



**BUREAU  
VERITAS**

# Certificate of compliance

**Applicant:** **JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD**  
NO.189 Kun Lun Shan Road  
Suzhou New District., Jiangsu  
China

**Product:** **Grid-tied photovoltaic (PV) inverter**

**Model:**  
**GW700-XS**  
**GW1000-XS**  
**GW1500-XS**  
**GW2000-XS**  
**GW2500-XS**  
**GW3000-XS**

## Use in accordance with regulations:

Automatic disconnection device with single-phase mains surveillance in accordance with EN 50438:2013 for photovoltaic systems with a single-phase parallel coupling via an inverter in the public mains supply. The automatic disconnection device is an integral part of the aforementioned inverter.

## Applied rules and standards:

### EN 50438:2013

Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks

### DIN V VDE V 0126-1-1:2006-02 (Functional safety)

Automatic disconnection device between a generator and the public low-voltage grid

At the time of issue of this certificate the safety concept of an aforementioned representative product corresponds to the valid safety specifications for the specified use in accordance with regulations.

**Report number:** **ZEM-19JA0755FCSHP**

**Certificate number:** **U19-0109**

**Date of issue:** **2019-02-19**

**Certification body**



Holger Schaffer

Certification body of Bureau Veritas Consumer Products Services Germany GmbH  
Accredited according to DIN EN ISO/IEC 17065



Deutsche  
Akkreditierungsstelle  
D-ZE-12024-01-00

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

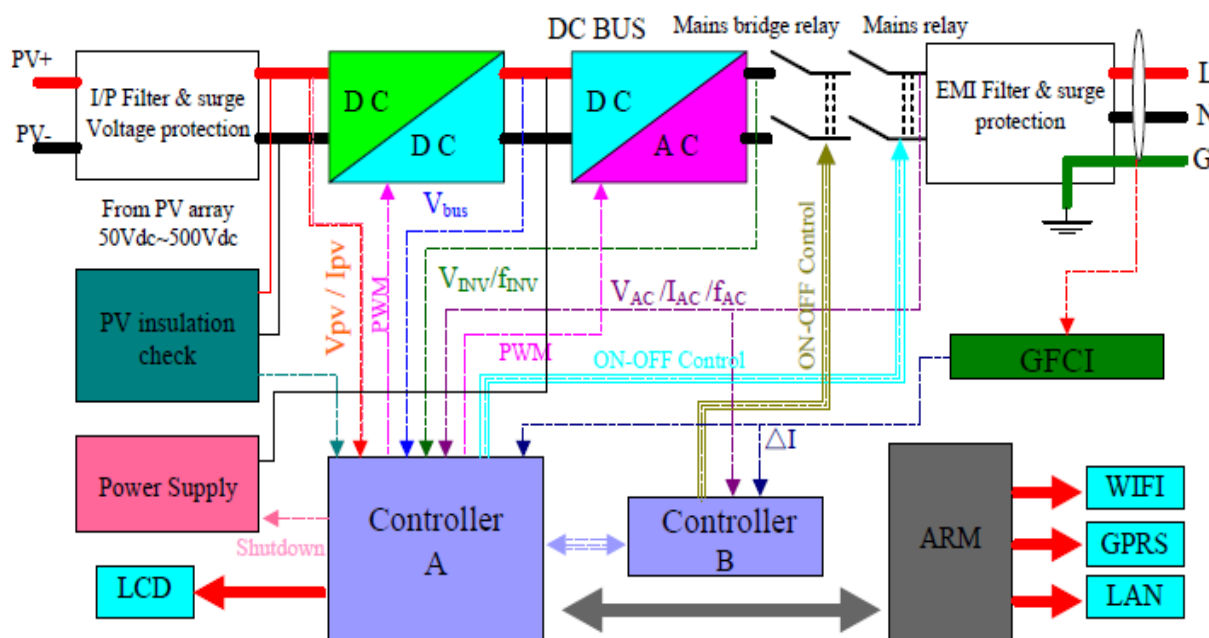
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**Type Approval and declaration of compliance with the requirements of EN 50438.**

