



Technical Information Service Report

TIS Report: 70205990

Date: January 14, 2019

CLIENT: Jiangsu Goodwe Power Supply Technology Co. Ltd.

No. 189 Kun Lun Road,
Suzhou New District,
Jiangsu, China

Attention: Jing. Xie

Issued by: Rohana Yang

SUBJECT: Transformerless Utility Interactive Inverter, DNS series and NS series, wall mounted.

APPLICABLE REQUIREMENTS:

- IEEE 1547-2003 (R2008) - IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems
- IEEE 1547.1-2005(R2011) - IEEE Standard Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

ASSESSMENT:

Please supply a copy of this information when filing an application for CSA Certification related to the SUBJECT, as it may aid the investigation.

PRODUCT Information:

Transformerless Utility Interactive Inverter, DNS series, models: GW3000D-NS, GW3600D-NS, GW4200D-NS, GW5KD-NS, GW5000D-NS, GW6000D-NS. Wall mounted. Refer to Appendix A for Electrical Parameter.

Transformerless Utility Interactive Inverter, NS series, models: GW1000-NS, GW1500-NS, GW2500-NS, GW3000-NS. Wall mounted. Refer to Appendix A for Electrical Parameter.

1. Utility Interconnection Voltage and Frequency Trip Limits and Trip Times:

Voltage and frequency limits for utility Interaction

Condition	Simulated utility source	Maximum time (sec) at 60
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THIS REPORT DOES NOT AUTHORIZE THE USE OF THE CSA MARK ON THE SUBJECT PRODUCTS.

The completion of this form does not imply certification or approval of the "SUBJECT" product nor any features or components thereof.

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	Voltage (V)	Frequency (Hz)	Hz before cessation of current to the simulated utility
A	< 50% V	Rated (60 Hz)	0.16
B	50% V ≤ V < 88% V	Rated (60 Hz)	2
C	110% V < V < 120% V	Rated (60 Hz)	1
D	120% V ≤ V	Rated (60 Hz)	0.16
E	Rated	f > 60.5	0.16
F	Rated	f < 59.3	0.16

2. Reconnect voltage and frequency after abnormal trip:

	Undervoltage	Overvoltage
Reconnect Voltage	199.3	243.4
Reconnect Frequency	59.3	60.5
Reconnect Time Delay	300s	

3. Manufacture specified accuracy:

Voltage:	+/- 2.3V
Frequency:	+/- 0.05 Hz
Time:	+/-1% but not less than 100ms

4. The Utility Interactive performance are evaluated on the following version software:

Inverter Model	MICROPROCESSOR/FPGA	FIRMWARE	CHECKSUM
DNS	TMS320F28034	V10	C1A1C7AE
NS	TMS320F28034	V16	9FFBE83E

5. Tests were performed with following sequence required and suggested by IEEE 1547-2003 (R2008):

Table 4—Sequence for conducting design test

Required order	Design test clause and title
1	5.1.1 Response to abnormal voltage and frequency
2	5.1.2 Synchronization
3	5.1.3 Interconnect integrity test
Suggested order	
4	5.1.1 Response to abnormal voltage and frequency
5	5.1.2 Synchronization
6	5.1.4 Unintentional islanding
7	5.1.5 Limitation of dc injection
8	5.1.6 Harmonics

Test History:

Transformerless Utility Interactive Inverter, DNS series and NS series were performed at CCIC-CSA International Certification Co., Ltd. Kunshan Branch. Following tests were performed according to IEEE 1547-2003 (R2008) and IEEE 1547.1-2005(R2011) with acceptable result.

Requirement		Topic	Test Result
IEEE 1547.1	5.1	Temperature Stability	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.5.3	Dielectric test for paralleling device	Conducted on the relays for GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.2	Test for response to abnormal voltage conditions	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.3	Response to abnormal frequency conditions	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.4	Synchronization	Conducted on model GW6000D-NS, GW3000D-NS, GW3000-NS and GW1000-NS with acceptable result
IEEE 1547.1	5.5	Interconnection integrity	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.5.1	Protection from electromagnetic interference (EMI) test	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.5.2	Surge withstand performance test	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.5.2 a)	Surge Withstand on External signal and control Circuits	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.5.2 b)	Surge Withstand on EUT power circuits	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.2	Test for response to abnormal voltage conditions at extreme temp	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.3	Response to abnormal frequency conditions at extreme temp	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.4	Synchronization	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.7	Unintentional islanding	Conducted on model GW6000D-NS, GW3000D-NS, GW3000-NS and GW1000-NS with acceptable result

