



Test Report: NTS-400P-224

400W High Reliable Built-in Type True Sine Wave DC-AC Power Inverter

- **DESIGN VERIFY TEST**
 - Output Function Test
 - Input Function Test
 - Protection Function Test
 - Control Function Test
 - APPLICATION 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	RATED POWER	400W	IP: 24VDC Ta:25°C	<u>408</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)460W/180sec. (2)600w/10sec (3)SURGE POWER 800W FOR 30CYCLE Vin (30±5 CYCLE)	IP: 25VDC OP: TESTING LOAD Ta:25°C	(1) 227.8 V/ 1.979 A/ 180.08 Sec (2) 227.4 V/ 2.578 A/ 10.07 Sec (3) 226.6V/ 3.481 A / 28 Cycle

CH3:O/P VAC CH4:O/P IAC

Fig1

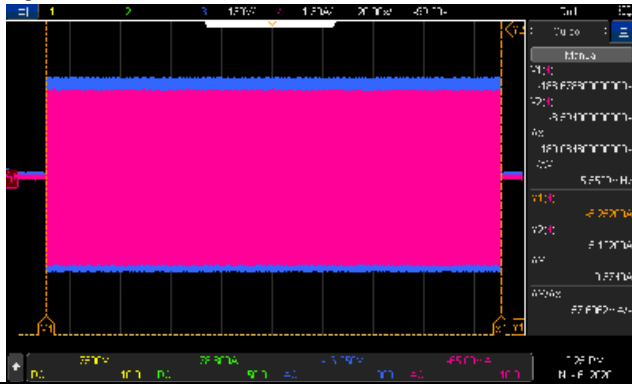


Fig2

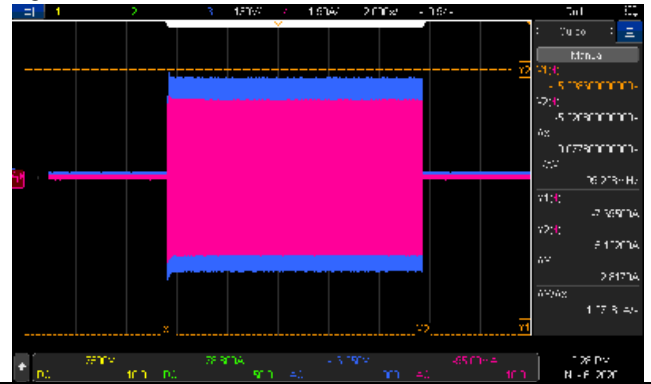


Fig3

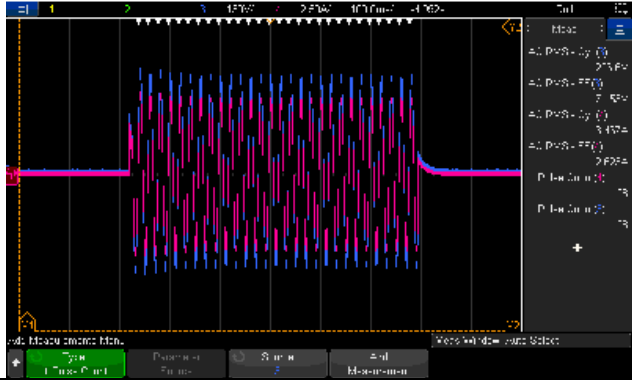


Fig4



3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.2</u> V DIP S.W 220VAC: <u>218.2</u> V DIP S.W 230VAC: <u>228.0</u> V DIP S.W 240VAC: <u>238.4</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 24VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.042</u> HZ DIP S.W 60HZ: <u>59.959</u> HZ
5	WAVEFORM	True sine wave (THD<3%)	IP: 25VDC OP: FULL LOAD (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) <u>1.17</u> % / Vo(min) /FULL LOAD (2) <u>1.22</u> % / Vo(nor) /FULL LOAD (3) <u>1.49</u> % / Vo(max) /FULL LOAD

CH3:O/P VAC CH4:O/P IAC				
Fig1		Fig2		
Fig3				
6	AC REGULATION	±3%	IP: 25VDC OP: FULL LOAD/NO LOAD Ta:25°C	<u>-0.74</u> %
7	Overshoot /Undershoot	<±10%	IP: 24VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) <u>-5.61</u> % (2) <u>-6.26</u> % (3) <u>-1.74</u> %
8	O/P voltage DC offset	Vin(nor)= <u>24</u> v · Vo<200mv · no load : <u>88.6mv</u> / full load: <u>160mv</u>		

