Test Report: RPS-120S-15

120W 3”X2”Reliable Green Medical 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

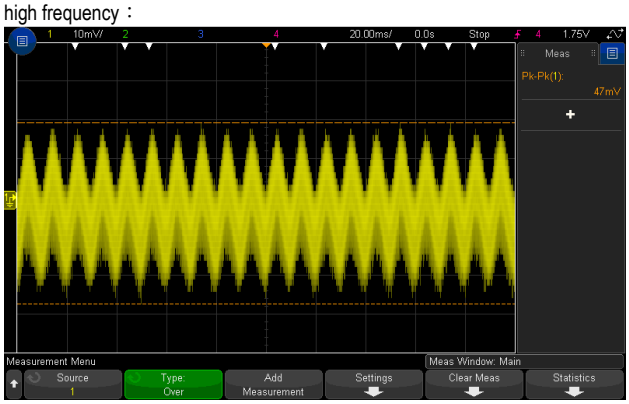
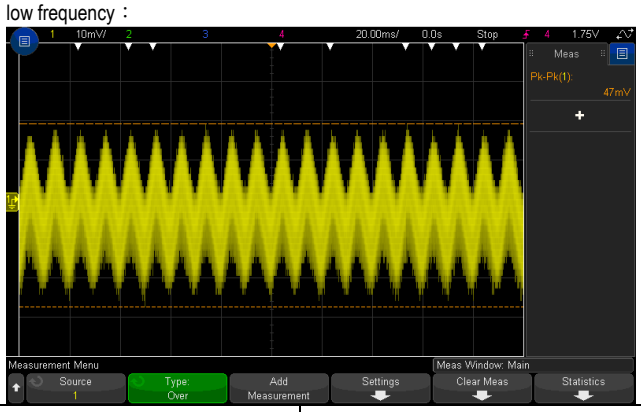
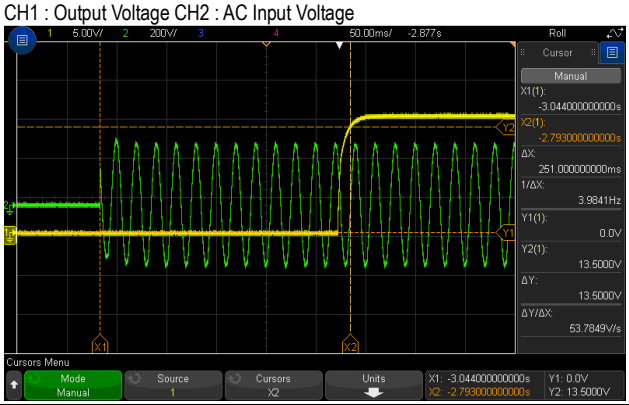
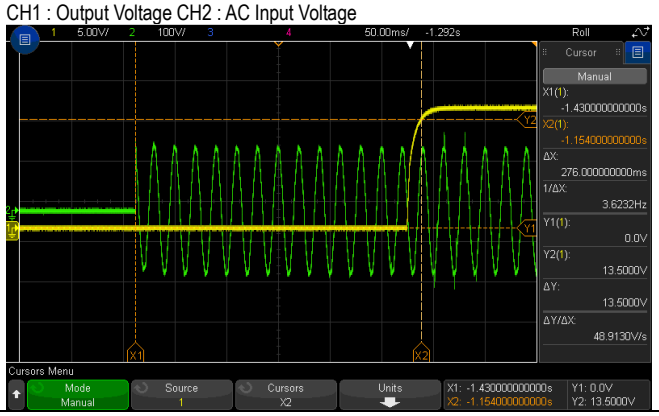
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