<b>Manufacturer / applicant:</b>	JIANGSU GOODWE POWER SUPPLY TECHNOLOGY CO.,LTD NO.189 Kun Lun Shan Road Suzhou New District., Jiangsu China		
<b>Micro-generator Type</b>	Grid-tied photovoltaic inverter		
<b>Rated values</b>	GW700-XS	GW1000-XS	GW1500-XS
<b>Maximum rated capacity</b>	700W	1000W	1500W
<b>Rated voltage</b>	230V	230V	230V
<b>Rated values</b>	GW2000-XS	GW2500-XS	GW3000-XS
<b>Maximum rated capacity</b>	2000W	2500W	3000W
<b>Rated voltage</b>	230V	230V	230V
<b>Firmware version</b>	V1.00.08		
<b>Measurement period:</b>	2018-12-10 to 2019-01-17		

**Description of the structure of the power generation unit (Figure 1):**

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has no galvanic isolation between DC input and AC output. Output switch-off is performed with single-fault tolerance based on two series-connected relays in line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.



**Figure 1 – Schematic structure of the power generation unit**

The above stated micro-generators are tested according to the requirements in the EN 50438. Any modification that affects the stated tests must be named by the manufacturer/supplier of the product to ensure that the product meets all requirements of the EN 50438.

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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**Type testing of the interface protection**

Over-/under-voltage tests						
Model: GW3000-XS						
Single						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]	Voltage [V]	Disconnection time [s]
Over-voltage stage 1	253,0	2	253,0	2	253,9	1,900
Under-voltage stage 1	184,0	2	184,0	2	184,0	1,850

Note.  
 Minimum operation time according to default interface protection:  
 Over-voltage stage 1 -  
 Over-voltage stage 2 0,1s  
 Under-voltage 1,2s

Over-/under-frequency tests						
Model: GW3000-XS						
Parameter	Protection limit		Actual setting		Trip value (test result)	
	Frequency [Hz]	Disconnection time [s]	Frequency [Hz]	Disconnection time [s]	Frequency [Hz]	Disconnection time [s]
Over-frequency	51,0	2,0	51,0	2,0	51,0	1,86
Under-frequency	48,0	2,0	48,0	2,0	48,0	1,85

Note.  
 Minimum operation time according to default interface protection:  
 Over-frequency 2 s  
 Under-frequency 2 s

LoM test						
Method used	EN 62116					
	33% of -5% Q Test 22	66% of -5% Q Test 12	100% of -5% P Test 5	33% of +5% Q Test 31	66% of +5% Q Test 21	100% of +5% P Test 10
Trip time. Phase 1 fuse removed [ms]	115,0	107,0	115,0	117,0	116,0	118,0

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**Type testing of a micro-generator**

**Operating range**

Test 1: U = 195,5 V; f = 47,5 Hz; P = 1,00 Sn; cosφ = 1

Test 2: U = 253,0 V; f = 51,5 Hz; P = 1,00 Sn; cosφ = 1

Test sequence	Voltage [V]	Frequency [Hz]	Output power [W]	Cos φ [1]
1	195,4	47,50	2590,1	0,9919
2	253,2	51,50	3060,2	0,9980

**Active power at under-frequency**

5-min mean value (each)	a) 50 ± 0,01 [Hz]	b) - 0,4 to - 0,5 [Hz]	c) - 2,4 to - 2,5 [Hz]
Frequency [Hz]:	50,00	49,50	47,55
Active power [W]:	3046,8	3042,6	3039,4
ΔP/PM [%] per 1 Hz:			0,010

**Power response to over-frequency**

1-min mean value [Hz]:	a) 50,00	b) 50,25	c) 50,70	d) 51,15	e) 50,70	f) 50,25	g) 50,00
<b>1. Measurement a) to g): Active power output &gt; 80% P<sub>n</sub></b>							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [W]:	N/A	2940	2400	1860	2400	2940	N/A
PE60 [W]:	3047,9	3003,1	2453,3	1897,3	2453,3	2995,7	3046,9
ΔPE60/PM [%]:	N/A	0,020	0,02	0,01	0,02	0,02	N/A
<b>2. Measurement a) to g): Active power output 40% and 60% after freezing &gt; 80% P<sub>n</sub></b>							
Frequency [Hz]:	50,00	50,25	50,70	51,15	50,70	50,25	50,00
PM [W]:	N/A	1430	1200	930	1200	1430	N/A
PE60 [W]:	1509,4	1454,5	1197,1	916,4	1198,9	1455,2	1470,8
ΔPE60/PM [%]:	N/A	0,02	0,01	0,01	0,01	0,02	N/A
Limit ΔP/P <sub>1min</sub> :	+ 10 % of P <sub>M</sub>						

