



Test Report: NTS-1200-212

1200W High Reliable True Sine Wave 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

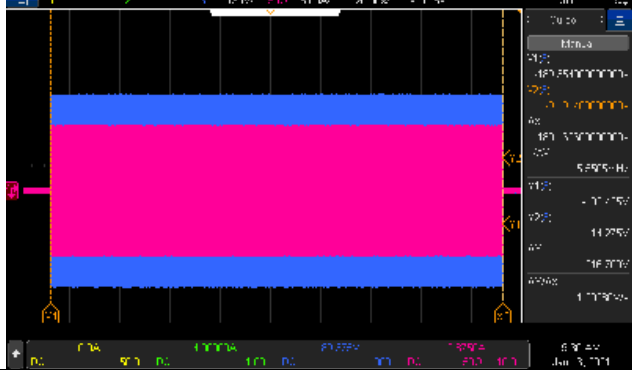
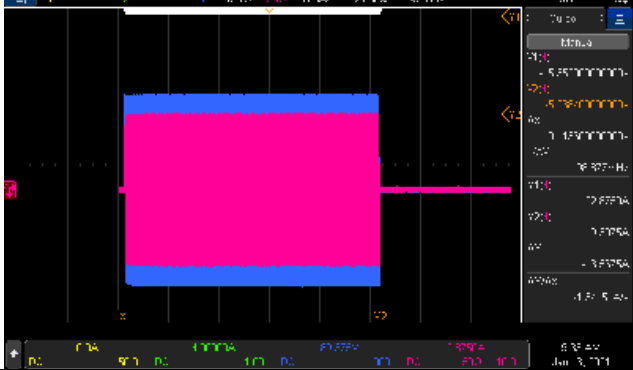
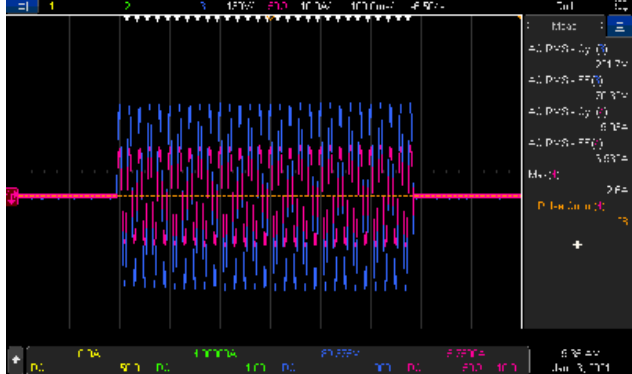
- E.M.C. Test

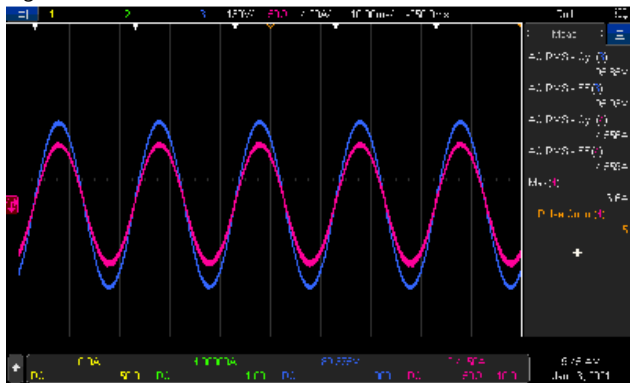
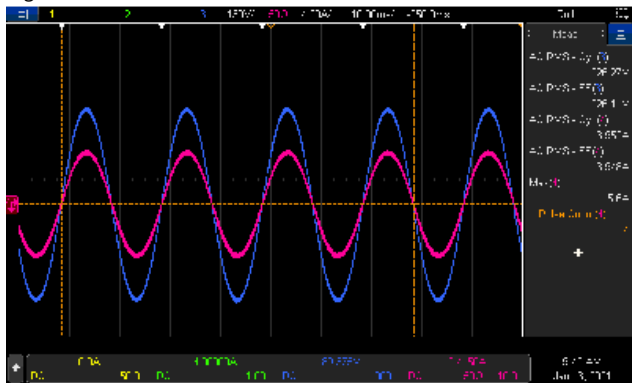
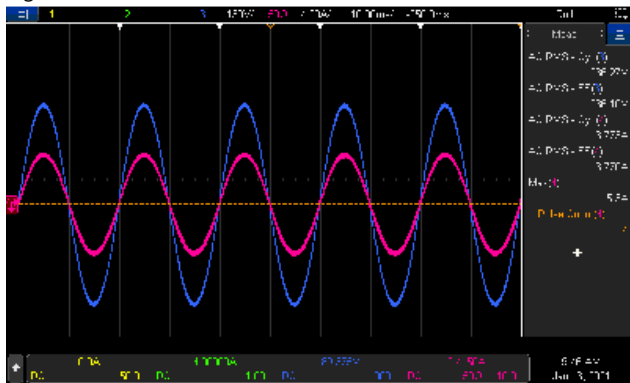
- **RELIABILITY TEST**