IEEE 1547.1	5.6	Limitation of dc injection	Conducted on model GW6000D-NS, GW3000D-NS, GW3000-NS and GW1000-NS with acceptable result
IEEE 1547.1	5.11	Harmonics	Conducted on model GW6000D-NS, GW3000D-NS, GW3000-NS and GW1000-NS with acceptable result
IEEE 1547.1	5.10	Reconnect following abnormal condition disconnect	Conducted on model GW6000D-NS and GW3000-NS with acceptable result
IEEE 1547.1	5.9	Open Phase Test	Conducted on model GW6000D-NS and GW3000-NS with acceptable result

Masuring Equipment:

	Lab Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Due Date
A	KS-AC002	AC Source	California Instruments	MX45-3Pi-400-LAN-LF-SNK-XV450	1210A00774	--
B	KS-DC025	DC Source	Regatron	TC.P.32.600.400.S	1217CC443	--
C	KS-OS002	Oscilloscope	Tektronix	MSO5045B	C011550	2019/8/17
D	KS-OSP002	Current Probe	Tektronix	TCPA300+TCP303	C032731+C016309	2019/2/8
E	KS-OSP005	High Voltage Differential Probe	Tektronix	P5210A	C010979	2019/11/15
F	KS-OSP009	High Voltage Differential Probe	Tektronix	P6015A	C066842	2019/11/11
G	KS-PA002	Power Analyzer	YOKOGAWA	WT3000	91M336710	2019/11/11
H	KS-CT004	Current Transducer	YOKOGAWA	751574	9112510050	2019/7/18
I	KS-CT002	Current Transducer	YOKOGAWA	751574	9112510018	2019/7/18
J	KS-CT007	Current Transducer	YOKOGAWA	751574	9112970016	2019/11/11
K	KS-CT008	Current Transducer	YOKOGAWA	751574	9112970022	2019/11/11
L	KS-CT009	Current Transducer	Pearson	101	140026	2019/11/11
M	KS-RLC002	RLC Load	Qunling	ACLT-2410H	93V003110	--
N	KS-EMC001	Coaxial Attenuator	EMC Partner	VERI50	103472	2019/11/16
O	KS-EMC002	Coaxial Attenuator	EMC Partner	VERI1K	103473	2019/11/1

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P	KS-EMC003	EMC Immunity Tester(EFT;Combination Wave;Ring Wave)	EMC Partner	TRA2006	TRA2006 F-S-R-1500	--
Q	KS-EMC005	Coupling and Decoupling Network	EMC Partner	CDN2000A-06-32 690V	CDN2000A-06-32 690V-1500	--
R	KS-WV001	Withstand Voltage Tester	KIKUSUI	TOS9201	SD001339	2019/11/11
S	KS-TC003	Climatic Chamber	Chongqing Yinhe	BST-SDJ66	201200089	2019/11/11

Test Condition

Power supply condition:

THD Current	Less than 50% of following Table 3 from IEEE 1547
THD Voltage	< 2.5%
Voltage Accuracy	±1V
Frequency Accuracy	±0.02Hz
Time Accuracy for voltage and frequency step	Less than 0.016s

Table 3—Maximum harmonic current distortion in percent of current (I)^a

Individual harmonic order h (odd harmonics) ^b	h < 11	11 ≤ h < 17	17 ≤ h < 23	23 ≤ h < 35	35 ≤ h	Total demand distortion (TDD)
Percent (%)	4.0	2.0	1.5	0.6	0.3	5.0

