



# TEST REPORT: KNX-20E-640

## 20W KNX Power Supply

### ■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Component Stress Test

### ■ SAFETY & E.M.C. TEST

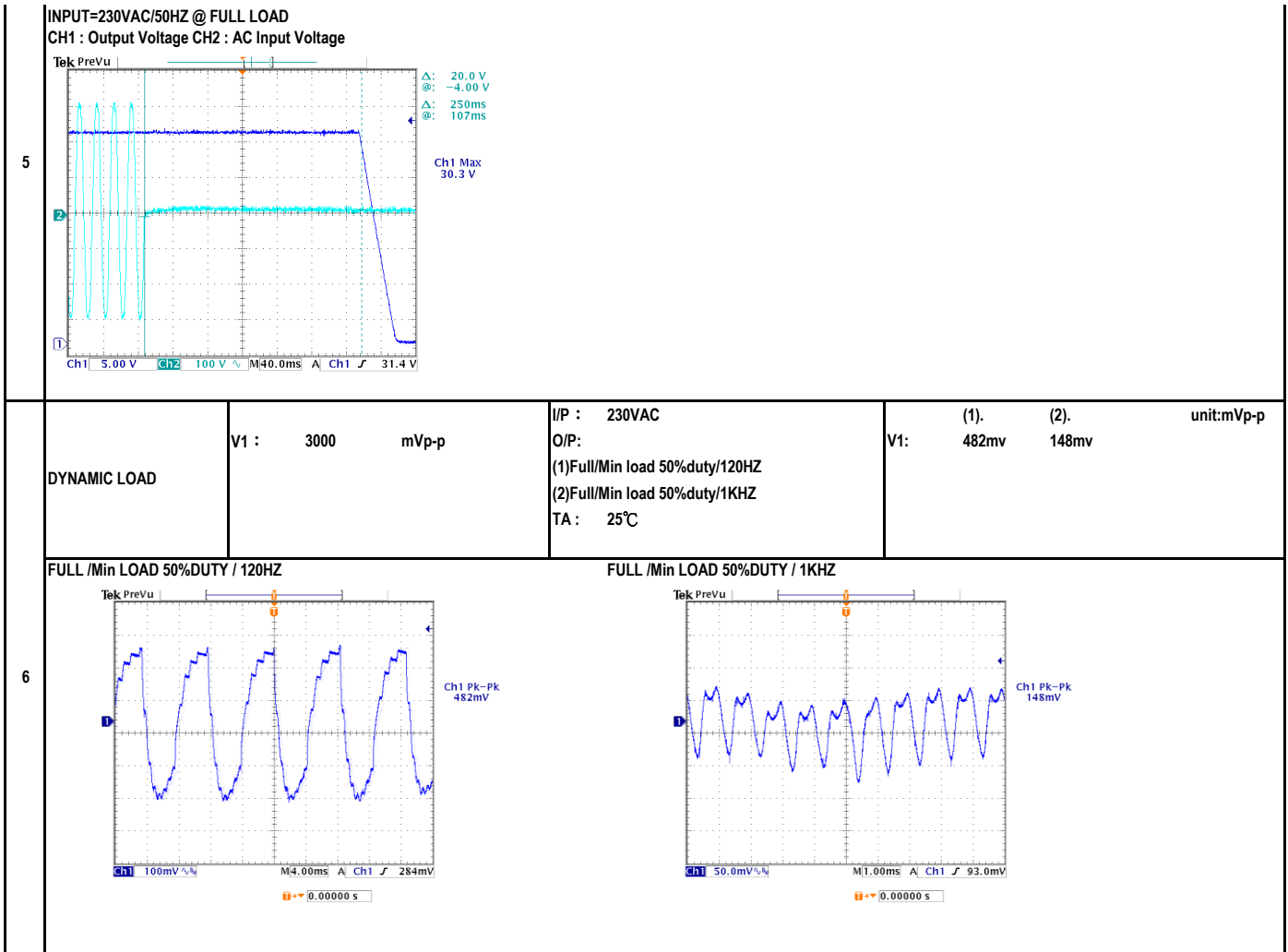
- Safety Test
- E.M.C. Test

### ■ RELIABILITY TEST

- ENVIRONMENT TEST

DESIGN VERIFY TEST  
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 3.7 %
2	RIPPLE & NOISE(Max)	V1 : 100 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 72.4 mVp-p
3	SET UP TIME (MAX.)	230VAC : 1000ms	I/P : 230VAC O/P: FULL LOAD TA: 25°C	230VAC : 212ms
4	RISE TIME (MAX.)	230VAC : 50ms	I/P : 230VAC O/P: FULL LOAD TA: 25°C	230VAC : 12.0ms
4	HOLD UP TIME (TYP.)	230VAC : 200ms	I/P : 230VAC O/P: FULL LOAD TA: 25°C	230VAC : 250.0ms