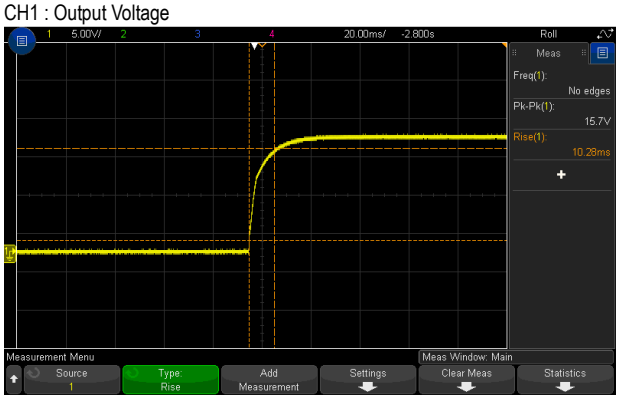
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 14.3 V~ 15.8V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	13.37V~16.72V/230VAC 13.31V~16.681V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -2%~ 2 %	I/P: 80VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.2 %~ 0.02%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5 %	I/P: 80VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: -0.01 %~0.01 %
4	LOAD REGULATION(Max)	V1: -1 %~1 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: -0.2 %~ 0.02%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	2.0%
6	RIPPLE & NOISE(Max)	V1: 120 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 47mVp-p
	high frequency：  low frequency： 			
7	SET UP TIME(Max)	230VAC600/ms 115VAC/600ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 251 ms 115VAC/ 276 ms
	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/30ms 115VAC/30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 10.28ms 115VAC/ 10.78 ms

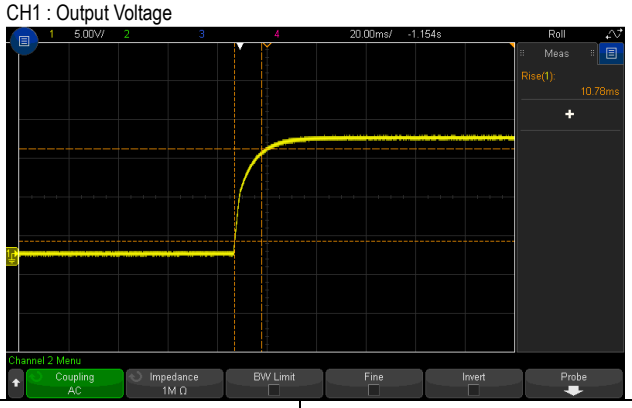
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

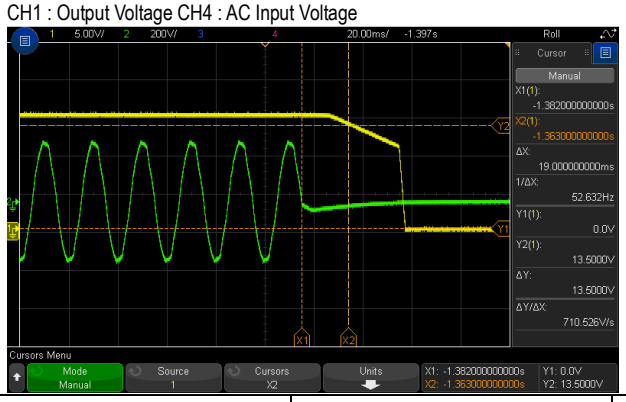
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	230VAC/15ms 115VAC/15ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 19 ms 115VAC/ 16.4ms

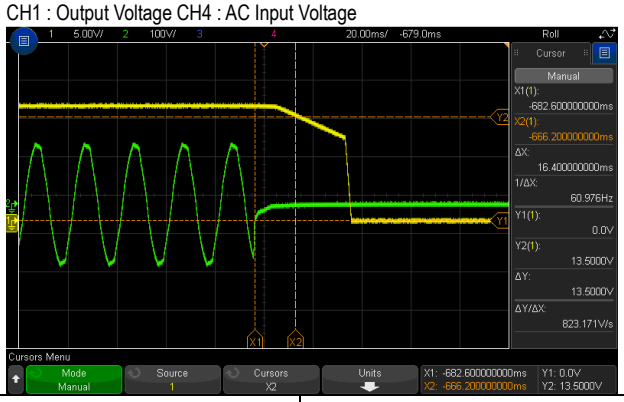
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH4 : AC Input Voltage



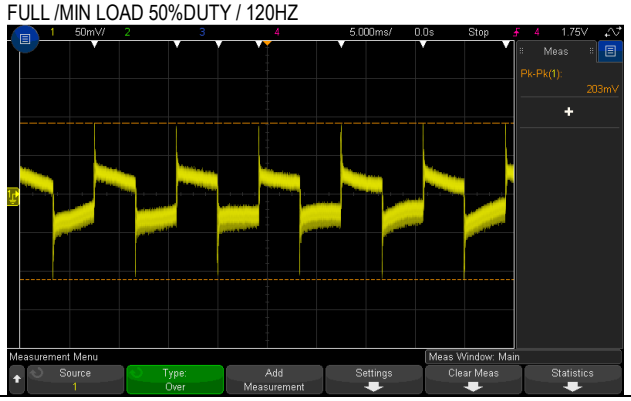
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH4 : AC Input Voltage

