



Test Report: HRP-300N-36

300W Single Output with PFC Function

■ 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

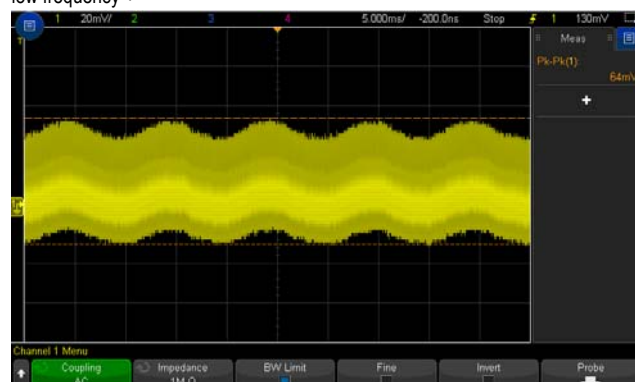
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 28.8 V~ 39.6 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	26.862V~40.867V/230VAC 26.862V~40.868V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0 %~ +1.0 %	I/P: 85VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:-0.04%~0.03%
3	LINE REGULATION (Max)	V1: -0.2 %~ +0.2 %	I/P: 85VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.01%~0.03%
4	LOAD REGULATION(Max)	V1: -0.5 %~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:-0.04%~0.01%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.6%
6	RIPPLE & NOISE(Max)	V1: 250mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 64mVp-p

high frequency :



low frequency :



7	SET UP TIME(Max)	230VAC/ 1000ms 115VAC/2500ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 63 ms 115VAC/ 136 ms
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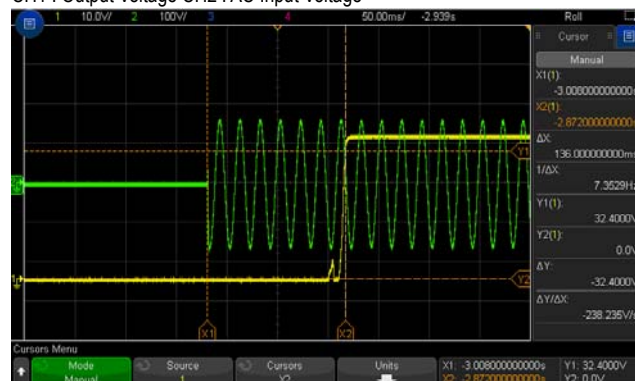
INPUT=230VAC/50HZ @ FULL LOAD

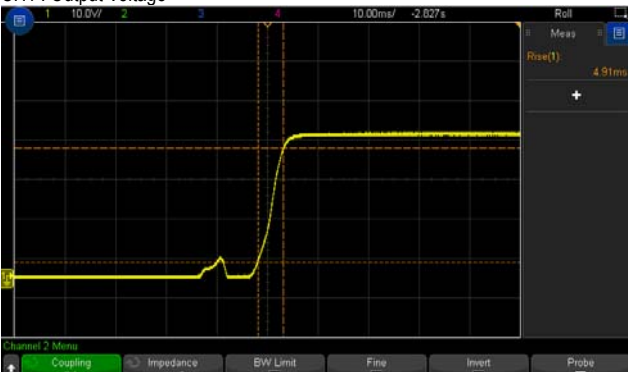
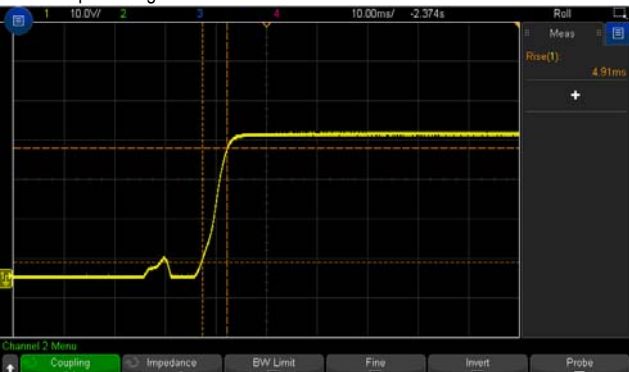
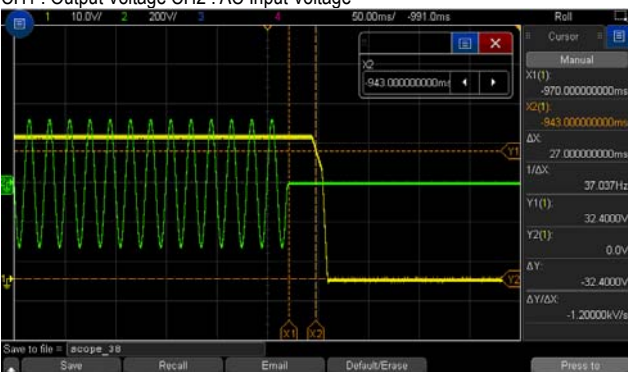
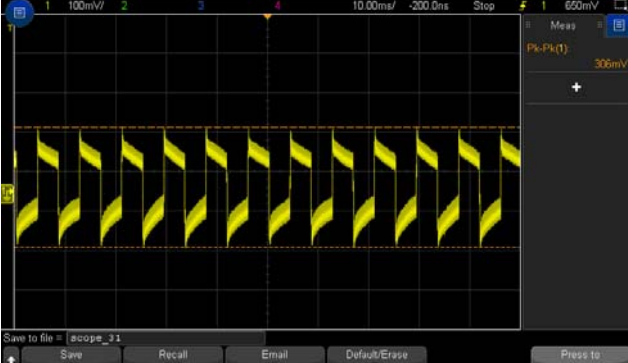
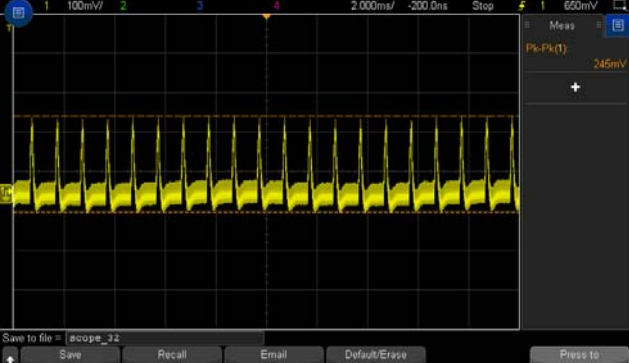
CH1 : Output Voltage CH2 : AC Input Voltage

