



# Test Report: VFD-250P-230

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250W General type Variable Frequency Drive 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	VOLTAGE RANGE(UVW)	3 $\psi$ 0~240VAC  Three phase line-to-line 0~240V, suit for 200-240V class motor	I/P : 90VAC 230VAC 264VAC O/P : 0~240VAC PWM Freq.:15KHz Ta : 25°C	V@min load 0V~280.3V / 0.05A @ I/P = 90Vac 0V~280.3V / 0.05A @ I/P = 230Vac 0V~280.4V / 0.05A @ I/P = 264Vac V@ Derating load 36.1V~279.4V / derating load @ I/P = 90Vac 35.2V~279.2V / derating load @ I/P = 230Vac 33.2V~279.3V / derating I load @ I/P = 264Vac
2	RATED OUTPUT CURRENT (A)	1A	I/P : 90VAC 230VAC 264VAC O/P:Rated output current PWM Freq.:15KHz Ta : 25°C	1A@90Vac 1A@230Vac 1A@264Vac
3	PEAK CURRENT	2A	I/P : 230 VAC O/P : 2A PWM Freq.:15KHz Ta : 25°C	TEST: OK
4	EFFICIENCY(Typ.)	91.5%	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	Eff : 92.5%
5	DC BUS VOILTAGE	DC BUS:380V $\pm$ 5V DC BUS VOLTAGE SENSOR:2.5 $\pm$ 0.05V	I/P : 230 VAC O/P: Rated output current PWM Freq.:15KHz Ta : 25°C	375.8V@ DC BUS VOLTAGE SENSOR:2.492V

### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED INPUT VOLTAGE	90VAC~264VAC	I/P : 87V~267V O/P: Full load PWM Freq.:15KHz Ta : 25°C	TEST : 80.8VAC~267VAC
			I/P : HIGH-LINE+10V=274V O/P: FULL/MIN LOAD PWM Freq.:15KHz (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 : 90 VAC ~264 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	TEST : OK
3	POWER FACTOR (Typ.)	0.93/ 230VAC 0.99/115VAC	I/P : 230 VAC I/P : 115 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	PF = 0.9646 @230Vac PF = 0.9953 @115Vac
4	RATED INPUT CURRENT	230V/1.3A 115V/2.6 A	I/P : (1) 230 VAC (2) 115 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	1.295 A @230Vac 2.56A @115Vac
5	INRUSH CURRENT(Typ.)	230V/70A COLD START	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	I = 49A/230V T50=440us/230V 
6	Leakage current	<2 mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	1.278mA

## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	SHORT PROTECTION	SHORT ANY TWO PHASE OUTPUT 1 HOUR NO DAMAGE Protection type : Shut down o/p voltage, re-power on to recover Inverter fault signal(Short circuit/OCP, PIN7 of CN93). TTL input: Normal: High(>3V); Abnormal: Low(<0.5V)	I/P : 264VAC I/P : 90VAC O/P : Short Any Two Phase Output Ta : 25°C	Test Result : O/P shut down PROTECTION TYPE : re-power on  FAULT SIGNAL Normal:3.288V Abnormal:0V
2	OVER TEMPERATURE PROTECTION	Protection type : auto-recovery Built-in 10KΩNTC for sensing IGBTs operating temperature. (TSM2A103F34D1R (Thinking Electronic), PIN2 of CN93)	I/P : 264VAC I/P : 90VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	Test Result : O/P shut down Protection type : Auto-Recovery
3	OVER LOAD PROTECTION	Protection type : Shut down o/p voltage, re-power on to recover Built-in 100mΩlow-side shunt	I/P : 230 VAC O/P : max. current@rated motor speed Ta : 25°C	Test Result : 200% OK · 265% shut down PROTECTION TYPE : Shut down o/p voltage, re-power on to recover



		resistor (each phase), (PIN4~6 of CN93)		
4	<b>OVER VOLTAGE PROTECTION</b>	When the voltage of the DC bus exceed 420V, the PWM input signal must shut down for protection.	I/P : 230 VAC O/P: Rated output current PWM Freq.:15KHz Ta : 25°C	Test Result: shut down for protection · re-power on

### CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1.	VCC	15V / 0.1A Ripple:1000mVp-p	I/P : 230 VAC O/P: Full load PWM Freq.:15KHz Ta : 25°C	14.662V / 709mVp-p

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	P.F.C Transistor ( D to S) or (C to E) Peak Voltage	Q1 · Q2 Rated : 16A/ 600 V	I/P : High-Line +3V =267 V AC ON/OFF O/P : (1)Full Load (2)Output Short (UVW) (3)0%→400% Load. Ta:25°C	VDS (1) 496V (2) 496V (3) 488V
2	P.F.C DIODE	D6 Rated: 12A/650V	I/P : High-Line +3V =267 V AC ON/OFF O/P : (1)Full Load (2)Output Short (UVW) Ta:25°C	(1) 405V (2) 405V
3	IGBT	Q901(High side)/Q904(Low side) Rated : 18A/600V	AC ON/OFF I/P : High-Line +3V =267 V O/P : (1)Full Load (2)Output Short (UVW) (3)0%→400% Load. (4)NO LOAD Ta:25°C	VCE(Q901 ) (1) 418V (2) 418V (3) 406V (4) 387V  VCE(Q904) (1) 424V (2) 465V (3) 424V (4) 377V
4	Input Capacitor Voltage	C5 Rated: : 100μ /450V	I/P : High-Line +3V =267V O/P : (1)Full Load input on/off	(1) 417V (2) 378V