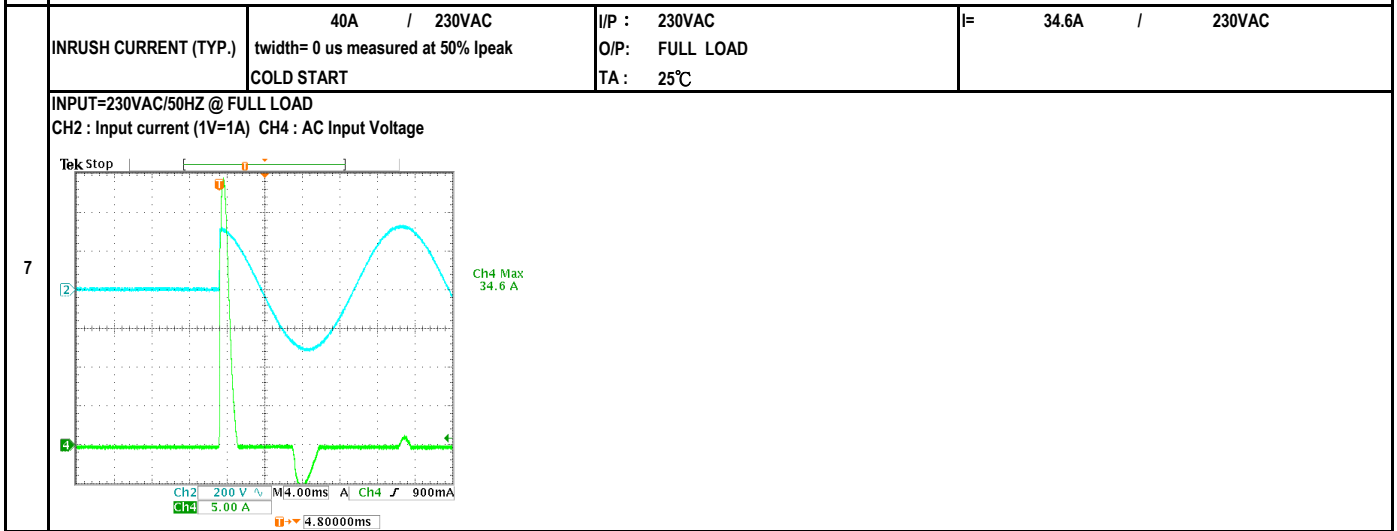
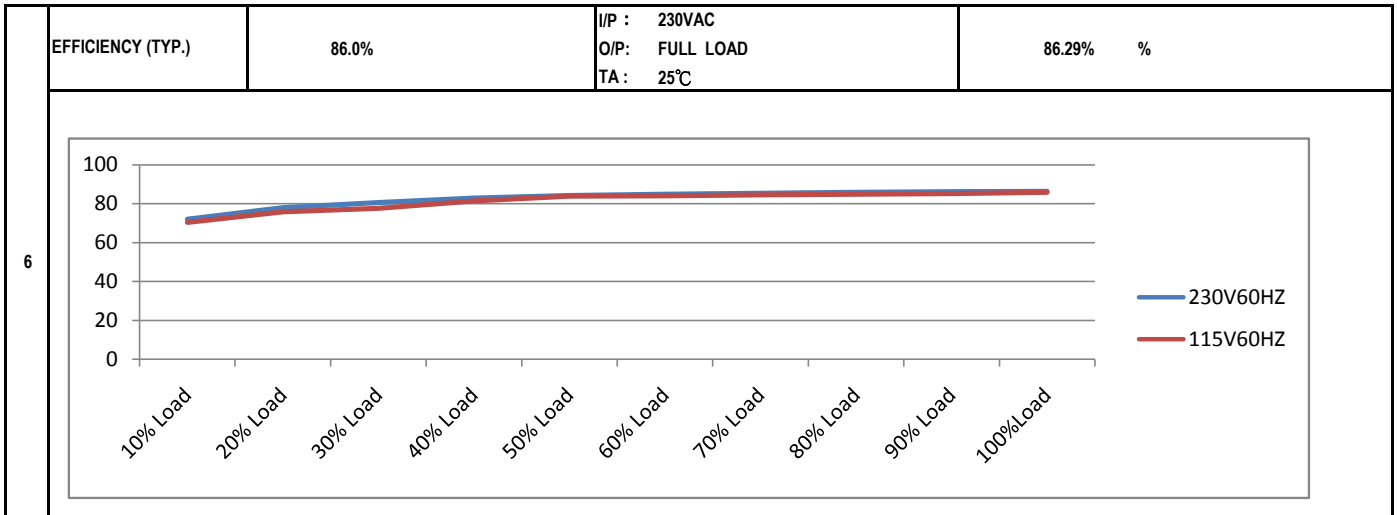
### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C I/P : LOW-LINE = 177VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN ( POWER ON/OFF NO DAMAGE )	140.0VAC ~ 264VAC  TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 180VAC ~ 264VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	0.22 / 230VAC	I/P : 230VAC O/P: FULL LOAD TA: 25°C	I= 0.1854 / 230VAC
4	LEAKAGE CURRENT	< 1.00mA	I/P : 240VAC O/P: MIN LOAD TA: 25°C	L-FG: 0.2297 mA N-FG: 0.2286 mA
5	NO LOAD POWER CONSUMPTION	< 0.50W	I/P : 230VAC O/P: MIN LOAD TA: 25°C	< 0.3822 W



