperature： -45℃~ +90℃ 2. Temperature change rate ：25℃ / 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℃	1. Thermal shock Temperature： -30℃~ +55℃ 2. Temperature change rate ：25℃ / 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℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C107 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta=25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta=50 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta=50 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta=50 ℃ LIFE TIME	(1) 418354HRS (2) 62188HRS (3) 145943HRS (4) 194937HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 2089.1K hrs min. Telcordia SR-332 (Bellcore) ; 243.6K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	WUWQ/HUANGMK	WENF	LINKX

2020.10.1 TAG-QA-009