			(2) Min load input on /Off (3) Full Load /Min load Change (4) Full load continue Ta : 25°C	(3) 406V (4) 403V
5	Control IC Voltage Test	PFC IC U1 Rated: 10.5V~ 25 V	AC ON/OFF I/P : High-Line +3V =267 V O/P : (1) FULL LOAD (Vo: 160VAC /Io:1A) (2) Output Short (UVW) (3) 0~200% (4) O.V.P. (5) NO LOAD Ta : 25°C	(1) 15.0V (2) 15.0V (3) 14.8V (4) 15.0V (5) 15.0V
		O/P IC U901 Rated: 13V~ 17.5 V	AC ON/OFF I/P : High-Line +3V =267 V O/P : (1) FULL LOAD (Vo: 160VAC /Io:1A) (2) Output Short (UVW) (3) 0~200% (4) O.V.P. (5) NO LOAD Ta : 25°C	(1) 15.3V (2) 15.9V (3) 15.3V (4) 15.2V (5) 15.3V
6	TOP SWITCHING STAND BY POWER	U902 Rated: 600V	AC ON/OFF I/P : High-Line +3V =267 V AC ON/OFF O/P : (1) Full Load (2) Output Short (UVW) Ta : 25°C	(1) 428V (2) 421V

## ■ SAFETY & E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-FG : 2KVAC/min	I/P-FG : 2.4 KVAC/min Ta : 25°C	I/P-FG : 6.94mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-FG : 500VDC > 100MΩ	I/P-FG : 500VDC Ta : 25°C	I/P-FG : 31GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100mΩ	40A / 2min Ta : 25°C	6mΩ

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 ■ CLASS A	I/P : 230VAC/50HZ O/P : motor Ta : 25°C	■ PASS □ FAIL
2	CONDUCTION	■ EN55032 □ EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : motor Ta : 25°C	Test by certified Lab
3	RADIATION	■ EN55032 □ EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : motor Ta : 25°C	Test by certified Lab
4	E.S.D	EN61000-4-2 ■ <u>INDUSTRY</u> AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : motor Ta : 25°C	■ CRITERIA A □ CRITERIA B
5	E.F.T	EN61000-4-4 ■ <u>INDUSTRY</u> INPUT : 2KV	I/P : 230 VAC/50HZ O/P : motor Ta : 25°C	■ CRITERIA A □ CRITERIA B
6	SURGE	IEC61000-4-5 ■ <u>LIGHT INDUSTRY</u> L-N : 1KV L,N-PE : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	■ 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 : VFD-250P-230 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2HRS I/P : 230VAC O/P : FULL LOAD Ta= 45 °C		

		NO	Position	ROOM AMBIENT Ta= 25°C	HIGH AMBIENT Ta= 45 °C
		1	LF1	84.9°C	97.8°C
		2	LF2	67.9°C	82.5°C
		3	Q1	68.9°C	84.4°C
		4	Q2	68.3°C	83.9°C
		5	D6	70.1°C	84.5°C
		6	L2	73.3°C	88.3°C
		7	L1	65.1°C	82.2°C
		8	BD1	61.9°C	77.6°C
		9	C10	58.1°C	75.8°C
		10	C962	42.3°C	63.8°C
		11	L931	55.1°C	76.2°C
		12	C961	42.8°C	65.0°C
		13	U903	59.0°C	79.1°C
		14	C5	62.9°C	81.2°C
		15	RTH3	59.1°C	76.8°C
		16	Q906	77.9°C	93.4°C
		17	Q903	71.4°C	85.7°C
		18	Q902	80.4°C	93.0°C
		19	Q901	82.3°C	93.1°C
		20	Q904	86.0°C	97.3°C
		21	Q905	85.1°C	98.6°C
		22	R913	79.6°C	90.9°C
		23	U901	64.6°C	83.3°C
		24	U902	67.6°C	87.6°C
		25	U1	72.5°C	87.8°C
		26	R914	77.3°C	90.7°C
		27	D961	51.2°C	69.7°C
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P : 264VAC/90VAC O/P : 100%LOAD Ta= -35°C	TEST : OK
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C/95 %R.H NO DAMAGE		I/P : 272 VAC O/P : FULL LOAD Ta= 45 °C HUMIDITY= 95 %R.H	TEST : OK
4	STORAGE TEMPERATURE TEST	-40~85°C		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 : 10 CYCLE 5. Input/Output condition : STATIC	
5	THERMAL SHOCK TEST	-30~45°C		1. Thermal shock Temperature : -35°C~ +50°C 2. Temperature change rate : 25°C / 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	



6	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°C
7	CAPACITOR LIFE CYCLE	SUPPOSE C9623 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= 45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME	(1) 745429HRS (2) 134543HRS (3) 160000HRS (4) 182522HRS
8	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Yuwei	Liutt	Wangdz

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