# 20W KNX POWER SUPPLY

KNX-20E series



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	205% ~ 235%	I/P: 264VAC I/P: 230VAC I/P: 180VAC O/P: TESTING TA: 25°C	216% 264VAC 217% 230VAC 216% 180VAC Constant Current Limiting
2	OVER VOLTAGE PROTECTION	33.00V ~ 35.00V	I/P: 264VAC I/P: 230VAC I/P: 180VAC O/P: MIN LOAD TA: 25°C	33.80V 264VAC 33.80V 230VAC 33.80V 180VAC Shut down Re- power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 180VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Constant Current Limiting



# 20W KNX POWER SUPPLY

KNX-20E series

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated : 600V 11.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q1 VIN: 267VAC (1). 490.00V (2). 490.00V (3). 488.00V
2	O/P Diode (MOSFET)	D100 Rated : 300V 20A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	D100 VDS : (1). 191.00V (2). 244.00V (3). 191.00V
3	Input Capacitor	C5 Rated : 150uf 400V	I/P : 267VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	C5 (1). 368.00V (2). 368.00V (3). 370.00V
4	Control IC	U1 Rated : 28V (max) 10.5V (min)	I/P : 267VAC O/P : (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta : 25°C	U1 (1). 12.80V (2). 12.30V (3). 12.60V (4). 13.80V (5). 12.40V
5	O/P Diode (MOSFET)	Q102 Rated : 40V 100A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q102 VIN: 267VAC (1). 30.40V (2). 2.00V (3). 29.60V
6	Clamp Diode	D3 Rated : 800V 2.0A	I/P : 267VAC O/P : (1)Dynamic Load Full/Min Load 90%Duty/1KHz (2)Full load continue Ta : 25°C	(1). 464.00V (2). 460.00V

