Test Report: TDR-480-24

480W Three Phase Industrial DIN RAIL with PFC Function

■ DESIGN VERIFY TEST

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

■ SAFETY & E.M.C. TEST

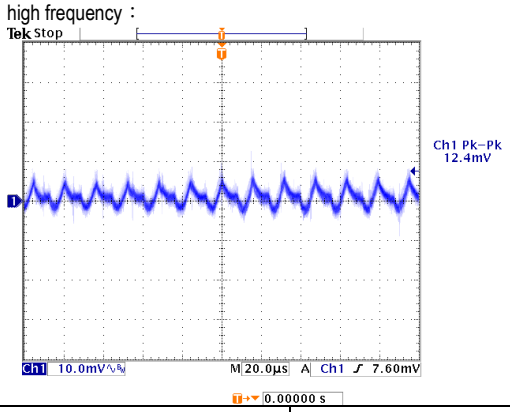
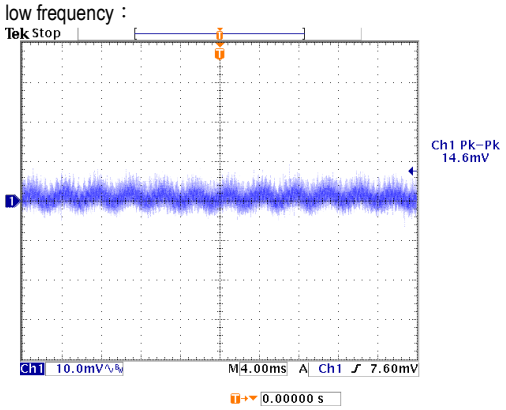
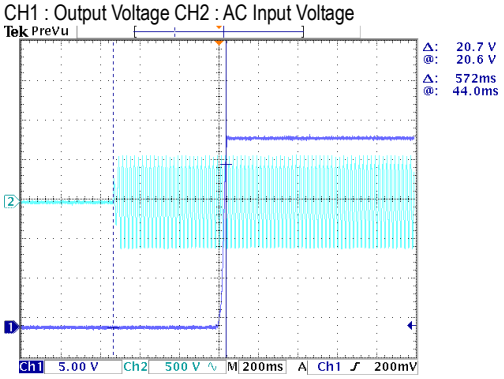
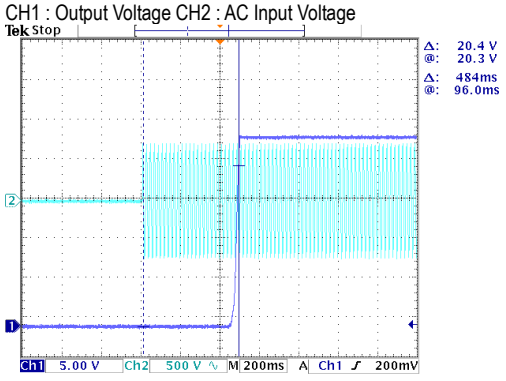
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

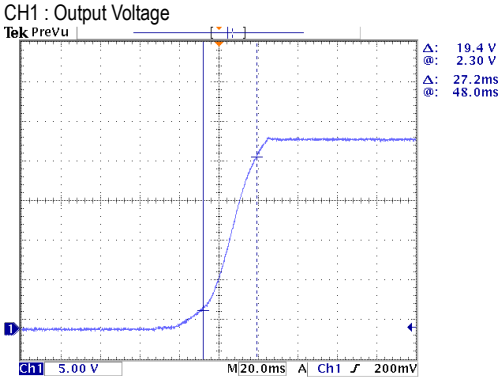
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 24 V~ 28 V	I/P： 400 VAC I/P： 500 VAC O/P：MIN LOAD Ta：25℃	23.36V~28.89V/400VAC 23.36V~28.90V/500VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 380VAC /550VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1:- 0.294%~ 0.221%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 380VAC /550VAC O/P:FULL LOAD Ta:25℃	V1: -0 %~0%
4	LOAD REGULATION(Max)	V1: 1 %~ -1 %	I/P: 400VAC O/P:FULL ~MIN LOAD Ta:25℃	V1:- 0.3605%~ 0.3357%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 400VAC O/P:FULL LOAD Ta:25℃	1.25%
6	RIPPLE & NOISE(Max)	V1: 150 mVp-p	I/P:400VAC O/P:FULL LOAD Ta:25℃	V1: 14.6mVp-p
	high frequency： 		low frequency： 	
7	SET UP TIME(Max)	400VAC/1200ms 500VAC/800ms	I/P： 400 VAC I/P： 500 VAC O/P：FULL LOAD Ta：25℃	400VAC/ 572ms 500VAC/ 484ms
	INPUT=400VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=500VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	