- ENVIRONMENT TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RATED POWER	1200W	IP: 12VDC Ta:25°C	<u>1225</u> W
2	MAXIMUM OUTPUT POWER (TYP)	(1)1380W/180sec. (2)1800w/10sec (3)SURGE POWER 2000W FOR 30CYCLE Vin (30 ± 5 CYCLE)	IP: 12.5VDC OP:TESTING LOAD Ta:25°C	(1) 228.02 V/ 5.95 A/ 180.1 Sec (2) 227.7 V/ 7.72 A/ 10.1 Sec (3) 222.8 V/ 9.09 A/ 28 Cycle
CH3:O/P VAC CH4:O/P IAC				
Fig1  Fig2  Fig3 				
3	AC Voltage	200 / 220 / 230 / 240Vac selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 200VAC: <u>198.3</u> V DIP S.W 220VAC: <u>218.1</u> V DIP S.W 230VAC: <u>228.1</u> V DIP S.W 240VAC: <u>238.1</u> V
4	FREQUENCY	50/60Hz (±0.1HZ) selectable by DIP S.W	IP: 12VDC OP: FULL LOAD Ta:25°C	DIP S.W 50HZ: <u>50.041</u> HZ DIP S.W 60HZ: <u>59.959</u> HZ

5	WAVEFORM	True sine wave (THD<3%)	IP: 12.5VDC OP:75% LOAD(900W) (1) Vo(min) (2) Vo(nor) (3) Vo(max) Ta:25°C	(1) 2.11 % / Vo(min)/75% LOAD (2) 1.98% / Vo(nor) /75% LOAD (3) 2.04 % / Vo(max) /75% LOAD
CH3:O/P VAC CH4:O/P IAC				
Fig1				
Fig2				
Fig3				
6	AC REGULATION	±3%	IP: 12.5VDC OP:75% LOAD(900W) Ta:25°C	-0.87 %
7	Overshoot /Undershoot	<±10%	IP: 12VDC OP: (1) full load turn on (2) no load turn on (3) full /no load change Ta:25°C	(1) -2.09 % (2) -1.22 % (3) 2.18 %
8	O/P voltage DC offset	Vin(nor)= 12 v · Vo< 200mV · no load : 74.9 mV / full load: 66.2 mV		

9	LED STATUS	Status test <table> <tr> <th>LED</th><th>Status</th><th>RESULT</th></tr> <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> </table> Battery test <table> <tr> <th>LED</th><th>Battery RANGE</th><th>RESULT</th></tr> <tr> <td>Green </td><td>12.5~15.5 Vdc±0.3v</td><td>12.55Vdc ~ 15.56Vdc</td></tr> <tr> <td>Orange </td><td>11~ 12.5Vdc ±0.3v</td><td>11.02Vdc ~12.50Vdc</td></tr> <tr> <td>Red </td><td><11.0 Vdc ±0.3v > 15.5vdc±0.3v</td><td>< 11.01 Vdc > 15.61 Vdc</td></tr> </table> Load test <table> <tr> <th>LED</th><th>LOAD RANGE</th><th>RESULT</th></tr> <tr> <td>Green </td><td>Min. load ~ 40%±5% LOAD</td><td>Min. load ~38.8%</td></tr> <tr> <td>Orange </td><td>40%±5% ~ 80%±5% LOAD</td><td>40.8%~ 78.3%</td></tr> <tr> <td>Red </td><td>≥ 80%±5% LOAD</td><td>≥ 79.2%</td></tr> </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 	12.5~15.5 Vdc±0.3v	12.55Vdc ~ 15.56Vdc	Orange 	11~ 12.5Vdc ±0.3v	11.02Vdc ~12.50Vdc	Red 	<11.0 Vdc ±0.3v > 15.5vdc±0.3v	< 11.01 Vdc > 15.61 Vdc	LED	LOAD RANGE	RESULT	Green 	Min. load ~ 40%±5% LOAD	Min. load ~38.8%	Orange 	40%±5% ~ 80%±5% LOAD	40.8%~ 78.3%	Red 	≥ 80%±5% LOAD	≥ 79.2%
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	VOLTAGE RANGE (TYP)	10VDC~16.5VDC	IP: TESTING OP:NO LOAD/FULL LOAD Ta:25°C I/P: LOW-LINE=10.5V HIGH-LINE=16.2V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON:30Sec OFF:30Sec 10MIN (POWER ON/OFF NO DAMAGE) I/P: 12V O/P:FULL LOAD ON:30ec OFF:30ec 12Hr (POWER ON/OFF NO DAMAGE)	<u>10.18</u> VDC~ <u>16.54</u> VDC/NO LOAD <u>10.07</u> VDC~ <u>16.54</u> VDC/FULL LOAD Test: <u>OK</u>