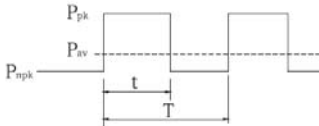


INPUT=115VAC/60HZ @ FULL LOAD

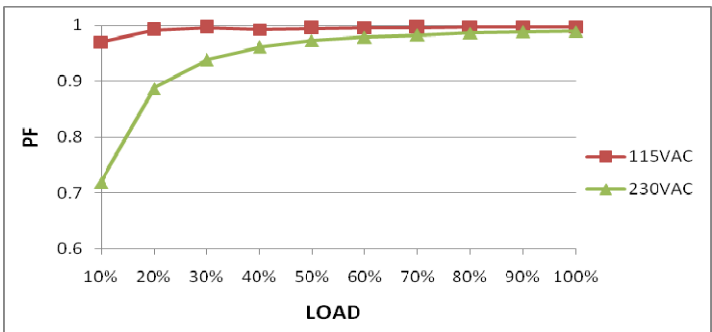
CH1 : Output Voltage CH2 : AC Input Voltage

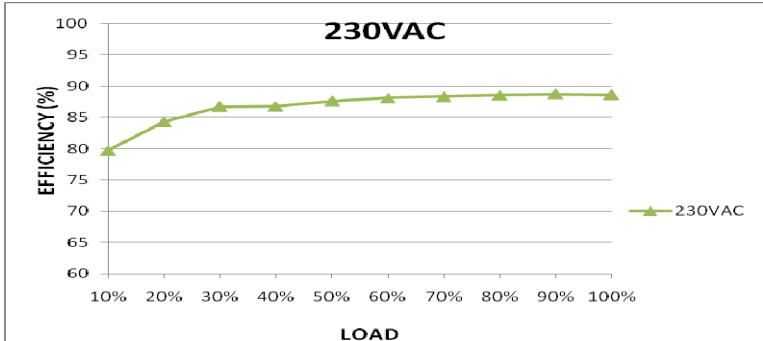
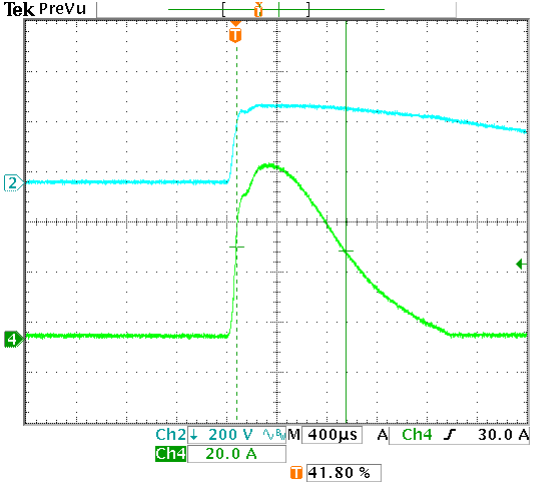
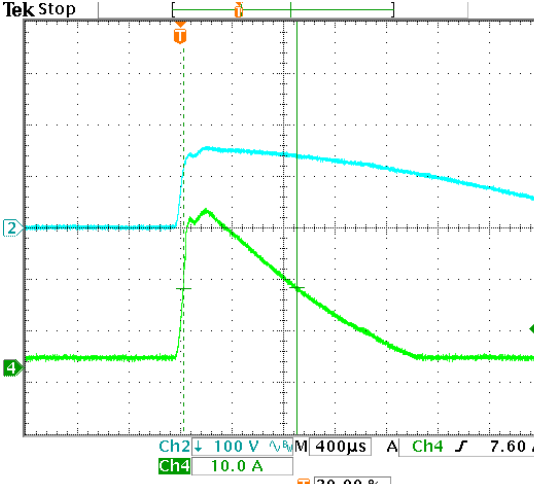