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Reactive power			
Uncontrollable reactive power			
Model: GW700-XS			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9615	0,9660	0,9601
50% PN	0,9818	0,9792	0,9920
75% PN	0,9878	0,9813	0,9956
100% PN	0,9947	0,9915	0,9972
Limit	>0,95	>0,95	>0,95
Model: GW1000-XS			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9916	0,9988	0,9833
50% PN	0,9915	0,9934	0,9946
75% PN	0,9956	0,9930	0,9894
100% PN	0,9983	0,9971	0,9956
Limit	>0,95	>0,95	>0,95
Model: GW1500-XS			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9659	0,9685	0,9652
50% PN	0,9890	0,9844	0,9791
75% PN	0,9955	0,9939	0,9919
100% PN	0,9962	0,9961	0,9950
Limit	>0,95	>0,95	>0,95
Model: GW2000-XS			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9708	0,9612	0,9631
50% PN	0,9946	0,9924	0,9901
75% PN	0,9969	0,9959	0,9950
100% PN	0,9972	0,9972	0,9967
Limit	>0,95	>0,95	>0,95
Model: GW2500-XS			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9823	0,9860	0,9653
50% PN	0,9953	0,9933	0,9891
75% PN	0,9961	0,9950	0,9932
100% PN	0,9878	0,9908	0,9916
Limit	>0,95	>0,95	>0,95
Model: GW3000-XS			
Test Voltage	211,6V	230V	248,4V
Output power			
25% PN	0,9871	0,9819	0,9744
50% PN	0,9961	0,9948	0,9920
75% PN	0,9937	0,9942	0,9934
100% PN	0,9899	0,9878	0,9828
Limit	>0,95	>0,95	>0,95

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Controllable reactive power				
Model: GW3000-XS				
Inductive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	162,80	-105,14	0,8396	229,73
10% - 20%	456,19	-44,70	0,9180	229,79
20% - 30%	754,10	-392,40	0,8871	229,85
30% - 40%	1087,85	-561,06	0,8888	229,91
40% - 50%	1371,55	-726,05	0,8838	229,97
50% - 60%	1667,17	-872,69	0,8860	230,04
60% - 70%	1975,38	-994,59	0,8932	230,10
70% - 80%	2263,03	-1137,56	0,8935	230,16
80% - 90%	2447,58	-1205,21	0,8970	230,19
90% - 100%	2671,38	-1353,31	0,8921	230,23
Capacitive (supply reactive power)				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	154,83	187,81	0,6360	229,73
10% - 20%	457,08	266,56	0,8638	229,80
20% - 30%	754,80	435,44	0,8662	229,86
30% - 40%	1073,07	584,05	0,8783	229,93
40% - 50%	1365,93	705,29	0,8885	229,99
50% - 60%	1672,21	874,38	0,8862	230,06
60% - 70%	1977,21	1025,45	0,8877	230,12
70% - 80%	2266,69	1167,76	0,8890	230,18
80% - 90%	2572,61	1300,15	0,8925	230,25
90% - 100%	2664,90	1384,15	0,8873	230,26
Reactive power supply with set point Q=0				
Power-BIN	Active power [W]	Reactive power [Var]	Power factor (cos φ)	AC voltage [V]
0% - 10%	155,47	181,42	0,6506	229,75
10% - 20%	466,69	163,68	0,9436	229,81
20% - 30%	760,42	149,41	0,9812	229,87
30% - 40%	1082,36	148,16	0,9976	229,93
40% - 50%	1362,29	154,60	0,9936	229,99
50% - 60%	1674,42	171,32	0,9948	230,05
60% - 70%	1969,87	203,65	0,9947	230,11
70% - 80%	2262,13	264,50	0,9932	230,17
80% - 90%	2561,56	400,60	0,9880	230,23
90% - 100%	2866,02	479,11	0,9863	230,29

Q adjustment				
	Reactive power set point Q [Var]	Measured reactive power Q [Var]	Measured cos φ	Deviation compared to setpoint ΔQ / PN [%]
- Qmin	-1,453	-1,477	0,8644	0,82
0	0	-0,069	0,9993	2,30
+ Qmax	1,453	1,433	0,8731	0,66