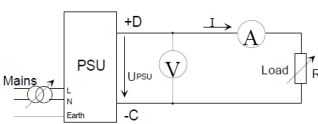
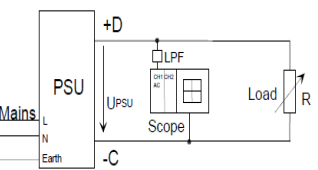
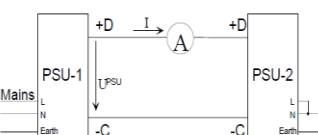
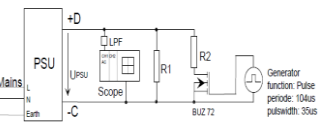
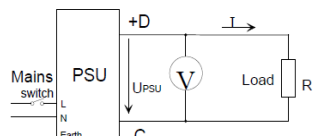
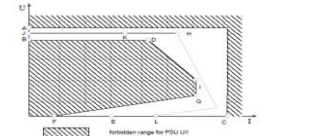
## SAFETY & E.M.C. TEST SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.750KVAC /min I/P-FG : 2.000KVAC /min O/P-FG : 1.250KVAC /min	I/P-O/P: 4.125KVAC /min I/P-FG: 2.400KVAC /min O/P-FG: 1.500KVAC /min Ta : 25°C	I/P-O/P: 2.46mA I/P-FG: 1.48mA O/P-FG: 1.37mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ I/P-FG : 500VDC>100MΩ	I/P-O/P: 500VDC I/P-FG: 500VDC Ta : 25°C/70%RH	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ 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°C	PASS
2	CONDUCTION	EN50491-5-2 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN50491-5-2 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR: 8KV / Contact: 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N: 2KV;L/N-PE: 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A

### ※ PSU TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	O/P VOLTAGE	 <p>Figure 5: Test Setup U/I</p>	I/P : 230VAC I/P : 180VAC O/P : 0.71A 0A	Vo= 29.885 V 230V /0.71A Vo= 29.892 V 230V /0A Vo= 29.892 V 180V /0.71A Vo= 29.898 V 180V /0A
2	RIPPLE NOISE		I/P : 230VAC I/P : 180VAC O/P : FULL LOAD	Vo= 80 mV 230V FULL LOAD Vo= 85.6 mV 180V FULL LOAD
3	Two products in parallel leakage current		I/P : 230VAC I/P : 180VAC O/P : NO LOAD	I= 8.01 mA 230V NO LOAD I= 8 mA 180V NO LOAD
4	Dynamic test		I/P : 230VAC I/P : 180VAC O/P : R2=140Ω	Vo= 200 mV 230V Vo= 201 mV 180V
5	Hold up time test		I/P : 230VAC O/P : FULL LOAD NO LOAD	264.72 ms / 230V output voltage drop to 95%, hold up time: ≥ 200ms
6	V/I test		I/P : 230VAC I/P : 180VAC O/P : TESTING	Vo=1.5V 1.4 A / 230V Vo=29.7V 1.38 A / 230V Vo=1.5V 1.4 A / 180V Vo=29.7V 1.38 A / 180V

### ※ CHOKE TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Steady state parameters test		I/P : 230VAC I/P : 180VAC O/P : 0.71A	1 $U_{cb} = 0.3784$ V $U_{da} = 0.376$ V  2 NO DAMAGE $I_N = 1.4$ A
2	Dynamic test		I/P : 230VAC I/P : 180VAC O/P : FULL LOAD NO LOAD  $R_2 = 220\Omega$ , $R_1 = (U_P / I_N) * 0.9 (40\Omega)$ , $L_1 = 4,8$ mH (at rated DC current), $R_i < 2\Omega$ judgment: waveform as left	S1 OPEN 180V 230V A= 31 V 30.9 V B= 23.7 V 23.5 V C= 24.6 V 24.9 V D= 34.8 V 34.8 V IP= 0.11 A 0.104 A  S1 CLOSE A= 29.5 V 29.4 V B= 23.1 V 23 V C= 25.3 V 25.4 V D= 35.8 V 29.4 V IP= 0.112 A 0.11 A
3	Reset test		I/P : 230VAC I/P : 180VAC O/P : 3A  U <sub>AUX</sub> shall be tuned to 10V DC ; R = 3,3 $\Omega$ ( I $\approx$ 3A ) when reset on/off judgment: U <sub>psu</sub> : $\geq 28$ V U <sub>aux</sub> : $\leq 0.5$ V LED turn red(Reset) , Choke no damage	U <sub>PSU</sub> = 29.853 V U <sub>AUX</sub> = 0.09 V LED red

