



# Test Report: TDR-960-48

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960W Three Phase Industrial DIN RAIL 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	VERDICT
1	RIPPLE & NOISE	V1 : 250 mVp-p (Max)	I/P : 400VAC O/P : FULL LOAD Ta : 25°C	V1 : 18.4 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 48 V ~ 55V	I/P : 400 VAC I/P : 500 VAC O/P : MIN LOAD Ta : 25°C	46.655 V~ 56.25 V/ 400 VAC 46.655 V~ 56.25 V/ 500 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 1%~ -1% (Max)	I/P : 380 VAC / 550 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.08 %~ -0.08 %	P
4	LINE REGULATION	V1 : 0.5%~ -0.5% (Max)	I/P : 380VAC ~ 550 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %	P
5	LOAD REGULATION	V1 : 1%~ -1% (Max)	I/P : 400 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.08 %~ -0.08 %	P
6	SET UP TIME	400VAC : 1000 ms (Max) 500VAC : 800 ms(Max)	I/P : 400 VAC I/P : 500 VAC O/P : FULL LOAD Ta : 25°C	400VAC/ 434 ms 500VAC/ 274 ms	P
7	RISE TIME	400VAC : 100 ms (Max) 500VAC : 100 ms (Max)	I/P : 400 VAC I/P : 500 VAC O/P : FULL LOAD Ta : 25°C	400VAC/ 16 ms 500VAC/ 16 ms	P
8	HOLD UP TIME	400VAC : 12 ms (TYP) 500VAC : 14 ms (TYP)	I/P : 400 VAC I/P : 500 VAC O/P : FULL LOAD Ta : 25°C	400VAC/ 18.4 ms 500VAC/ 18.4 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %	P
10	DYNAMIC LOAD	V1 : 4800 mVp-p	I/P : 400 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P : FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1)656 mVp-p (2)864 mVp-p (3)848 mVp-p (4)1760 mVp-p	P

**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	380VAC~550 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	265 V~550V	P
			I/P : LOW-LINE-3V= 377 V HIGH-LINE+10V=560 V O/P : FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON : 30 Sec. OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	TEST : OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 380 VAC ~ 550 VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.88 / 400 VAC(TYP) 0.86 / 500 VAC(TYP)	I/P : 400 VAC I/P : 500 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.927 / 400 VAC PF= 0.899 / 500 VAC	P
4	EFFICIENCY	94.5 % (TYP)	I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	95.01 %	P
5	INPUT CURRENT	400V/ 2 A (TYP) 500V/ 1.4 A (TYP)	I/P : 400 VAC I/P : 500 VAC O/P : FULL LOAD Ta : 25°C	I = 1.56 A/ 400 VAC I = 1.3 A/ 500 VAC	P
6	INRUSH CURRENT	400V/ 60 A (TYP) COLD START	I/P : 400 VAC O/P : FULL LOAD Ta : 25°C	I = 58 A/ 400 VAC	P
7	LEAKAGE CURRENT	< 3.5 mA / 530VAC	I/P : 530VAC O/P : Min LOAD Ta : 25°C	L1-FG : 2 mA L2-FG : 2 mA L3-FG: 2 mA	P

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105% ~130 %	I/P : 400 VAC I/P : 500 VAC O/P : TESTING Ta : 25°C	117 %/ 400 VAC 117 %/ 500 VAC Constant current limiting, unit will shut down after 3 sec. ,re-power on to recover	P
2	OVER VOLTAGE PROTECTION	CH1 : 56V ~65V	I/P : 400 VAC I/P : 500 VAC O/P : MIN LOAD Ta : 25°C	60.73 V/ 400 VAC 60.75 V/ 500 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC : TSW1 : 85± 5°C O.T.P. NO DAMAGE	I/P : 400 VAC O/P : FULL LOAD	O.T.P. Active Shut down o/p voltage , recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 550 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Constant current limiting, unit will shut down after 3 sec. ,re-power on to recover	P

### CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	DC OK RELAY CONTACT RATINGS	60Vdc/0.3A, 30Vdc/1A, 30Vac/0.5A resistive load	I/P : 400 VAC O/P : FULL LOAD	TEST : OK	P

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q301 Rated : FET STP26NM60N 20A/600V	I/P : High-Line +3V = 553 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 440 V (2) 432 V (3) 430 V	P
2	Diode Peak Voltage	Q104 Rated : IPP111N15N3G 83A/150V	I/P : High-Line +3V = 553V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 129 V (2) 13.6 V (3) 127 V	P
3	Input Capacitor Voltage	C905 Rated : 150u/450V 105°C 18*40 CXW	I/P : High-Line +3V = 553 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 424 V (2) 440 V (3) 448 V	P
4	Control IC Voltage Test	U 301 Rated : L6599 AD 8.15V~17V	I/P : High-Line +3V = 553V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 15.2 V (2) 14.8 V (3) 15.1 V	P
5	P.F.C. Transistor ( D to S) or (C to E) Peak Voltage	Q 902 Rated : IPW90R500C3 11A/900V	I/P : High-Line +3V = 553V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 899 V (2) 832 V (3) 872 V	P

**■ SAFETY & E.M.C. TEST**
**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min I/P-FG : 2 KVAC/min O/P-FG : 0.5 KVAC/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°C	I/P-O/P : 8.86 mA I/P-FG : 7.07 mA O/P-FG : 8.61 mA NO DAMAGE	P
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°C/70% RH	I/P-O/P : 29.9 GΩ I/P-FG : 24.8 GΩ O/P-FG : 22.7 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C /70% RH	18 mΩ	P

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS D	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P : 400 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS B	I/P : 400 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 400 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				



6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°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	OK	P
7	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 : 400VAC/Full Load AC ON/OFF TEST turn on 58sec ; turn off 2sec	OK	P
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK	P
9	CAPACITOR LIFE CYCLE	TDR-960-24:SUPPOSE C110 IS THE MOST CRITICAL COMPONENT (1) I/P : 400VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 400VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME (3) I/P : 400VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 400VAC O/P : 50% LOAD Ta=50 °C LIFE TIME	(1) 86884HRS (2) 16375HRS (3) 44970HRS (4) 95805HRS	P
10	MTBF	Conducted by Parts Stress Analysis Prediction 647.1K hrs min. Telcordia SR-332 (Bellcore) ; 59.5K hrs min. MIL-HDBK-217F (25°C)		P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2012/6/29	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2012/7/4	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2012/9/26	PRODUCT SAMPLE W1208C25	PASS	SANFORD SU	VINCENT TSENG

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