**Appendix E Type Verification Test Report**

Extract from test report according to EN 50438

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Connection and starting to generate electrical power		
Test according EN 50438 with standard setting	Min. voltage for connection to grid:	193,2V
	Max. voltage for connection to grid:	255,3V
	Min. frequency for connection to grid:	47,95Hz
	Max. frequency for connection to grid:	50,15Hz
	Observation time ( $\geq 60s$ )	60
<b>Test</b>		
<b>Voltage conditions</b>		
a) Start up for voltage range	<84% $U_n$ for twice of observation time	>111% $U_n$ for twice of observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
b) In voltage range at start-up	$\geq 84\% U_n$ within twice setting observation time	$\leq 111\% U_n$ within twice setting observation time
Reconnection time [s]	79,0	78,5
Limit:	Connected after setting observation time ( $\geq 60s$ )	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% $P_n$ /min.	
c) In voltage range after voltage failure	$\geq 84\% U_n$ for twice of setting observation time	$\leq 111\% U_n$ for twice of setting observation time
Reconnection time [s]	78,5	79,0
Limit:	Reconnection after setting observation time ( $\geq 60s$ )	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% $P_n$ /min.	
<b>Frequency conditions</b>		
d) Start up for frequency range	<47,95 Hz for twice of setting observation time	>50,15 Hz for twice of setting observation time
Connection:	No connection	No connection
Limit:	No connection allowed	
e) In frequency range at start-up	$\geq 47,95$ Hz within twice of setting observation time	$\leq 50,15$ Hz within twice of setting observation time
Reconnection time [s]	78,5	78,5
Limit:	Connected after setting delay time ( $\geq 60s$ )	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% $P_n$ /min.	
f) In frequency range after frequency failure	$\geq 47,95$ Hz for twice of setting observation time	$\leq 50,15$ Hz for twice of setting observation time
Reconnection time [s]	79,0	78,0
Limit:	Reconnection after setting observation time ( $\geq 60s$ )	
Gradient:	For adjustable micro generators the maximum occurring active power gradient after connection respectively start generating electrical power is less than the configured maximum active power per minute Max gradient: 10% $P_n$ /min.	

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**Short-circuit current contribution**

**Short-circuit current parameters**

For a directly coupled micro-generator			For a Inverter micro-generator		
Parameter	Symbol	Value	Time after fault	Volts	Amps
Peak Short Circuit current	$I_p$	N/A	20ms	105,35V	3,37A
Initial Value of aperiodic current	A	N/A	100ms	N/A	N/A
Initial symmetrical short-circuit current*	$I_k$	N/A	250ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	$i_{DC}$	N/A	500ms	N/A	N/A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to trip	4ms	In seconds



**Appendix E Type Verification Test Report**

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Power Quality. Harmonic current emission				
micro-generator		GW3000-XS		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	13,393	--	Single Phase	-
2nd	0,117	0,874	Single Phase	1,080
3rd	0,135	1,011	Single Phase	2,300
4th	0,016	0,121	Single Phase	0,430
5th	0,021	0,154	Single Phase	1,140
6th	0,011	0,085	Single Phase	0,300
7th	0,065	0,486	Single Phase	0,770
8th	0,011	0,085	Single Phase	0,230
9th	0,048	0,360	Single Phase	0,400
10th	0,010	0,077	Single Phase	0,184
11th	0,058	0,431	Single Phase	0,330
12th	0,011	0,079	Single Phase	0,153
13th	0,055	0,414	Single Phase	0,210
14th	0,011	0,083	Single Phase	0,131
15th	0,056	0,421	Single Phase	0,150
16th	0,011	0,080	Single Phase	0,115
17th	0,050	0,375	Single Phase	0,132
18th	0,012	0,086	Single Phase	0,102
19th	0,049	0,364	Single Phase	0,118
20th	0,010	0,076	Single Phase	0,092
21th	0,035	0,264	Single Phase	0,107
22th	0,009	0,069	Single Phase	0,084
23th	0,029	0,217	Single Phase	0,098
24th	0,009	0,064	Single Phase	0,077
25th	0,034	0,257	Single Phase	0,090
26th	0,010	0,073	Single Phase	0,071
27th	0,025	0,190	Single Phase	0,083
28th	0,010	0,078	Single Phase	0,066
29th	0,009	0,065	Single Phase	0,078
30th	0,010	0,073	Single Phase	0,061
31th	0,014	0,104	Single Phase	0,073
32th	0,009	0,064	Single Phase	0,058
33th	0,012	0,087	Single Phase	0,068
34th	0,006	0,045	Single Phase	0,054
35th	0,009	0,068	Single Phase	0,064
36th	0,006	0,045	Single Phase	0,051
37th	0,006	0,045	Single Phase	0,061
38th	0,007	0,052	Single Phase	0,048
39th	0,007	0,050	Single Phase	0,058
40th	0,007	0,053	Single Phase	0,046

