Test Report: LRS-200N2-12

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

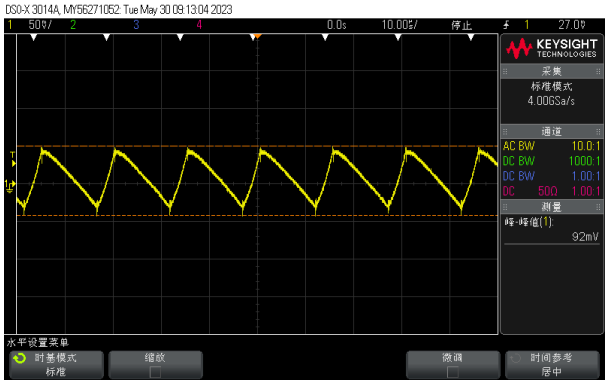
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

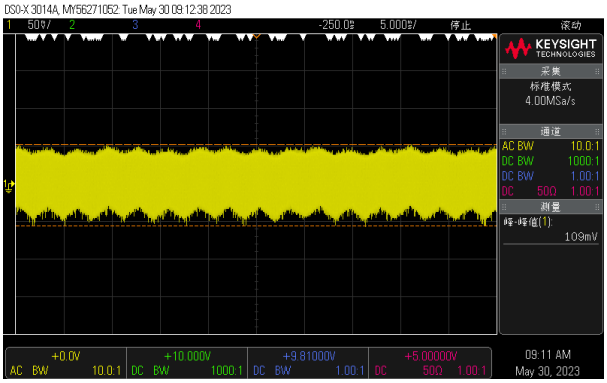
OUTPUT FUNCTION TEST

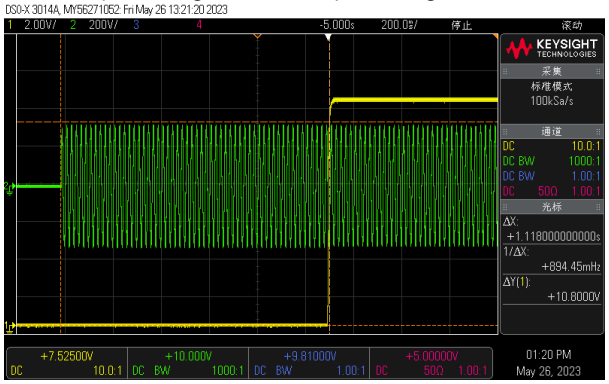
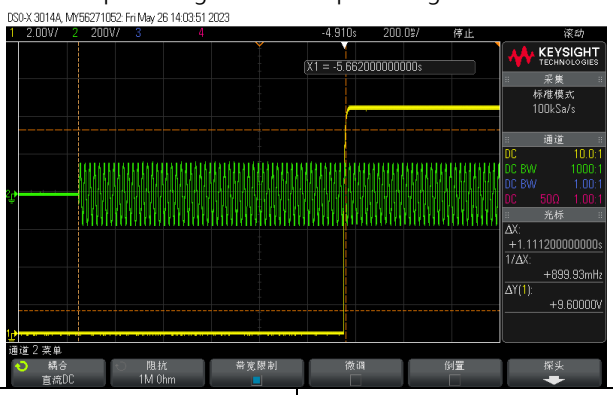
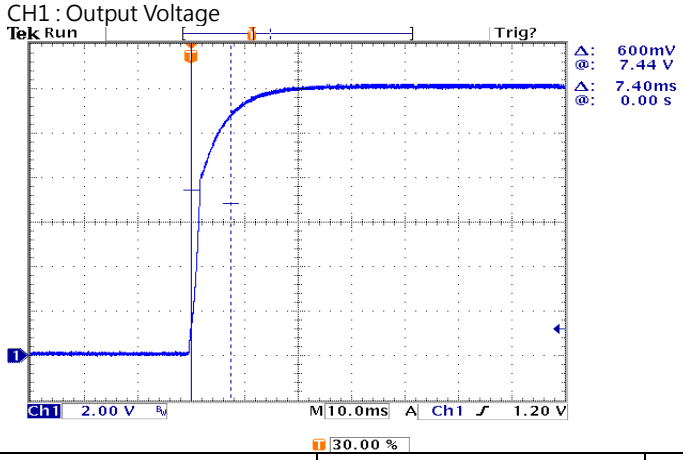
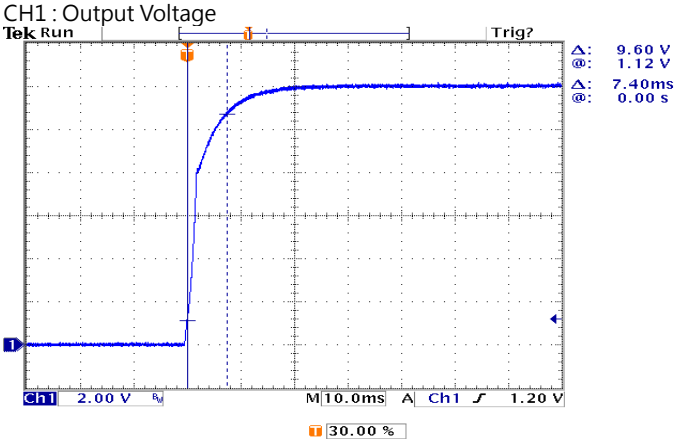
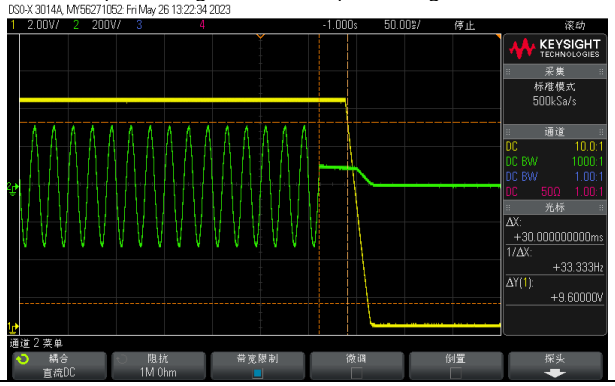
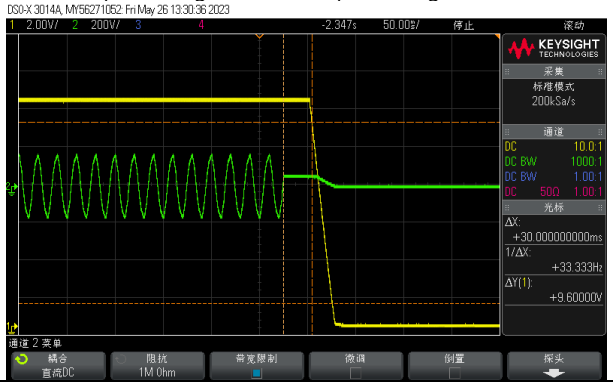
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.2V~13.8V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	9.93V~14.09V/230VAC 9.93V~14.09V/115VAC
2	OUTPUT VOLTAGE TOLERANCE	V1: -1.5%~ 1.5%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: 0.08%~1.0 %
3	LINE REGULATION	V1:-0.5%~0.5%	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0%~ 0%