### ■ RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																
1	TEMPERATURE RISE TEST	MODEL : KNX-20E 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC      O/P: 100% LOAD      TA= 15.0°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC      O/P: 100% LOAD      TA= 50.6°C																																																																		
				<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT 15.0°C</th> <th>HIGH AMBIENT Ta: 50.6°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>34.7°C</td><td>68.0°C</td></tr> <tr><td>2</td><td>BD1</td><td>33.9°C</td><td>68.3°C</td></tr> <tr><td>3</td><td>C5</td><td>32.7°C</td><td>67.6°C</td></tr> <tr><td>4</td><td>C35</td><td>38.4°C</td><td>71.7°C</td></tr> <tr><td>5</td><td>Q1</td><td>49.9°C</td><td>85.9°C</td></tr> <tr><td>6</td><td>T1 BOB</td><td>52.9°C</td><td>85.2°C</td></tr> <tr><td>7</td><td>T1 COIL</td><td>55.1°C</td><td>88.1°C</td></tr> <tr><td>8</td><td>D100</td><td>63.7°C</td><td>96.8°C</td></tr> <tr><td>9</td><td>U1</td><td>54.1°C</td><td>87.6°C</td></tr> <tr><td>10</td><td>C105</td><td>55.7°C</td><td>88.9°C</td></tr> <tr><td>11</td><td>RTH3</td><td>50.4°C</td><td>84.1°C</td></tr> <tr><td>12</td><td>L100</td><td>50.8°C</td><td>83.8°C</td></tr> <tr><td>13</td><td>T100</td><td>52.9°C</td><td>87.9°C</td></tr> <tr><td>14</td><td>Q101</td><td>43.8°C</td><td>69.5°C</td></tr> <tr><td>15</td><td>Q102</td><td>45.0°C</td><td>68.6°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT 15.0°C	HIGH AMBIENT Ta: 50.6°C	1	LF1	34.7°C	68.0°C	2	BD1	33.9°C	68.3°C	3	C5	32.7°C	67.6°C	4	C35	38.4°C	71.7°C	5	Q1	49.9°C	85.9°C	6	T1 BOB	52.9°C	85.2°C	7	T1 COIL	55.1°C	88.1°C	8	D100	63.7°C	96.8°C	9	U1	54.1°C	87.6°C	10	C105	55.7°C	88.9°C	11	RTH3	50.4°C	84.1°C	12	L100	50.8°C	83.8°C	13	T100	52.9°C	87.9°C	14	Q101	43.8°C	69.5°C	15	Q102	45.0°C	68.6°C
NO.	Position	ROOM AMBIENT 15.0°C	HIGH AMBIENT Ta: 50.6°C																																																																	
1	LF1	34.7°C	68.0°C																																																																	
2	BD1	33.9°C	68.3°C																																																																	
3	C5	32.7°C	67.6°C																																																																	
4	C35	38.4°C	71.7°C																																																																	
5	Q1	49.9°C	85.9°C																																																																	
6	T1 BOB	52.9°C	85.2°C																																																																	
7	T1 COIL	55.1°C	88.1°C																																																																	
8	D100	63.7°C	96.8°C																																																																	
9	U1	54.1°C	87.6°C																																																																	
10	C105	55.7°C	88.9°C																																																																	
11	RTH3	50.4°C	84.1°C																																																																	
12	L100	50.8°C	83.8°C																																																																	
13	T100	52.9°C	87.9°C																																																																	
14	Q101	43.8°C	69.5°C																																																																	
15	Q102	45.0°C	68.6°C																																																																	
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230VAC O/P : 192.00% LOAD Ta : 25°C	TEST : OK																																																																



# 20W KNX POWER SUPPLY

KNX-20E series

3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 264VAC / 180VAC O/P : FULL LOAD Ta : -30.0°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40°C ~ +85°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		TEST : OK
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +55°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 : 230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec		TEST : OK
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60 min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK
8	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0°C LIFE TIME	(1). 186994.8 HRS (2). 39018.6 HRS (3). 81350.1 HRS (4). 151902.6 HRS	
9	MTBF	Conducted by Parts Stress Analysis Prediction 109K hrs min. MIL-HDBK-217F (25°C)		
10	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50°C		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