Technical Data	GW3000D-NS	GW3600D-NS	GW4200D-NS	GW5K0D-NS	GW5000D-NS	GW8000D-NS
PV String Input Data						
Max. DC Input Power (W)	3900	4680	5460	6600	6500	7200
Max. DC Input Voltage (V)	600	600	600	600	600	600
MPPT Range (V)	80-950	80-950	80-950	80-950	80-950	80-950
Start-up Voltage (V)	120	120	120	120	120	120
MPPT Range for Full Load (V)	150-550	180-550	210-550	250-550	250-550	280-550
Nominal DC Input Voltage (V)	360	360	360	360	360	360
Max. Input Current (A)	11/11	11/11	11/11	11/11	11/11	11/11
Max. Short Current (A)	13.8/13.8	13.8/13.8	13.8/13.8	13.8/13.8	13.8/13.8	13.8/13.8
No. of MPPT Trackers	2	2	2	2	2	2
No. of Input Strings per Tracker	1	1	1	1	1	1
AC Output Data						
Nominal Output Power (W)	3000	3680	4200	5000	5000	6000
Max. Output Apparent Power (VA)	3000	3680	4200	5000	5000	6000
Nominal Output Voltage (V)	220/230	220/230	220/230	220/230	220/230	220/230
Nominal Output Frequency (Hz)	50/60	50/60	50/60	50/60	50/60	50/60
Nominal Output Current (A)	13.6	16	19	21.7	22.8	27.3
Output Power Factor	~1 (Adjustable from 0.8 leading to 0.8 lagging)					
Output THDi (@Nominal Output)	<3%	<3%	<3%	<3%	<3%	<3%
Efficiency						
Max. Efficiency	97.8%	97.8%	97.8%	97.8%	97.8%	97.8%
Europe Efficiency	97.5%	97.5%	97.5%	97.5%	97.5%	97.5%
MPPT Efficiency	99.9%	99.9%	99.9%	99.9%	99.9%	99.9%
Protection						
Anti-Islanding Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Input Reverse Polarity Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Insulation Resistor Detection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Residual Current Monitoring Unit	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Output Over Current Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Output Short Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Output Over Voltage Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
General Data						
Operating Temperature Range (°C)	-25-60	-25-60	-25-60	-25-60	-25-60	-25-60
Relative Humidity	0-100%	0-100%	0-100%	0-100%	0-100%	0-100%
Operating Altitude (m)	≤4000	≤4000	≤4000	≤4000	≤4000	≤4000
Cooling	Natural Convection	Natural Convection	Natural Convection	Natural Convection	Natural Convection	Natural Convection
Noise (dB)	<25	<25	<25	<25	<25	<46
User Interface	LCD & LED	LCD & LED	LCD & LED	LCD & LED	LCD & LED	LCD & LED
Communication	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi
Weight (kg)	13	13	13	13	13	13.5
Size (Width*Height*Depth mm)	354*433*147	354*433*147	354*433*147	354*433*147	354*433*147	354*433*147
Protection Degree	IP65	IP65	IP65	IP65	IP65	IP65
Night Self Consumption (W)	<1	<1	<1	<1	<1	<1
Topology	Transformerless	Transformerless	Transformerless	Transformerless	Transformerless	Transformerless
Certifications & Standards						
Grid Regulation	VDE-AR-N 4105, VDE0126-1-1 EN50438(PL), EN50438(SW) AS4777.2, G83, IEC61727, IEC62116	VDE-AR-N 4105, VDE0126-1-1 EN50438(PL), EN50438(SW) AS4777.2, G83, IEC61727, IEC62116	VDE-AR-N 4105, VDE0126-1-1 EN50438(PL), EN50438(SW) AS4777.2, G59, IEC61727, IEC62116	VDE-AR-N 4105, VDE0126-1-1 EN50438(PL), EN50438(SW) AS4777.2, G59, IEC61727, IEC62116	VDE-AR-N 4105, VDE0126-1-1 EN50438(PL), EN50438(SW) AS4777.2, G59, IEC61727, MEA, PEA, IEC62116	VDE-AR-N 4105, VDE0126-1-1
Safety Regulation	IEC62109-1&2	IEC62109-1&2	IEC62109-1&2	IEC62109-1&2	IEC62109-1&2	IEC62109-1&2
EMC	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4	EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4