8	RISE TIME (Max)	400VAC/60ms 500VAC/60ms	I/P： 400 VAC I/P： 500 VAC O/P：FULL LOAD Ta：25℃	400VAC/ 27.2ms 500VAC/ 27.2ms

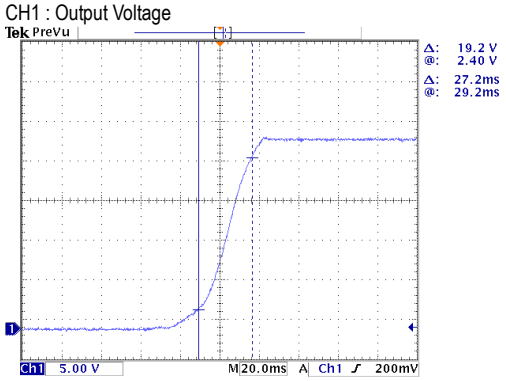
INPUT=400VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=500VAC/60HZ @ FULL LOAD

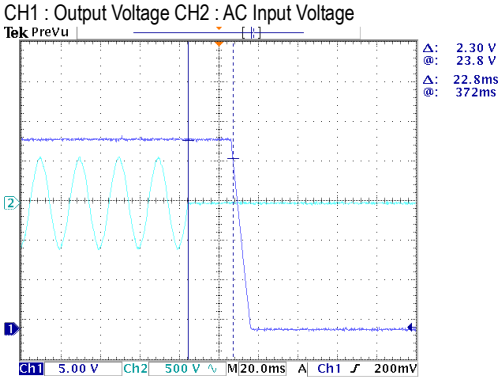
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	400VAC/20ms 500VAC/20ms	I/P： 400 VAC I/P： 500 VAC O/P：FULL LOAD Ta：25℃	400VAC/22.8ms 500VAC/ 23.6ms

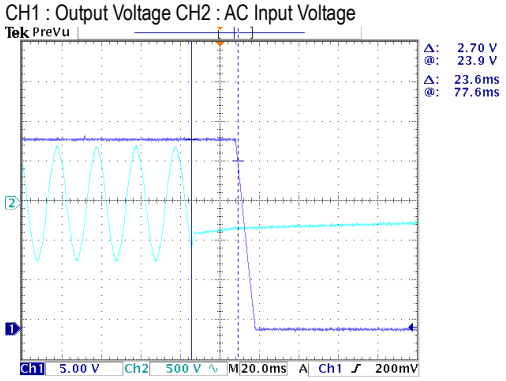
INPUT=400VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



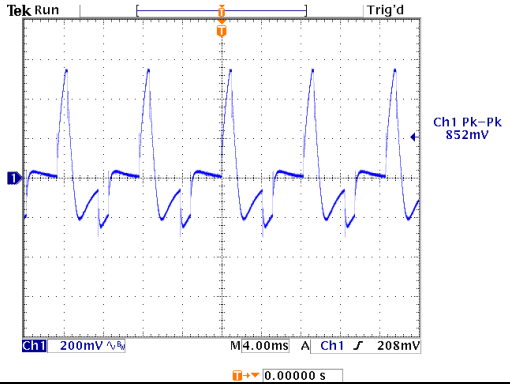
INPUT=500VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