4	LOAD REGULATION	V1: -1%~ 1%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.16%~0.16%
5	OVER/UNDERSHOOT TEST	<± 5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	1.3%
6	RIPPLE & NOISE (Max)	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1:109mVp-p

high frequency：



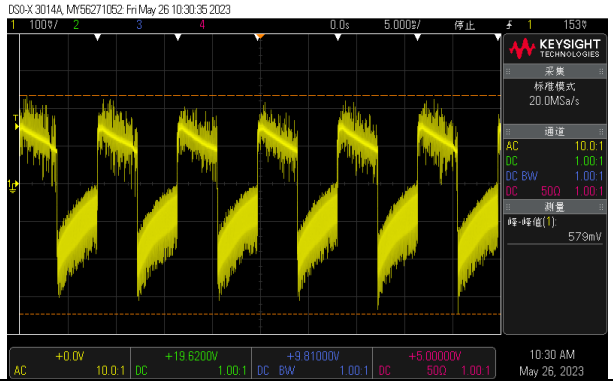
low frequency：



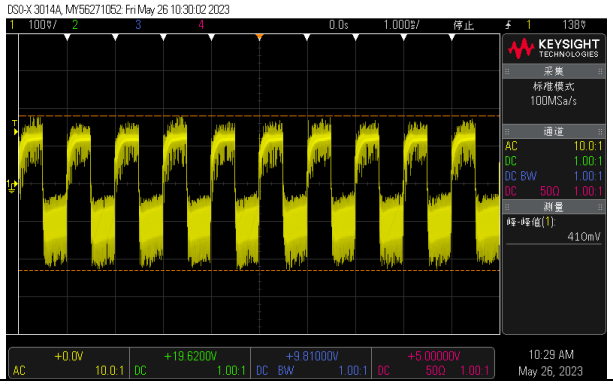
7	SET UP TIME(Max)	230VAC/1300ms 115VAC/1300ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/1108ms 115VAC/ 1111ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/7.4ms 115VAC/7.4ms
	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/30.00ms 115VAC/30.00ms
	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: 1200mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	579mVp-p 410mVp-p