N3 Series Specification_V2.2					
Technical Data	Grg1000-375	Grg1500-375	Grg2000-375	Grg2500-375	Grg3000-375
PV Input Data					
Max. DC Input Power (W)	1300	1950	2600	3250	3900
Max. DC Input Voltage (V)	500	500	500	500	500
MPP Range (V)	80-450	80-450	80-450	80-450	80-450
Start-up Voltage (V)	80	80	80	80	80
MPP Range for Full Load (V)	120-450	100-450	230-450	160-450	215-450
Nominal DC Input Voltage (V)	360	360	360	360	360
Max. Input Current (A)	10	10	10	18	18
Max. Short Current (A)	12.5	12.5	12.5	22.5	22.5
No. of MPP Trackers	1	1	1	1	1
No. of Input Voltage per Tracker	1	1	1	1	1
AC Output Data					
Nominal Output Power (W)	1000	1500	2000	2500	3000
Max. Output Apparent Power (VA)	1000	1500	2000	2500	3000
Nominal Output Voltage (V)	220/230	220/230	220/230	220/230	220/230
Nominal Output Frequency (Hz)	50/60	50/60	50/60	50/60	50/60
Max. Output Current (A)	5	7.5	10	12.5	13.5
Output Power Factor			>1 (adjustable from 0.8 leading to 0.8 lagging)		
Output THD (@Nominal Output)	<3%	<3%	<3%	<3%	<3%
Efficiency					
Max. Efficiency	93.5%	97.0%	97.0%	97.5%	97.5%
Europe Efficiency	93.0%	96.0%	96.0%	97.0%	97.0%
MPP Efficiency	99.9%	99.9%	99.9%	99.9%	99.9%
Protection					
Anti-Islanding Protection	Integrated	Integrated	Integrated	Integrated	Integrated
Input Reverse Polarity Protection	Integrated	Integrated	Integrated	Integrated	Integrated
Overvoltage Reverse Protection	Integrated	Integrated	Integrated	Integrated	Integrated
Overload Current Monitoring Ultra	Integrated	Integrated	Integrated	Integrated	Integrated
Output Over Current Protection	Integrated	Integrated	Integrated	Integrated	Integrated
Output Short Protection	Integrated	Integrated	Integrated	Integrated	Integrated
Output Over Voltage Protection	Integrated	Integrated	Integrated	Integrated	Integrated
General Data					
Operating Temperature Range (°C)	-25~60	-25~60	-25~60	-25~60	-25~60
Relative Humidity	0~95%	0~95%	0~95%	0~95%	0~95%
Operating Altitude (m)	<4000	<4000	<4000	<4000	<4000
Cooling	Natural Convection	Natural Convection	Natural Convection	Natural Convection	Natural Convection
Noise (dB)	<25	<25	<25	<25	<25
Display Interface	LED & LED	LED & LED	LED & LED	LED & LED	LED & LED
Connectivity	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi	RS485 or WiFi
Weight (kg)	7.5	7.5	7.5	8.5	8.5
Size (Width*Height*Depth mm)	344*274.9*126	344*274.9*126	344*274.9*126	344*274.9*126	344*274.9*126
Protection Degree	IP65	IP65	IP65	IP65	IP65
High Self-Compassion (W)	<1	<1	<1	<1	<1
Topology	Transformerless	Transformerless	Transformerless	Transformerless	Transformerless
Certification & Standards					
Grid Regulation	VDE0126-1-1, AS4777.2 IEC60439(P), GB EN50438-1, IEC62116	VDE0126-1-1, AS4777.2 IEC60439(P), GB EN50438-1, IEC62116	VDE0126-1-1, AS4777.2 IEC60439(P), GB EN50438-1, IEC62116	VDE0126-1-1, AS4777.2 IEC60439(P), GB EN50438-1, IEC62116	VDE0126-1-1, AS4777.2 IEC60439(P), GB EN50438-1, IEC62116
Selfy Regulation	IEC62108-1&2	IEC62108-1&2	IEC62108-1&2	IEC62108-1&2	IEC62108-1&2
EMC	IEC 61000-4-1, IEC 61000-4-2 IEC 61000-3, IEC 61000-4-4	IEC 61000-4-1, IEC 61000-4-2 IEC 61000-3, IEC 61000-4-4	IEC 61000-4-1, IEC 61000-4-2 IEC 61000-3, IEC 61000-4-4	IEC 61000-4-1, IEC 61000-4-2 IEC 61000-3, IEC 61000-4-4	IEC 61000-4-1, IEC 61000-4-2 IEC 61000-3, IEC 61000-4-4

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