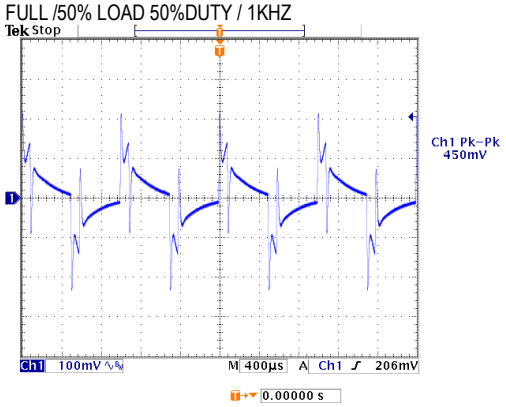


10	DYNAMIC LOAD	V1: 2400 mVp-p	I/P: 400VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 852mVp-p 450mVp-p

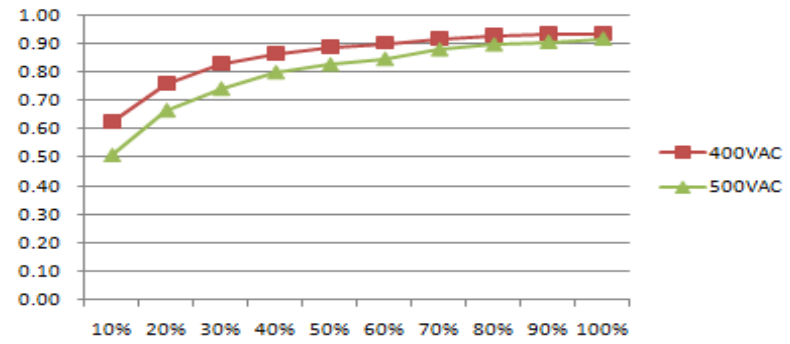
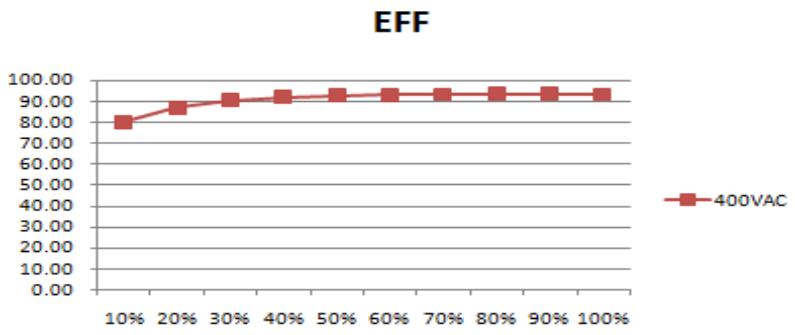
FULL /50% LOAD 50%DUTY / 120HZ

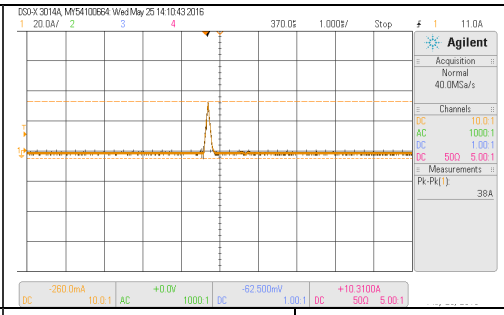


FULL /50% LOAD 50%DUTY / 1KHZ



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	340VAC~550VAC 480VDC~780VDC	I/P:TESTING O/P:FULL LOAD Ta:25℃	334VAC~550VAC 475VDC~780VDC
			I/P: LOW-LINE-3V=337 V HIGH-LINE+10V=560 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:340 VAC ~550 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST:OK
3	INPUT CURRENT (Typ.)	400V/ 0.85A 500V/ 0.7A	I/P： 400 VAC I/P： 500 VAC O/P：FULL LOAD Ta：25℃	I =0.794A/ 400VAC I =0.658A/ 500VAC
5	POWER FACTOR (Typ.)	0.9/ 400VAC 0.88/500VAC	I/P： 400 VAC I/P： 500 VAC O/P：FULL LOAD Ta：25℃	PF=0.935/400VAC PF=0.913/500VAC
	P.F vs LOAD 			
6	EFFICIENCY(Typ.)	92.5%	I/P:400 VAC O/P:FULL LOAD Ta:25℃	93.36 %
	EFFICIENCY vs LOAD 			
7	INRUSH CURRENT(Typ.)	400V/50A COLD START	I/P： 400 VAC O/P：FULL LOAD Ta：25℃	I = 38 A/ 400VAC
	INPUT=400VAC/50HZ @ FULL LOAD CH1 : Input current (1V=1A)			