8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 4.91 ms 115VAC/ 4.91 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/16ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 27 ms 115VAC/ 28.0 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 	
10	DYNAMIC LOAD	V1: 3600 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	306mVp-p 245mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	
11	PEAK POWER	1 HOUR NO DAMAGE	I/P : 230 VAC O/P:TESTING Ta:25°C	TEST:OK

		$P_{av} = \frac{P_{pk} \times t + P_{nprk} \times (T-t)}{T} \leq P_{rated}$ $Duty = \frac{t}{T} \times 100\% \leq 35\%$ $t \leq 5 \text{ sec}$ 		
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC 120VDC~ 370VDC	(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) 81.2 V~264V (2)100.77Vdc~370Vdc/FULL LOAD 100.83Vdc~370Vdc/50% LOAD (3) 100.67Vdc~370Vdc/FULL LOAD 100.73Vdc~370Vdc/50% LOAD
			I/P: LOW-LINE-3V=82 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 DAMA GE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:85 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST:OK
3	INPUT CURRENT (Typ.)	230V/ 1.8 A 115V/ 3.5 A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25℃	I=1.6151A/ 230VAC I=3.3201A/ 115VAC
4	LEAKAGE CURRENT	<1.5mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25℃	1.279mA
5	POWER FACTOR (Typ.)	0.95/ 230VAC 0.99/115VAC	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25℃	PF=0.9888/230VAC PF=0.9961/115VAC
	P.F vs LOAD 			

6	EFFICIENCY(Typ.)	88%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	88.62 %
EFFICIENCY vs LOAD  230VAC				
7	INRUSH CURRENT(Typ.)	230V/75A 115V/35A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I=70.4A/ 230VAC I=31A/ 115VAC
INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current Tek PreVu  Ch2 Max 200 V Ch4 Max 70.4 A INPUT=115VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current Tek stop  Ch2 Max 158 V Ch4 Max 31.0 A				

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~ 200 %/5S 280% LOAD > 5s	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25°C	108.78%/ 264VAC 108.78%/ 230VAC 108.78%/100VAC 5S TEST: OK PROTECTION TYPE : Normally works within 105%~200% rated power for more than 5seconds and than shut down o/p voltage, re-power on to recover ; Constant current limiting for output power >280% rated for more than 5seconds and than shut down o/p voltage, re-power on to recover

2	OVER PROTECTION VOLTAGE	41.4V~48.6V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C	44.9V/ 264VAC 44.9V/ 230VAC 44.9V/ 90VAC 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: 85VAC 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: 85VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting, and shut down after 5 seconds , re-power on to recover .

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT						
3	REMOTE SENSE	S+ / S- >0.3V Compensate voltage drop on the load wiring up to 0.5V.	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	0.349V						
4	DC OK SIGNAL	High (3.3 ~ 5.6V) :PSU turn on Low (0 ~ 1V) : PSU turn off. I/P: 230 VAC O/P:FULL LOAD Ta:25°C Test Result : <table><tr><th>Vout</th><th>DC OK SIGNAL</th></tr><tr><td>PSU turn on</td><td>5.140 V</td></tr><tr><td>PSU turn off</td><td>0 V</td></tr></table>			Vout	DC OK SIGNAL	PSU turn on	5.140 V	PSU turn off	0 V
Vout	DC OK SIGNAL									
PSU turn on	5.140 V									
PSU turn off	0 V									
11	FAN ON/OFF CONTROL	Load 35±15% or RTH2≥50°C FAN ON	I/P: 230 VAC O/P:TESTING	<table><tr><td></td><td>RTH(°C)</td><td>LOAD(%)</td></tr><tr><td>FAN ON</td><td>OK</td><td>31.27%</td></tr></table>		RTH(°C)	LOAD(%)	FAN ON	OK	31.27%
	RTH(°C)	LOAD(%)								
FAN ON	OK	31.27%								