2	DC CURRENT (TYP)	120A	IP: 12VDC OP: FULL LOAD Ta: 25°C	<u>114.4</u> A
3	NO LOAD DISSIPATION (Typ.)	$\leq 1.2\text{W}$ standby saving mode $\leq 25\text{W}$ @ NON-Saving Mode	IP: 12VDC OP: NO LOAD Ta: 25°C	<u>1.153</u> W <u>20.34</u> W
4	SAVING MODE TO NORMAL	$P_o \geq 25\text{W}$	IP: 12VDC OP: TESTING LOAD Ta: 25°C	<u>≥ 20</u> W
5	NORMAL TO SAVING MODE	$P_o \leq 10\text{W}$	IP: 12VDC OP: TESTING LOAD Ta: 25°C	<u>≤ 11</u> W
6	OFF MODE CURRENT DRAW (Typ.)	$\leq 1\text{mA}$	IP: 12VDC OP: Sw off Ta: 25°C	<u>0.58</u> mA
7	EFFICIENCY (TYP)	900W/90%	IP: 12.5VDC OP: $P_o = 900\text{W}$ 230V/50HZ (factory setting) Ta: 25°C	<u>90.3</u> %

PROTECTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	BAT LOW ALARM	11V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>11.01</u> V
2	BAT LOW SHUT DOWN	10V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>10.11</u> V
3	BAT LOW RESTART	12.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>12.55</u> V
4	BAT HIGH ALARM	15.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>15.65</u> V
5	BAT HIGH SHUT DOWN	16.5V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>16.52</u> V
6	BAT HIGH RESTART	15V $\pm$ 0.3VDC	IP: TESTING OP: FULL LOAD SW: ON Ta: 25°C	<u>15.04</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: 12VDC 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: 12VDC OP: TESTING SW:ON Ta:25°C	(1). <u>107</u> %~ <u>113</u> % <u>180.1</u> sec (2). <u>117</u> %~ <u>146</u> % <u>10.1</u> sec Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	REMOTE CONTROL	(1).Power ON-OFF remote control by front panel dry contact connector (by RELAY) Open : Normal work Short : Remote off (2). IRC3	IP: 12VDC OP: FULL LOAD Ta:25°C	Open : Normal work Short : Remote off (1).TEST: <u>OK</u> (2).TEST: <u>OK</u>

APPLICATION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	LAMP	LAMP: <u>841</u> W · turn on <u>OK</u> LAMP: <u>1264</u> W · turn on <u>OK</u> LAMP: <u>1465</u> W · turn on <u>OK</u>	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
2	INDUCTION MOTOR	<u>0.5</u> HP	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
3	SWITCHING POWER SUPPLY	WITH PFC: <u>RSP-1600-48</u> · O/P= <u>1190</u> W	1. Vin=HIGH LINE 2. O/P=110V/60Hz TEST: <u>OK</u>	
		NO PFC: <u>SE-1000-48</u> · O/P= <u>505</u> W	1. Vin=HIGH LINE 2. O/P=110V/60Hz 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	Q101 Rated : 60V /195 A	I/P: high line O/P:V(max)/Freq 60HZ 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	Q101 (1) 44.4V (2) 37.1V (3) 45.2V (4) 37.1V (5) 36.3V	Q105 (1) 40.4V (2) 36.3V (3) 42.4V (4) 40.8V (5) 37.9V
2	DC TO DC Diode Peak Voltage	D 151 Rated : 600V/ 20A	I/P: high line O/P:V(max) /Freq 60HZ 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	D151 (1) 529V (2) 533V (3) 545V (4) 557V (5) 532V	D152 (1) 545V (2) 557V (3) 553V (4) 549V (5) 553V
3	DC BUS Capacitor Voltage	C161/C162 Rated : 680 u/ 315V	I/P: high line O/P:V(max) /Freq 60HZ 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	C161 (1) 251V (2) 251V (3) 251V (4) 255V (5) 251V	C162 (1) 259V (2) 259V (3) 259V (4) 259V (5) 259V
4	DC TO AC Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : 30A / 650 V	I/P: high line O/P:V(max) /Freq 60HZ 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	Q1 (1)556V (2)568V (3)560V (4)552V (5)548V	Q4 (1)556V (2)572V (3)556V (4)556V (5)560V
5	AUX PWM MOS	Q201 Rated : 80 A/ 100 V Q501 Rated : 120 A/ 60 V	I/P: high line O/P:V(max) /Freq 60HZ 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	Q201 (1) 58.0V (2) 58.0V (3) 58.0V (4) 58.0V (5) 57.2V	Q501 (1) 49.2V (2) 49.2V (3) 49.2V (4) 49.2V (5) 49.2V
6	Control IC Voltage Test	MCU IC U301 Rated 2.4 V~ 3.6 V AUX IC U201 Rated	I/P: high line O/P:V(max) /Freq 60HZ O/P: (1)Full Load Turn On (2) Output Short (3)O.L.P(200%) Turn On	U301 (1) 3.35V (2) 3.31V (3) 3.35V (4) 3.31V	U501 (1) 12.40V (2) 12.48V (3) 12.48V (4) 12.48V