				
8	LEAKAGE CURRENT	< 3.5 mA/530VAC For Touch	I/P:530 VAC O/P:MIN LOAD Ta:25℃	N1，N2，N3 and Earth：1.45 mA

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105 %~ 130 %	I/P: 550VAC I/P: 400VAC I/P: 340VAC O/P:TESTING Ta:25℃	118.0%/ 550VAC 118.0%/ 400VAC 118.0%/340VAC PROTECTION TYPE： Constant current limiting, unit will shut down after 3 sec. ,re-power on to recover
2	OVER VOLTAGE PROTECTION	29V~33V	I/P: 550VAC I/P: 400VAC I/P: 340VAC O/P:MIN LOAD Ta:25℃	31.1V/ 550VAC 31.1V/ 400VAC 31.0V/ 340VAC 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: 550VAC I/P: 340VAC 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: 550VAC I/P: 340VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE： Constant current limiting, unit will shut down after 3 sec. ,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 :20A/600 V	I/P:High-Line +3V =553V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25℃	VDS: (1)388V (2)396V (3)388V
2	P.F.C Transistor (D to S) or (C to E) **Peak Voltage**	Q902 Rated ： 12A/950 V	I/P:High-Line +3V =553 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25℃	VDS: (1)820V (1)812V (3)820V

3	Diode Peak **Voltage**	Q100 Rated ：**90A/80V**	I/P:High-Line +3V =553 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full Load Continue (4)BURST MODE(15 % LOAD) Ta:25℃	Q100: VDS: (1)59.6V (2)3.7V (3)59.6V (4)58.0V
4	**Input Capacitor Voltage**	C905 Rated: :150 μ / 400V 105 ℃	I/P:High-Line +3V =553V 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)396V (2)398V (3)398V (4)396 V
5	**Control IC Voltage Test**	PWM IC U2 Rated : 16V 8.85 V(MIN.) PFC IC U901 Rated : 22V -0.3V(MIN.) O/P IC U121Rated : 20 V -0.3 V(MIN.)	I/P:High-Line +3V =553 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR MIN LOW LINE Ta:25℃	(1) 14.0V (2) 13.9V (3) 13.9V (4) 13.4V (5) 13.0V (1)19.6V (2)18.3V (3)18.3V (4)15.4V (5)15.0V (1)12.9V (2)12.0V (3)13.4V (4)12.7V (5)12.5V

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:4.4mA I/P-FG:3.6mA O/P-FG:5.1m 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

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:400VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
2	CONDUCTION	EN55022 CLASS B	I/P： 400 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab

3	RADIATION	EN55022 1 CLASS B	I/P： 400 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 Din rail Model : AIR：15KV / Contact：8KV	I/P： 400 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P： 400 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N ：2KV L,N-PE：4KV	I/P： 400 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