9	LED STATUS	<ul style="list-style-type: none"> Status test <table border="1"> <thead> <tr> <th>LED</th> <th>Status</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td>Green</td> <td> Inverter OK</td> <td>OK</td> </tr> <tr> <td>Orange</td> <td> Remote off Saving mode</td> <td>OK</td> </tr> <tr> <td>Red</td> <td> Abnormal Status (See SPEC)</td> <td>OK</td> </tr> </tbody> </table> Battery test <table border="1"> <thead> <tr> <th>LED</th> <th>Battery RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>25~31VDC±0.5v</td> <td>>24.86 Vdc</td> </tr> <tr> <td> Orange</td> <td>22~25VDC ±0.5v</td> <td>21.89Vdc ~ 24.75dc</td> </tr> <tr> <td> Red</td> <td><22 Vdc ±0.5v >31 Vdc ±0.5v</td> <td><21.85Vdc >30.95 Vdc</td> </tr> </tbody> </table> Load test <table border="1"> <thead> <tr> <th>LED</th> <th>LOAD RANGE</th> <th>RESULT</th> </tr> </thead> <tbody> <tr> <td> Green</td> <td>Min. load ~ 40%±5% LOAD</td> <td>Min. load ~ 40.75%</td> </tr> <tr> <td> Orange</td> <td>40%±5% ~ 80%±5% LOAD</td> <td>41% ~80.0 %</td> </tr> <tr> <td> Red</td> <td>≥ 80%±5% LOAD</td> <td>≥ 80.25%</td> </tr> </tbody> </table> 	LED	Status	RESULT	Green	Inverter OK	OK	Orange	Remote off Saving mode	OK	Red	Abnormal Status (See SPEC)	OK	LED	Battery RANGE	RESULT	Green	25~31VDC±0.5v	>24.86 Vdc	Orange	22~25VDC ±0.5v	21.89Vdc ~ 24.75dc	Red	<22 Vdc ±0.5v >31 Vdc ±0.5v	<21.85Vdc >30.95 Vdc	LED	LOAD RANGE	RESULT	Green	Min. load ~ 40%±5% LOAD	Min. load ~ 40.75%	Orange	40%±5% ~ 80%±5% LOAD	41% ~80.0 %	Red	≥ 80%±5% LOAD	≥ 80.25%
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	20VDC~33VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C I/P: LOW-LINE=21V HIGH-LINE=32.5V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) 加測: I/P: 24V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	<u>19.95</u> VDC~ <u>32.78</u> VDC/NO LOAD <u>19.99</u> VDC~ <u>32.72</u> VDC/FULL LOAD Test: <u>OK</u>

2	DC CURRENT (TYP)	20A	IP: 24VDC OP:FULL LOAD Ta:25°C	<u>17.79</u> A
3	NO LOAD DISSIPATION (Typ.)	≤1.3W @saving mode ≤10W@NON-Saving Mode	IP: 24VDC OP:NO LOAD Ta:25°C	<u>0.95</u> W <u>6.40</u> W
4	SAVING MODE TO NORMAL	Po≥25W	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>≥ 20.96</u> W
5	NORMAL TO SAVING MODE	Po≤ 10W	IP: 24VDC OP: TESTING LOAD Ta:25°C	<u>≤ 12</u> W
6	OFF MODE CURRENT DRAW (Typ.)	≤ 1mA	IP: 24VDC OP: Sw off Ta:25°C	0 mA
7	EFFICIENCY(TYP)	400W/93%	IP: 25VDC OP: Po=400W 230V/50HZ (factory setting) Ta:25°C	<u>93.88</u> %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	22V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>21.87</u> V
2	BAT LOW SHUT DOWN	20V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>19.97</u> V
3	BAT LOW RESTART	25V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>24.84</u> V
4	BAT HIGH ALARM	31V±0.5VDC	IP: TESTING OP:FULL LOAD SW:ON Ta:25°C	<u>30.83</u> V
5	BAT HIGH SHUT DOWN	33V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>32.79</u> V
6	BAT HIGH RESTART	30V±0.5VDC	IP: TESTING OP: FULL LOAD SW:ON Ta:25°C	<u>29.91</u> V