		8.2V~30V	(4) NO LOAD Turn On (5) Saving mode Ta:25°C	(5) 3.31V U201 (1) 12.32V (2) 12.32V (3) 12.32V (4) 12.32V (5) 12.32V	(5) 12.48V U81 (1) 5.08V (2) 5.08V (3) 5.08V (4) 5.08V (5) 5.08V
		CHARGE IC U501 Rated -0.3V~20V			
		Gate Driver IC U81 Rated -0.3V~20V			

SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	BAT I/P-AC O/P: 3 KVAC/min AC O/P-FG: 1.5 KVAC/min	BAT I/P-AC O/P: 3.6 KVAC/min AC O/P-FG:1.8 KVAC/min Ta:25°C	BAT I/P-AC O/P: 7.09 mA AC O/P-FG: 5.95 mA NO DAMAGE
2	GROUNDING CONTINUITY	IEC62368 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25°C	3mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RADIATION	EN55032 CISPR32 (except for Type-UN) CLASS A	I/P:12 VDC O/P: :FULL/50% LOAD Ta:25°C	CLASS A
2	E.S.D	EN61000-4-2 AIR : 8KV / Contact : 4KV	I/P: 12VDC O/P:FULL LOAD Ta:25°C	■ CRITERIA A □ 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 : NTU-1200-212			
		1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 25.0 °C			
		2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 12.5VDC O/P : FULL LOAD Ta= 35.0 °C			
		NO	Position	ROOM AMBIENT Ta=25.0 °C	HIGH AMBIENT Ta= 35.0 °C
		1	C101	62.4℃	76.5℃
		2	T101	59.5℃	71.4℃
		5	D151	44.9℃	56.2℃
		6	RTH6	56.3℃	69.8℃
		7	Q105	49.9℃	62.7℃
		8	Q104	48.6℃	60.8℃
		9	C531	28.3℃	41.3℃
		10	T501	31.2℃	42.6℃
		11	Q501	33.5℃	45.3℃
		12	U301	34.5℃	46.7℃
		13	U361	31.9℃	44.8℃
		14	TSW1	37.3℃	49.3℃
		15	Q1	58.1℃	70.3℃
		16	Q4	44.3℃	56.5℃
		17	R223	35.1℃	47.5℃
		18	C222	34.7℃	46.7℃
		19	Q201	34.8℃	47.0℃
		20	D154	43.8℃	55.2℃
		21	C161	35.5℃	47.4℃
		22	L10	39.7℃	51.7℃
		23	C2	28.0℃	39.6℃
		24	T202	30.8℃	43.0℃
		25	RY1	34.4℃	45.2℃
		26	ZNR1	32.1℃	43.1℃
		27	LF1	30.8℃	41.9℃
		28	C1	32.7℃	43.7℃
		29	R213	46.6℃	56.6℃
		30	U501	36.4℃	47.6℃
		31	R24	45.5℃	72.2℃
		32	U81	34.9℃	45.8℃
		33	D501	35.5℃	45.6℃
		34	R501	39.1℃	49.5℃
		35	U201	44.8℃	55.1℃
		36	C104	67.0℃	79.6℃
37	TC	35.1℃	46.5℃		
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 12.5VDC 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 35 °C NO DAMAGE	I/P : 16.2VDC O/P : FULL LOAD Ta= 35 °C HUMIDITY= 95 %R.H	TEST : OK
4	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
5	THERMAL SHOCK TEST	1. Thermal shock Temperature : -25°C~ +40°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 : 12.5VDC/Full Load		TEST : OK
6	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
7	CAPACITOR LIFE CYCLE	SUPPOSE C104 IS THE MOST CRITICAL COMPONENT (1) I/P : 12.5VDC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 12.5VDC O/P : FULL LOAD Ta= 35 °C LIFE TIME		(1) 166424.9HRS (2) 69489.7HRS
8	MTBF	Conducted by Parts Stress Analysis Prediction 198.9K hrs min. Telcordia TR/SR-332 (Bellcore) ; 62.0K hrs min. MIL-HDBK-217F (25°C)		
9	Ongoing Reliability Test	I/P : 12.5VDC O/P : 80% LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010