FULL /50% LOAD 50%DUTY / 120HZ



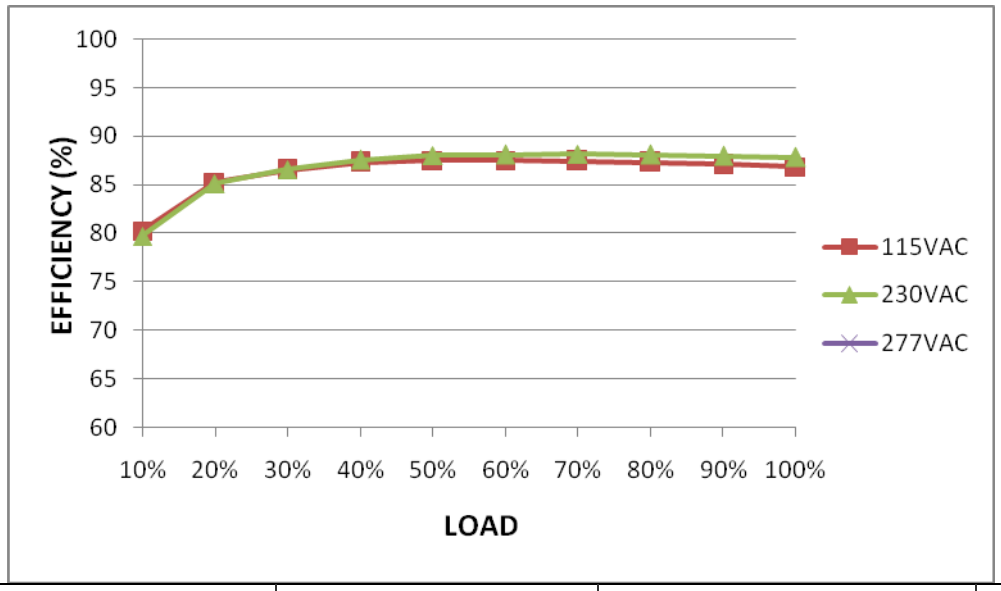
FULL /50% LOAD 50%DUTY / 1KHZ

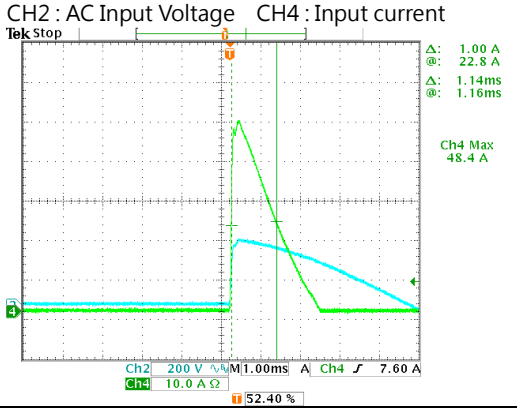


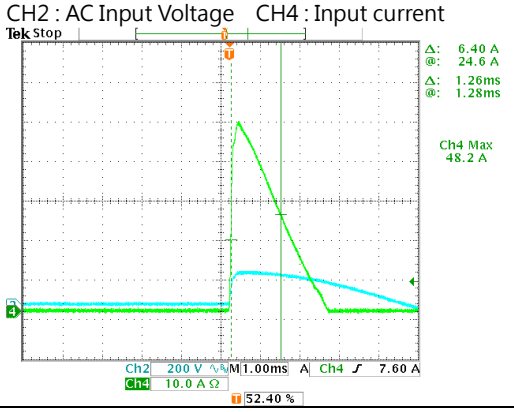
INPUT FUNCTION TEST

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 (2) 237Vdc~373Vdc/FULL LOAD 237 Vdc~373Vdc/50% LOAD (4) 237Vdc~373Vdc/FULL LOAD 237 Vdc~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 =2.1A/ 230VAC I =3.8A/ 115VAC