■ 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： TDR-480-24
1. ROOM AMBIENT BURN-IN： 1 HRS
I/P： 400VAC O/P： FULL LOAD Ta= 25.2℃
2. HIGH AMBIENT BURN-IN： 1 HRS
I/P： 400VAC O/P： FULL LOAD Ta= 45.2℃</td></tr>
<tr><td colspan="5">
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=25.2℃</th><th>HIGH AMBIENT Ta=45.2℃</th></tr>
<tr><td>1</td><td>LF1</td><td>59.1℃</td><td>79.7℃</td></tr>
<tr><td>2</td><td>T1</td><td>84.7℃</td><td>96.4℃</td></tr>
<tr><td>3</td><td>L1</td><td>43.8℃</td><td>64.1℃</td></tr>
<tr><td>4</td><td>L2</td><td>48.1℃</td><td>68.4℃</td></tr>
<tr><td>5</td><td>L3</td><td>48.8℃</td><td>69.3℃</td></tr>
<tr><td>6</td><td>ZR2</td><td>53.3℃</td><td>74.2℃</td></tr>
<tr><td>7</td><td>D7</td><td>72.5℃</td><td>92.1℃</td></tr>
<tr><td>8</td><td>D8</td><td>76.0℃</td><td>95.1℃</td></tr>
<tr><td>9</td><td>D9</td><td>72.2℃</td><td>91.8℃</td></tr>
<tr><td>10</td><td>C12</td><td>64.0℃</td><td>83.8℃</td></tr>
<tr><td>11</td><td>LF2</td><td>62.7℃</td><td>82.9℃</td></tr>
<tr><td>12</td><td>L191</td><td>77.8℃</td><td>97.9℃</td></tr>
<tr><td>13</td><td>RY31</td><td>71.8℃</td><td>91.0℃</td></tr>
<tr><td>14</td><td>C104</td><td>64.5℃</td><td>85.4℃</td></tr>
<tr><td>15</td><td>Q100</td><td>62.3℃</td><td>82.5℃</td></tr>
<tr><td>16</td><td>C51</td><td>67.8℃</td><td>87.7℃</td></tr>
<tr><td>17</td><td>C5</td><td>61.8℃</td><td>81.7℃</td></tr>
<tr><td>18</td><td>C42</td><td>61.6℃</td><td>81.4℃</td></tr>
<tr><td>19</td><td>Q1</td><td>72.7℃</td><td>94.1℃</td></tr>
<tr><td>20</td><td>C45</td><td>62.4℃</td><td>83.6℃</td></tr>
<tr><td>21</td><td>C203</td><td>61.9℃</td><td>83.1℃</td></tr>
<tr><td>22</td><td>RT1</td><td>56.5℃</td><td>77.1℃</td></tr>
<tr><td>23</td><td>L8</td><td>58.6℃</td><td>79.3℃</td></tr>
<tr><td>24</td><td>C910</td><td>60.3℃</td><td>81.0℃</td></tr>
<tr><td>25</td><td>T902</td><td>73.0℃</td><td>93.5℃</td></tr>
<tr><td>26</td><td>D912</td><td>65.7℃</td><td>87.7℃</td></tr>
<tr><td>27</td><td>Q901</td><td>70.5℃</td><td>92.1℃</td></tr>
<tr><td>28</td><td>L901</td><td>52.3℃</td><td>73.4℃</td></tr>
<tr><td>29</td><td>D910</td><td>65.3℃</td><td>86.2℃</td></tr>
<tr><td>30</td><td>C906</td><td>63.2℃</td><td>83.8℃</td></tr>
<tr><td>31</td><td>C944</td><td>59.8℃</td><td>80.2℃</td></tr>
<tr><td>32</td><td>C943</td><td>55.8℃</td><td>76.3℃</td></tr>
<tr><td>33</td><td>C927</td><td>54.9℃</td><td>75.6℃</td></tr>
<tr><td>34</td><td>C926</td><td>61.8℃</td><td>82.4℃</td></tr>
<tr><td>35</td><td>TSW1</td><td>61.6℃</td><td>82.6℃</td></tr>
<tr><td>36</td><td>U150</td><td>66.2℃</td><td>86.5℃</td></tr>
<tr><td>37</td><td>U2</td><td>66.4℃</td><td>86.9℃</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： 400 VAC
O/P： 118 % LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
</table>

3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 380VAC/550VAC O/P： 100 % LOAD Ta= -30 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 ℃ NO DAMAGE	I/P： 550 VAC O/P：FULL LOAD Ta= 50 ℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~50℃)	I/P： 400 VAC O/P：FULL LOAD	± 0.0108 %/℃(0~50℃)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature： -40℃~ +85℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：5 CYCLE 5. Input/Output condition： STATIC		OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -30℃~ +70℃ 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： 400VAC/Full Load AC ON/OFF TEST turn on 58sec；turn off 2sec		OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：2G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃		TEST：OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C 105 IS THE MOST CRITICAL COMPONENT (1) I/P： 400VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 400VAC O/P：FULL LOAD Ta= 50 ℃ LIFE TIME (3) I/P： 400VAC O/P：75% LOAD Ta= 50 ℃ LIFE TIME (4) I/P： 400VAC O/P：50% LOAD Ta= 50 ℃ LIFE TIME		(1) 220920HRS (2) 36688HRS (3) 73755HRS (4) 126175HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1174.0K hrs min. Telcordia SR-332 (Bellcore) ; 108.3K hrs min. MIL-HDBK-217F (25℃)		
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50℃		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014