

# 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

### 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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DQD 507.10 Rev 2018-11-12

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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
В	$50\% \text{ V} \le \text{V} < 88\% \text{ V}$	Rated (60 Hz)	2
С	110% V < V < 120% V	Rated (60 Hz)	1
D	120% V ≤ V	Rated (60 Hz)	0.16
Е	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
ſ	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	

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## **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		1	
Requirement		Торіс	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

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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

# Mearsuring 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	
В	KS-DC025	DC Source	Regatron	TC.P.32.600.400.	1217CC443	
С	KS-OS002	Oscilloscope	Tektronix	MSO5045B	C011550	2019/8/17
D	KS-OSP002	Current Probe	Tektronix	TCPA300+TCP3 03	C032731+C 016309	2019/2/8
Е	KS-OSP005	High Voltage Differential Probe	Tektronix	P5210A	C010979	2019/11/1
F	KS-OSP009	High Voltage Differential Probe	Tektronix	P6015A	C066842	2019/11/1
G	KS-PA002	Power Analyzer	YOKOGAW A	WT3000	91M336710	2019/11/1
Н	KS-CT004	Current Transducer	YOKOGAW A	751574	9112510050	2019/7/18
Ι	KS-CT002	Current Transducer	YOKOGAW A	751574	9112510018	2019/7/18
J	KS-CT007	Current Transducer	YOKOGAW A	751574	9112970016	2019/11/1
K	KS-CT008	Current Transducer	YOKOGAW A	751574	9112970022	2019/11/1
L	KS-CT009	Current Transducer	Pearson	101	140026	2019/11/1
M	KS-RLC002	RLC Load	Qunling	ACLT-2410H	93V003110	
N	KS-EMC001	Coaxial Attenuator	EMC Partner	VERI50	103472	2019/11/1 6
О	KS-EMC002	Coaxial Attenuator	EMC Partner	VERI1K	103473	2019/11/1

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						6
P	KS-EMC003	EMC Immunity Tester(EFT;Combin ation 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	2019/11/1
S	KS-TC003	Climatic Chamber	Chongqing Yinhe	BST-SDJ66	201200089	2019/11/1

# **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)<sup>a</sup>

Individual harmonic order h (odd harmonics) <sup>b</sup>	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