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q 3/Q4 Rated : 18 A/ 600V VGS : $\pm 25\text{ V}$	AC ON/OFF I/P: High-Line=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. Ta:25°C	Q3 Q4 VDS: VDS: (1) 505V (1) 538V (2) 517V (2) 562V (3) 513V (3) 538V (4) 521V (4) 542V (5) 521V (5) 542V (6) 485V (6) 521V (7) 505V (7) 546V

2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 34 A/ 600 V VGS :± 25 V	I/P:High-Line =267 V AC ON/OFF 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. Ta:25℃	Q1 VDS: (1) 413V (2) 525V (3) 413V (4) 413V (5) 417V (6) 417V (7) 405V
3	P.F.C DIODE	D1 Rated : 8A/ 600 V	I/P:High-Line =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) 385V (2) 405V (3) 385V (4) 385V
4	Diode Peak Voltage	Q101 Rated : 20 A/200V Q104 Rated : 10 A/400V	AC ON/OFF I/P:High-Line =300 V VOmax 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 VO: O/P: (1)Full Load Ta:25℃	Q101: VOmax VDS: (1) 174V (2) 174V (3) 180V (4) 184V (5) 180V (6) 172V (7) 174V (8) 176V VO: (1) 172V Q104: VOmax VDS: (1) 288V (2) 350V (3) 322V (4) 306V (5) 302V (6) 294V (7) 338V (8) 328V VO: (1) 310V
5	Input Capacitor Voltage	C5 Rated: : 120 μ / 400V	I/P:High-Line =300 V 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) 398V (2) 397V (3) 398V (4) 382V
6	Control IC Voltage Test	PWM IC U1 Rated 11V~ 30 V O/P IC U201/ U110 Rated -0.3 V~ 32 V	AC ON/OFF I/P:High-Line =300 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) 14.9V (2) 14.9V (3) 14.9V (4) 14.9V (5) 14.9V U201 (1) 12.3V U110 (1) 16.7V

				(2) 13.7V (3) 12.3V (4) 20.3V (5) 12.1V	(2) 16.9V (3) 16.7V (4) 15.5V (5) 14.9V
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SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25℃	I/P-O/P:7.10mA I/P-FG:6.77mA O/P-FG:4.96mA 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℃	5 mΩ

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
2	CONDUCTION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR: 8KV / Contact: 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
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
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 : HRP-300N-36 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25.0 ℃ 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50.0℃		

NO	Position	ROOM AMBIENT Ta= 25.0 °C	HIGH AMBIENT Ta= 50.0 °C
1	RTH1	29.9°C	56.6°C
2	LF1	29.0°C	56.2°C
3	LF2	30.3°C	57.5°C
4	ZNR1	25.5°C	51.7°C
5	BD1	36.3°C	62.7°C
6	L3	43.3°C	69.8°C
7	D1	40.6°C	66.4°C
8	Q1	39.6°C	65.8°C
9	RY1	44.6°C	71.4°C
10	TSW1	33.1°C	59.0°C
11	C5	35.8°C	61.7°C
12	U1	41.0°C	68.5°C
13	T2	42.0°C	69.4°C
14	Q3	44.8°C	72.3°C
15	Q4	41.6°C	68.9°C
16	R28	40.4°C	67.5°C
17	T1coil	58.0°C	86.3°C
18	T1core	55.2°C	83.9°C
19	Q102	45.7°C	72.7°C
20	Q103	37.1°C	76.1°C
21	L100	54.9°C	83.7°C
22	C105	31.7°C	59.4°C
23	RG1	30.0°C	56.8°C
24	RTH2	30.1°C	57.3°C
25	ZD102	39.1°C	67.7°C
26	ZD103	38.2°C	65.6°C
27	D30	39.6°C	65.7°C
28	U201	30.8°C	57.3°C
29	J111	34.4°C	61.2°C
30	U2	36.8°C	63.7°C
31	D150	41.7°C	70.1°C
32	R105	45.9°C	77.6°C
33	U110	33.8°C	60.4°C
34	C107	28.3°C	54.9°C

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 114 % 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= -45 °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	± 0.0041 %/°C (0~50°C)

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	-40~50℃	1. Thermal shock Temperature : -45℃~+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 : 10min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 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) 2361387.9 HRS (2) 346189.8 HRS (3) 411029.4 HRS (4) 473941.4 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 529.1K hrs min. Telcordia SR-332 (Bellcore) ; 201.43K hrs min. MIL-HDBK-217F (25℃)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50℃ Demonstration Mean Time Between Failure :50,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010