7	OVER TEMPERATURE	Shut down o/p voltage: re-power on	IP: HI LINE/LOW-LINE OP: FULL LOAD SW:ON Ta:25°C	Shut down o/p voltage, re-power on to recover LED DISPLAY: <u>OK</u>
8	OUTPUT SHORT	Shut down o/p voltage: re-power on	IP: 24VDC O/P: FULL LOAD SW:ON Ta:25°C	Shut down o/p voltage, re-power on to recover LED DISPLAY: <u>OK</u> (1).TEST: <u>OK</u>
9	OVER LOAD (typ.)	105%~115%LOAD 180sec 115%~150%LOAD 10 sec Shut down o/p voltage, re-power on to recover	IP: 24VDC OP: TESTING SW:ON Ta:25°C	(1). <u>104.5%~ 112.5 %</u> <u>180.08 sec</u> (2). <u>113.25 %~ 146.25 %</u> <u>10.07 sec</u> Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off	IP: 24VDC OP: FULL LOAD Ta:25°C	Open : Normal work Short : Remote off TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>207 W</u> · turn on <u>OK</u> LAMP: <u>408 W</u> · turn on <u>OK</u> LAMP: <u>510 W</u> · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	0.15 <u>HP</u>	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>EPP-500-48</u> · O/P= <u>400.85W</u>	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: <u>OK</u>	
		NO PFC: <u>LRS-350-36</u> · O/P= <u>360 W</u>	1. Vin=HIGH LINE 2. O/P= 230V/50Hz TEST: <u>OK</u>	

COMPONENT WEAFORM TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	DC TO DC Power Transistor (D to S) or (C to E) Peak Voltage	Q102 Rated :100 V /80 A	I/P: high line O/P:V(max)/Freq 50HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 78.9V (2) 79.7V (3) 78.9V (4) 79.7V (5) 78.9V

2	DC TO DC Diode Peak Voltage	D 105 Rated : 600V/10 A	I/P: high line O/P:V(max) /Freq 50HZ O/P: (1)Full Load Turn On (2) Output Short (5)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1)521V (2)533V (3)521V (4)521V (5)525V
3	DC BUS Capacitor Voltage	C118 Rated : 270u/ 265 V	I/P: high line O/P:V(max) /Freq 50HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	C118 (1) 248V (2)242 V (3) 236V (4) 238V (5) 240V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 200 IKP15N65H5 Rated : 650V / 15 A	I/P: high line O/P:V(max) /Freq 50HZ VDS: O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	(1) 515V (2) 563V (3) 551V (4) 515V (5) 515V
5	AUX PWM MOS	Q504 Rated : 18A/ 200 V Q105 Rated : 40A/ 200 V	I/P: high line O/P:V(max) /Freq 50HZ O/P: (1)Full Load Turn On (2) Output Short (5)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	Q504 (1) 71.6V (2) 71.6V (3) 70.8V (4) 72.4V (5) 72.4V Q105 (1)91.7 V (2) 91.7V (3) 90.9V (4) 90.9V (5) 91.7V
6	Control IC Voltage Test	MCU IC U303 Rated 2.4 V~ 3.6 V AUX IC U501 Rated 8.2V~30V CHARGE IC U101 Rated -0.3V~20V	I/P: high line O/P:V(max) /Freq 50HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On (4) NO LOAD Turn On (5) Saving mode Ta:25°C	U303 (1) 3.34V (2)3.42V (3) 3.46V (4) 3.34V (5) 3.34V U501 (1) 11.67V

		Gate Driver IC U200 Rated -0.3V~20V		(2) 11.67V (3) 11.67V (4) 11.67V (5) 11.67V U101 (1)12.63 V (2) 12.71V (3)12.63V (4) 12.71V (5) 12.63V U200 (1) 5.03V (2) 5.11V (3) 5.11V (4) 5.03V (5) 5.03V
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SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-ACO/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-ACO/P 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-ACO/P: 2.62 mA AC O/P-FG: 6.1 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	8mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CLASS A	I/P:24 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 15KV / Contact : 8KV	I/P: 24VDC O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
3	Test by certified Lab & Test Report Prepare Any contradictions of the test results, please refer to the latest EMC test report			

Reliability Test

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																																												
1	TEMPERATURE RISE TEST	MODEL : NTS-400P-248 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 31.1 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 50VDC O/P : FULL LOAD Ta= 41.1 °C																																																																																																																														
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30	T501	50.6°C	57.3°C																																																																																																																													
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 50VDC O/P : 100%LOAD Ta= -25 °C	TEST : OK																																																																																																																												
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE	I/P : 65VDC O/P : FULL LOAD Ta= 40 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																																												

5	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	TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°C~ +45°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 : 48VDC/Full Load	TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 4G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P : 50VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 50VDC O/P : FULL LOAD Ta= 40 °C LIFE TIME	(1) 1424805.8HRS (2) 574653.9HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 278.7K hrs min. Telcordia SR-332 (Bellcore) ; 84K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 50VDC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

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