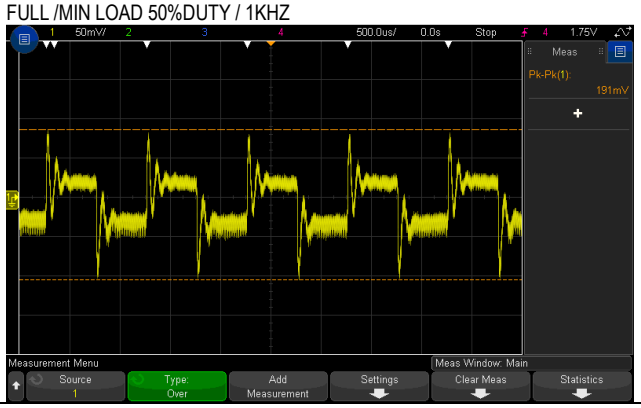


10	DYNAMIC LOAD	V1: 1500 mVp-p	I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25℃	 203mVp-p 191mVp-p

FULL /MIN LOAD 50%DUTY / 120HZ

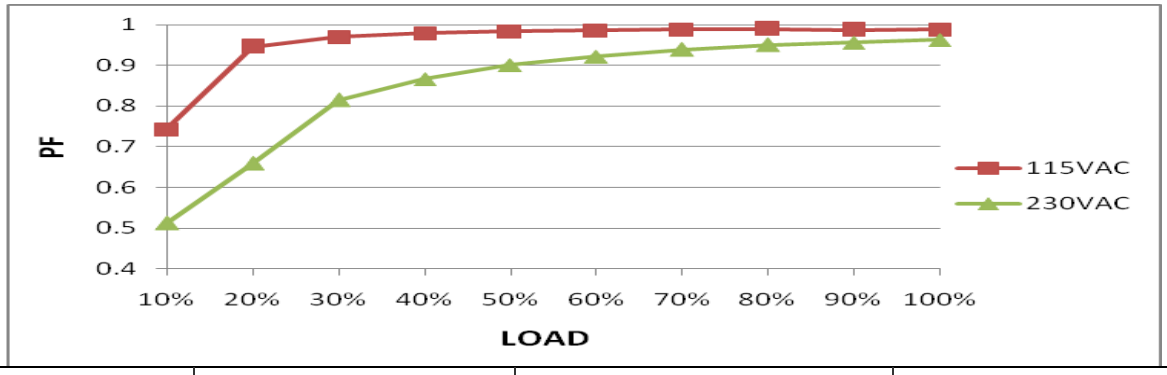


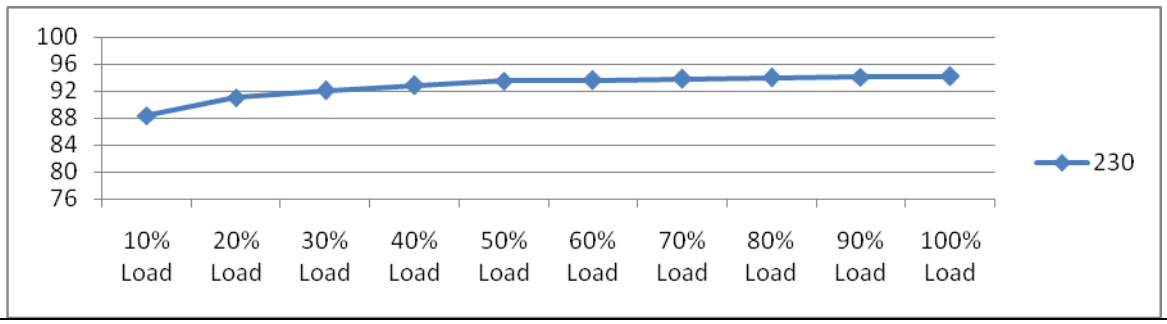
FULL /MIN LOAD 50%DUTY / 1KHZ



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	72 V~264V
			I/P: LOW-LINE-3V=77 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:80 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST:OK
3	INPUT CURRENT (Typ.)	230V/1.1A 115V/2.3A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =0.55A/ 230VAC I =0.96A/ 115VAC
4	LEAKAGE CURRENT	Earth <0.15 mA / 264 VAC touch< 0.08 mA / 264 VAC	I/P： 264 VAC O/P：Min LOAD Ta：25℃	Earth： 0.0928 mA touch：0.0608mA
5	NO LOAD CONSUMPTION	< 0.3W	I/P：240VAC O/P：NO LOAD Ta：25℃	<0.23W
6	POWER FACTOR (Typ.)	0.94/ 230VAC 0.98/115VAC	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	PF=0.959/230VAC PF=0.989/115VAC
	P.F vs LOAD			
7	EFFICIENCY(Typ.)	92%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	94.2%
	EFFICIENCY vs LOAD			