4	LEAKAGE CURRENT	< 2mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG： 0.792mA N-FG：0.777mA
5	NO LOAD CONSUMPTION	< 1W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	0.75W/115VAC 0.85W/230VAC
6	EFFICIENCY(Typ.)	87.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	87.80 %
	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 =48.2A/ 115VAC T50=1140us/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		

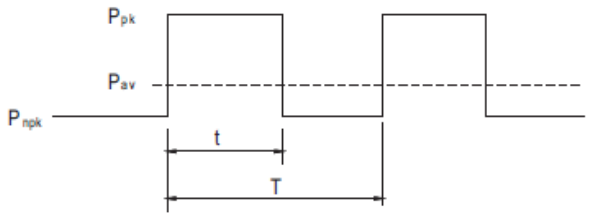
■ **Function Manual**

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℃	120.6%/ 264VAC 120.3%/ 230VAC 120.1%/100VAC PROTECTION TYPE : Output power >105% rated for more than 5 seconds then shut down o/p voltage, re-power on to recover 222.94%/ 264VAC 220.58%/ 230VAC 218.82%/100VAC PROTECTION TYPE : Ouput power >200% rated, hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	13.8V~16.2V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P:MIN LOAD Ta:25℃	16.02V/ 264VAC 16.05V/ 230VAC 15.97V/ 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	Q1 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 = 87V 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) 458V (2) 506V (3) 450V (4) 454V (5) 450V (6) 458V (7) 522V (8) 490V VDS: (1) 313V (2) 341V (3) 309V (4) 305V (5) 317V (6) 313V (7) 349V (8) 345V

2	Diode Peak Voltage	D101 Rated 30A/ 100V D104 Rated 40A/100V	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℃	D101: VDS: (1) 85.9V (2) 84.3V (3) 80.3V (4) 85.9V (5) 85.9V (6) 84.3V (7) 83.5V (8) 72.2V D104: VDS: (1) 96.3V (2) 80.3V (3) 98.7V (4) 96.3V (5) 98.7V (6) 95.5V (7) 89.9V (8) 89.1V
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)221V (2)223V (3)223V (4) 215V
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) 19.7V (2) 20.1V (3) 19.7V (4) 19.1V (5) 19.5V (1) 12.77V (2) 8.27V (3) 12.85V (4) 12.53V (5) 12.45V

■ 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:3.108mA I/P-FG:2.715mA O/P-FG:4.03m 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℃	12 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℃	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-200N2-12
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>97.8℃</td><td>121.2℃</td></tr>
<tr><td>2</td><td>RTH2</td><td>96.1℃</td><td>119.1℃</td></tr>
<tr><td>3</td><td>BD1</td><td>70.5℃</td><td>90.6℃</td></tr>
<tr><td>4</td><td>C6</td><td>64.9℃</td><td>85.8℃</td></tr>
<tr><td>5</td><td>R23</td><td>75.9℃</td><td>97.4℃</td></tr>
<tr><td>6</td><td>D10</td><td>74.6℃</td><td>96.5℃</td></tr>
<tr><td>7</td><td>Q1</td><td>78.6℃</td><td>99.7℃</td></tr>
<tr><td>8</td><td>Q2</td><td>77.9℃</td><td>99.0℃</td></tr>
<tr><td>9</td><td>U1</td><td>71.5℃</td><td>91.2℃</td></tr>
<tr><td>10</td><td>T1</td><td>97.2℃</td><td>117.7℃</td></tr>
<tr><td>11</td><td>C201</td><td>76.8℃</td><td>97.8℃</td></tr>
<tr><td>12</td><td>L100</td><td>98.8℃</td><td>118.7℃</td></tr>
<tr><td>13</td><td>D101</td><td>79.7℃</td><td>99.0℃</td></tr>
<tr><td>14</td><td>D103</td><td>90.9℃</td><td>109.9℃</td></tr>
<tr><td>15</td><td>C107</td><td>73.8℃</td><td>93.5℃</td></tr>
<tr><td>16</td><td>R112</td><td>105.1℃</td><td>123.3℃</td></tr>
<tr><td>17</td><td>RTH3</td><td>85.3℃</td><td>105.3℃</td></tr>
<tr><td>18</td><td>TC(D104)</td><td>76.4℃</td><td>93.7℃</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 : 121 %/224%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>± 0.004 %/℃(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) 191656HRS (2) 33183HRS (3) 73020HRS (4) 116393HRS
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