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Technical Data	GW3000D-NS	GW3600D-NS	GW4200D-NS	GW5KD-NS	GW5000D-N8	GW6000D-NS
PV String Input Data						
Max. DC Input Power (W)	3900	4680	5460	6600	6500	7200
Max. DC Input Voltage (V)	600	600	800	600	600	600
MPPT Range (V)	80~960	80~550	80-660	80-650	80-550	80-650
Start-up Votage (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	138/138	13.8/13.8
No. of MPP Trackers	2	2	2	2	2	2
No. of Input Strings per Tracker	1	1	1	1	1	1
A.C 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
Naminal Output Frequency (Hz)	50/60	50/60	50/90	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)	agging)	A CONTRACTOR OF THE CONTRACTOR	
Output THDi (@Nominal Output)	<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%	90.9%	99.9%	99.9%
Protection				7		
Anti-islanding Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Input Reverse Polarity Protection	Integrated	htegrated	Integrated	Integrated	Integrated	Integrated
Insulation Resistor Detection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Residual Current Monitoring Unit	Integrated	htegrated	Integrated	Integrated	Integrated	Integrated
Output Over Current Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
Output Short Protection	Integrated	htegrated	Integrated	Integrated	Integrated	Integrated
Output Over Votage Protection	Integrated	Integrated	Integrated	Integrated	Integrated	Integrated
General Data		and and	- Indiana	1209.121	and and	
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	54000	s4000	54000	s4000	s4000
Coding	Natural Convection	Natural Convection	Natural Convection	Natural Convection	Natural Convection	Natural Convection
Noise (dB)	<25	<25	<25	c25	<25	<45
User Interface	LCD & LED	LCD & LED	LCD& LED	LCD & LED	LCD& LED	LCD & LED
Communication	RS485 or WFI	RS485 or WFI	RS485 or WIFI	RS486 or WIFI	RS485 or WIFI	RS486 or WIFI
Weight (kg)	13 354*433*147	13 364*433*147	13 354*433*147	13 354*433*147	13 354433447	13.5 354*433*147
Size (Width Height Depth mm.)						
Protection Degree	IP65	P65	IP65	IP65	IP66	IP65
Night Self Consumption (W)	ং ব	<1				
Topology	Transformeriess	Transformeriess	Transformerless	Transformerless	Transformerless	Transformerless
Certifications & Standards						
Grid Regulation	VDE-AR-N 4105, VDE0126-1-1 EN50438(PL), EN50438(SW) AS471 G83, IEOS1727 , IEOS2116	VDE-AR-N 4105, VDE0126-1-1 E8(50438(PL), EN50438(SW) AS471 G83, IEC61727 , IEC62116	VDE-AR-N 4105, VDE0126-1-1 E860438(PL), EN50438(SW) AS477 G59, IEC81727, IEC82116	7847772	VDE-AR-N 4105, VDE0126-1-1 ENG0436(PL), EN50436(SW) AS 4777.2, G90, IEC61727, MEA, PEA, IEC62116	VDE-AR-N 4105, VDE0126-1-1
Safety Regulation	IEC62109-182	EC62109-18-2	EC62109-182	EC62109-18.2	EC62109-1&2	IEC62109-182
Saroty regulation	IEU-02 IUS-182	EUG 109-182	IEDOZ IVS-18Z	EUG 109-162	EU02 (dB-162	IDU02109-182
BMC	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	EN61000-6-1, 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
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N3 3eries Specification_V2.2					
Schilical Dass	Gg/1000-343	Ogr1500-Na	GW2000-84s	G952300-6/a	Gw3000-N3
V Swing Impor Date	The same of the sa	91	The same of the sa	\$1	13
lag. DC liipus Pogetr (W)	1300	1950	2600	3250	3900
fag. DC Hipus Voltage (V)	500	500	500	500	500
IPPT Range (V)	80~450	80~450	80~450	80-450	10~450
un-op Voluge (V)	80	80	80	100	80
(PPT Range for Pull Load (V)	120-450	180-450	230-450	180-450	215-450
Comittal DC Hipes Volvegt (V)	360	360	360	360	360
lay, Itipos Curritis (A)	10	30	10	18	18
lag. Shora Currtila (A)	12,5	12,5	12.5	22.5	22,5
o. of MPP Tradition	1	1	1	1	1
o. of Ripus Sudigs për Trackër	10	1	1	1	1
C Osepus Date			•		•
omital Ouspes Poger (W)	1000	1500	2000	2500	3000
lag. Ouspus Appartin Pogetr (VA)	1000	1500	2000	2500	3000
omital Osspes Voluge (V)	220/230	220/230	220/230	220/230	220/230
omitial Ouspea Prospetitoy (Hs.)	50/60	20/60	20/60	50/60	50/60
lag. Ompos Contin (A)	5	7.5	10	12,5	13.5
upus Poger Factor	2000	ili anno	/1 (Adjumable from 0.8 leading to 0.8 lag		
upus THDi (@Nomital Ouspus)	<3%	<3%	<3%	K3%	<3%
Moracy					
lap Efficiency	98.5%	97.0%	97.0%	97.5%	97.5%
uropt Ilfficitiky	96.0%	96.0%	96.0%	97.0%	97.0%
PPT Emokacy	99.9%	99.9%	99.9%	99,9%	99,9%
roeficeioù	72		16		46
Bal-Irlanding Provinces	Midgradd	linégraéd	Hatgratd	Matgraatd	Distgrand
pur Reserve Polaries Proseculors	Intgrate	linegrand	Intgrate	Mintgrantd	Margaret
rolated Stroner Distrated	Motgravid	linegraed	Intgrate	Matgravid	Margaret
Anidoul Curretta Motinoring Utin	Motgradd	linegrand	Intgrate	Matgravid	Matgranti
tupus Oytr Cuntils Prostosios	Midgradd	linégraéd	Historied	Metgraetd	Statement
tupu Shon Provinica	Inegraed	linegraed	Intgrate	Mintgrastd	Mangrashd
tupus Oetr Volsage Prostosion	Motgravid	Mintgrantd	Hatgradd	Mistgrashd	Matgrand
tipinal Dana		\$ 1002000 m	150 ( Cath, 4)	in and an an	
ptrastig Temptrasort Baligt (C)	-25-60	-25-60	-25-60	-25-60	-25-60
tlastyt Humidisy	0-95%	0-95%	0-95%	0-95%	0-95%
lptrailig Alskodt (m)	<4000	<4000	<4000	<4000	<4000
noling	Naural Collection	Nasonal Con-toxon	Nasural Code-trainid	Natural Collection	Nasral Collection
loist (dB)	<25	<21	<25	<25	(25
otr Inverset	LCD & LED	LCD & LED	LCD & LED	LCD & LED	LCD & LED
ommuticasioti	\$3485 or WIFI	834(5 or WIF)	83485 or WiF1	834(5 or WIF)	A3485 or Wift
(eighn (kg)	7.5	7.5	7.5	8,5	8.5
et (Widsh*Heigh#Depsh mm)	944*274.5*128	344*274.5*128	344*274.5*128	344*274.5*128	344*274.5*128
roxicaloù Dégrée	1P65	1965	1965	1965	1965
Ighs 2dif Colimmpsioli (W)	q	- d	d	d	- ci
spology	Trainformética	Traditionstates	Trainformétric	Tradeformériées	Trainformériess
tréficacions de Destidarés	S. Contractions			100000000000000000000000000000000000000	5)
	VDB0126-1-1, A94777.2	VDB0126-1-1, A34777.2	VIDE0126-1-1, A54777.2	VIDE0126-1-1, A34777.2	VD80126-1-1, A34777.2
	12/20438(PL), G83	(2/30438(PL), G83	E2430438(P4), G83	12×3043((PL), G13	E2130438(PC), G83
eid Régulation	EXDF-NOI-RELISE,	EADP-NOI-RELISE,	EXDF-NOI-REL_13E,	EXDF-NOI-KEL_13E,	ERDF-NOI-RES_13E,
0.000000000000	18061727, 18062116	IEC61727, IEC62116	18061727, 18062116	INC61727, INC62116	IEC61727, IEC62116
Ry Regulation	1HC62109-18/2	IEC62109-18/2	IEC62109-18/2	IBC62109-1842	IEC62109-1&2
\$12.5°	127 61000-6-1, 127 61000-6-2	F24 61000 6-1, F24 61000 6-2	En 61000-6-1, En 61000-6-2	124 61000-6-1, 124 61000-6-2	EN 61000-6-1, EN 61000-6-2
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