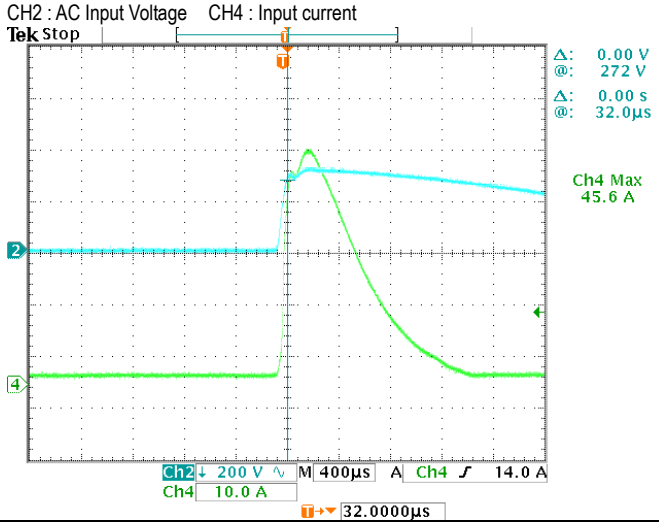




8	INRUSH CURRENT(Typ.)	230V/60A 115V/30A COLD START	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =45.6A/ 230VAC I =14.6A/ 115VAC

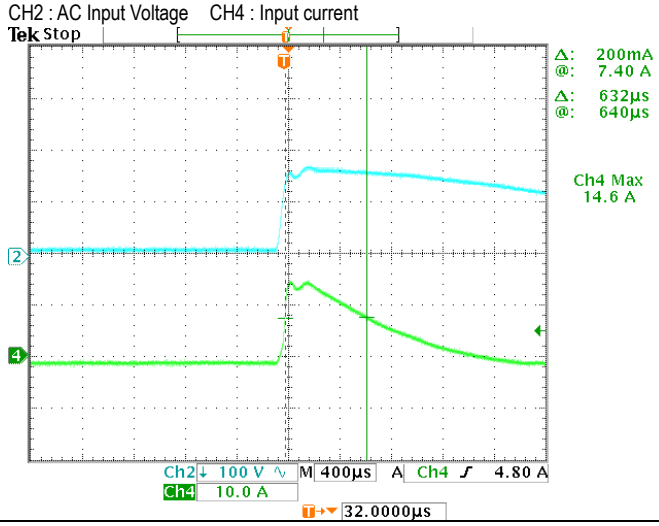
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



INPUT=115VAC/ 60HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	130 %~160%	I/P: 264VAC I/P: 230VAC I/P:115VAC O/P:TESTING Ta:25℃	143.3%/ 264VAC 143.4%/ 230VAC 144.2%/115VAC PROTECTION TYPE： Hiccup mode ,recovers automatically after fault condition is removerd
2	OVER VOLTAGE PROTECTION	16.5V~19.5V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P:MIN LOAD Ta:25℃	18.3V/ 264VAC 18.3V/ 230VAC 18.3V/ 80VAC 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: 264VAC I/P: 90VAC 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: 264VAC I/P: 90VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE： Hiccup mode ,recovers automatically after fault condition is removerd

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q3 Rated : 11A/ 650 V Q4 Rated	AC ON/OFF I/P:High-Line +3V =267V VDS:	Q3 Q4 VDS: VDS:

		: 11A/ 650 V	O/P: (1)Full Load (2)Output Short (3)Full load continue Ta:25℃	(1) 410V (2) 390V (3) 402V	(1)414V (2)410V (3)406V
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 18A/ 600V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full load continue Ta:25℃	VDS: (1) 483V (2) 430V (3) 446V	
3	P.F.C DIODE	D1 Rated : 9A/ 600 V	I/P:High-Line +3V =267 V AC ON/OFF 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℃	(1) 426V (2) 406V (3) 426V (4) 430V	
4	Diode Peak Voltage	Q101 Rated : 71 A/ 60 V Q102 Rated : 71 A/ 60 V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3)Full load continue Ta:25℃	Q101: VDS: (1) 35.6V (2) 11.9V (3) 35.6V	Q102 VDS (1) 37.6V (2) 5.1V (3) 37.6V
5	Input Capacitor Voltage	C5 Rated: : 100 μ / 420 V	I/P:High-Line +3V =267V 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)405V (2) 413V (3) 401V (4) 417V	
6	Control IC Voltage Test	PWM IC U1 Rated -0.3 V~ 30 V PFC IC U2 Rated -0.3V~30V O/P IC U101 Rated -0.3V~38V	AC ON/OFF I/P:High-Line +3V =267 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(LOW LINE) Ta:25℃	U1 (1) 11.6V (2) 11.6V (3) 11.6V (4) 11.6V (5) 11.4V U101 (1) 15.2V (2) 1.1V (3) 15.2V (4) 18.4V (5) 14.4V	U2 (1) 25.9V (2) 25.9V (3) 25.9V (4) 25.9V (5) 25.7V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min I/P-FG :2KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 4.4KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.8KVAC/min Ta:25℃	I/P-O/P:1.8mA I/P-FG:1.2mA O/P-FG:1.0m 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: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ

			Ta:25℃	NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 ☑CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	☑PASS □FAIL
2	CONDUCTION	□EN55032 ☑EN55011 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	□EN55032 ☑EN55011 CLASS I：CLASS B CLASS II：CLASS A	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR：15KV / Contact：8KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	☑CRITERIA A □CRITERIA B
5	E.F.T	EN61000-4-4 INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	☑CRITERIA A □CRITERIA B
6	SURGE	IEC61000-4-5 L-N ：2KV L,N-PE：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	☑CRITERIA A □CRITERIA B
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：RPS-120S-12 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 22.7 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 53.4 ℃		

NO	Position	ROOM AMBIENT Ta= 22.7 ℃	HIGH AMBIENT Ta= 53.4 ℃
1	PCB	53.1℃	82.4℃
2	LF1	48.1℃	76.1℃
3	L2	67.4℃	92.5℃
4	BD1	71.0℃	95.7℃
5	Q1	75.9℃	97.7℃
6	L1	77.0℃	98.4℃
7	C5	57.2℃	79.8℃
8	T1 COIL	93.2℃	106.4℃
9	TI CORE	79.8℃	103.7℃
10	RTH2	49.6℃	74.5℃
11	C101	60.9℃	87.5℃
12	C100	60.6℃	75.8℃
13	L100	60.4℃	82.9℃
14	U1	64.1℃	90.3℃
15	U2	70.9℃	88.9℃
16	D1	79.4℃	83.6℃
17	Q3	82.9℃	102.3℃
18	Q4	66.6℃	97.9℃
19	Q101	81.2℃	105.3℃
20	Q102	73.9℃	102.3℃
21	C103	71.6℃	90.4℃
22	R101	73.0℃	96.4℃
23	R40	66.3℃	91.3℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：142 % LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 264VAC/100VAC O/P： 100 % LOAD Ta= -35 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ / 95 %R.H NO DAMAGE	I/P： 272 VAC O/P：FULL LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃ (0~50℃)	I/P： 230 VAC O/P：FULL LOAD	± 0.0001 %/℃ (0~50℃)
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	-30~50℃	1. Thermal shock Temperature： -35℃~ +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, 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℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C100 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) 201512.6 HRS (2) 47660.6 HRS (3) 63599.3 HRS (4) 136254.7 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 468K 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	LIUTT		Wangdz

2018.4.30 GP-A50-F010