**Appendix E Type Verification Test Report**

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Power Quality. Harmonic current emission				
micro-generator		GW700-XS		
Harmonic order n	Current Magnitude [A] at 100% rated output power	% of Fundamental	Phase	Harmonic current limit EN 61000-3-2, Class A [A]
1st	3,097	--	Single Phase	-
2nd	0,025	0,816	Single Phase	1,080
3rd	0,062	2,009	Single Phase	2,300
4th	0,005	0,150	Single Phase	0,430
5th	0,008	0,273	Single Phase	1,140
6th	0,005	0,177	Single Phase	0,300
7th	0,006	0,203	Single Phase	0,770
8th	0,006	0,184	Single Phase	0,230
9th	0,007	0,229	Single Phase	0,400
10th	0,004	0,137	Single Phase	0,184
11th	0,005	0,168	Single Phase	0,330
12th	0,004	0,113	Single Phase	0,153
13th	0,007	0,224	Single Phase	0,210
14th	0,002	0,077	Single Phase	0,131
15th	0,009	0,304	Single Phase	0,150
16th	0,003	0,107	Single Phase	0,115
17th	0,003	0,103	Single Phase	0,132
18th	0,002	0,056	Single Phase	0,102
19th	0,002	0,075	Single Phase	0,118
20th	0,002	0,056	Single Phase	0,092
21th	0,003	0,103	Single Phase	0,107
22th	0,002	0,053	Single Phase	0,084
23th	0,003	0,094	Single Phase	0,098
24th	0,001	0,041	Single Phase	0,077
25th	0,003	0,094	Single Phase	0,090
26th	0,001	0,035	Single Phase	0,071
27th	0,002	0,077	Single Phase	0,083
28th	0,002	0,055	Single Phase	0,066
29th	0,002	0,063	Single Phase	0,078
30th	0,001	0,046	Single Phase	0,061
31th	0,002	0,060	Single Phase	0,073
32th	0,001	0,032	Single Phase	0,058
33th	0,002	0,051	Single Phase	0,068
34th	0,001	0,030	Single Phase	0,054
35th	0,002	0,055	Single Phase	0,064
36th	0,001	0,032	Single Phase	0,051
37th	0,001	0,043	Single Phase	0,061
38th	0,001	0,031	Single Phase	0,048
39th	0,003	0,098	Single Phase	0,058
40th	0,001	0,040	Single Phase	0,046

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Voltage fluctuation and Flicker.					
	Maximum permissible flicker and voltage fluctuation as per EN 61000-3-3				
Value	Pst	Plt 2 hours	d(t) <sub>500ms</sub>	dc	dmax
Limit	1,0	0,65	3,3%	3,3%	4%
Test value	0,10	0,09	0,00%	0,00%	0,00%

DC-Injection.					
Model: GW700-XS					
Protection limit	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (15,2mA)				
Output power	~20%	~50%	75%	~100%	
Max. test value [mA]	16,5	16,3	16,4	16,5	

DC-Injection.					
Model: GW1000-XS					
Protection limit	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (21,7mA)				
Output power	~20%	~50%	75%	~100%	
Max. test value [mA]	22,2	18,6	21,8	22,0	

DC-Injection.					
Model: GW1500-XS					
Protection limit	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (32,6mA)				
Output power	~20%	~50%	75%	~100%	
Max. test value [mA]	28,9	27,2	28,9	30,3	

DC-Injection.					
Model: GW2000-XS					
Protection limit	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (43,5mA)				
Output power	~20%	~50%	75%	~100%	
Max. test value [mA]	16,7	17,6	10,6	15,0	

DC-Injection.					
Model: GW2500-XS					
Protection limit	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (54,4mA)				
Output power	~20%	~50%	75%	~100%	
Max. test value [mA]	11,3	15,2	14,5	37,3	

DC-Injection.					
Model: GW3000-XS					
Protection limit	Tested at four power levels, limit 0,5% of IAC <sub>nom</sub> (65,2mA)				
Output power	~20%	~50%	75%	~100%	
Max. test value [mA]	13,7	18,4	24,7	0,51	