



**BUREAU
VERITAS**

Certificate of compliance

Applicant: ZHEJIANG HYXI TECHNOLOGY CO., LTD
9-10F, Building 3, Jiuyao Commercial Center, Zhuantang Street, Xihu District, Hangzhou,
Zhejiang
China

Product: Photovoltaic (PV) inverter

Model: HYX-M500-SW, HYX-M400-SW, HYX-M300-SW,
HYX-M500-S, HYX-M400-S, HYX-M300-S

Use in accordance with regulations:

Automatic disconnection device with single-phase mains surveillance in accordance with Engineering Recommendation G98/1 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. This serves as a replacement for the disconnection device with isolating function, which can be accessed the distribution network provider at any time.

Applied rules and standards:

Engineering Recommendation G98/1-7:2022

Requirements for the connection of Fully Type Tested Micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks

DIN V VDE V 0126-1-1:2006 (4.1 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: CJDJ-ESH-P24010312

Certification program:

NSOP-0032-DEU-ZE-V01

Certificate number: U24-0154

Date of issue:

2024-03-08

Certification body



Domenik Koll
Head of Energy Systems



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

Testing laboratory accredited according to DIN EN ISO/IEC 17025

A partial representation of the certificate requires the written approval of Bureau Veritas Consumer Products Services Germany GmbH

Appendix C Type Test Verification Report

Extract from test report according to the Engineering Recommendation G98/1

Nr. CJDJ-ESH-P24010312

Type Approval and declaration of compliance with the requirements of Engineering Recommendation G98/1.

PGM Technology	Photovoltaic inverter		
Manufacturer	ZHEJIANG HYXI TECHNOLOGY CO., LTD		
Address	9-10F, Building 3, Jiuyao Commercial Center, Zhuantang Street, Xihu District, Hangzhou, Zhejiang, China		
Tel	--	Fax	--
Email	--	Website	--

Rated values	HYX-M500-SW	HYX-M400-SW	HYX-M300-SW	HYX-M500-S
PV Input (DC)				
MPP DC voltage range [V]	16-60	16-60	16-60	16-60
Input DC voltage range [V]	16-65	16-65	16-65	16-65
Input DC current [A]	16	16	16	16
Grid Output (AC)				
Output AC voltage [V]	230, L/N/PE, 50/60Hz			
Rated AC current [A]	2,17	1,74	1,3	2,17
Apparent power [VA]	500	400	300	500

Rated values	HYX-M400-S	HYX-M300-S	--	--
PV Input (DC)				
MPP DC voltage range [V]	16-60	16-60	--	--
Input DC voltage range [V]	16-65	16-65	--	--
Input DC current [A]	16	16	--	--
Grid Output (AC)				
Output AC voltage [V]	230, L/N/PE, 50/60Hz		--	--
Rated AC current [A]	1,74	1,3	--	--
Apparent power [VA]	400	300	--	--

Firmware version V01.00.02

Description of the structure of the power generation unit:

The power generation unit is equipped with a PV and line-side EMC filter. The power generation unit has galvanic isolation between DC input and AC output (HF/LF transformer). Output switch-off is performed with single-fault tolerance based on one series-connected relays in (each) line and neutral. This enables a safe disconnection of the power generation unit from the network in case of error.

Differences between Generating Units:

The only difference between model HYX-M500-SW, HYX-M400-SW, HYX-M300-SW and model HYX-M500-S, HYX-M400-S, HYX-M300-S is the product label model and the software, others are the same. See photos for details. So the tests had been performed on model HYX-M500-SW, HYX-M400-SW, HYX-M300-SW.

The tests had been performed on the HYX-M500-SW, is valid for the HYX-M400-SW, HYX-M300-SW since the hardware are similar and just power derated by software.

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The above stated Generating Units are tested according the requirements in the Engineering Recommendation G98/1. 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 Engineering Recommendation G98/1.

Operating Range.

Test 1	Voltage = 85% of nominal (195,5 V) Frequency = 47,0 Hz Power Factor = 1 Period of test 20 seconds
Connection:	Always connected
Limit:	No disconnection allowed
Test 2	Voltage = 85% of nominal (195,5 V) Frequency = 47,5 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	No disconnection allowed
Test 3	Voltage = 110% of nominal (253 V) Frequency = 51,5 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	No disconnection allowed
Test 4	Voltage = 110% of nominal (253 V) Frequency = 52,0 Hz Power Factor = 1 Period of test 15 minutes
Connection:	Always connected
Limit:	No disconnection allowed
Test 5	Voltage = 100% of nominal (230 V) Frequency = 50,0 Hz Power Factor = 1 Period of test 90 minutes
Connection:	Always connected
Limit:	No disconnection allowed
Test 6	Confirm that the Micro-Generating Plant is capable of staying connected to the Distribution Network and operate at rates of change of frequency up to 1 Hzs-1 as measured over a period of 500 ms.
Connection:	Always connected
Limit:	No disconnection allowed



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Protection. Voltage tests.

Phase 1

Function	Setting		Trip test		No trip test	
	Voltage [V]	Time delay [s]	Voltage [V]	Time delay [s]	Voltage / time	Confirm no trip
U/V	184,0	2,5	184,7	2,50	188V / 5s	No trip
					180V / 2,45s	No trip
O/V stage 1	262,2	1,0	262,5	1,00	258,2V / 5,0s	No trip
O/V stage 2	273,7	0,5	273,0	0,50	269,7V / 0,95s	No trip
					277,7V / 0,45s	No trip

Note. For Voltage tests the Voltage required to trip is the setting $\pm 3,45V$. The time delay can be measured at a larger deviation than the minimum required to operate the protection. The No trip tests need to be carried out at the setting $\pm 4V$ and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

Protection. Frequency tests.

Function	Setting		Trip test		No trip test	
	Frequency [Hz]	Time delay [s]	Frequency [Hz]	Time delay [s]	Frequency / time	Confirm no trip
U/F stage 1	47,5	20	47,50	20,00	47,7Hz / 30s	No trip
U/F stage 2	47	0,5	47,00	0,51	47,2Hz / 19,5s	No trip
					46,8Hz / 0,45s	No trip
O/F stage 2	52	0,5	52,00	0,50	51,8Hz / 120s	No trip
					52,2Hz / 0,45s	No trip

Note. For Frequency Trip tests the Frequency required to trip is the setting $\pm 0,1Hz$. In order to measure the time delay a larger deviation than the minimum required to operate the projection can be used. The "No-trip tests" need to be carried out at the setting $\pm 0,2Hz$ and for the relevant times as shown in the table above to ensure that the protection will not trip in error.

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Protection. Loss of Mains.

Inverters tested according to BS EN 62116.

Balancing load on islanded network	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. Ph1 fuse removed [s]	0,064	0,136	0,405	0,072	0,179	0,415

Note. Trip time limit is 0,5s.

Protection. Re-connection timer.

Test should prove that the reconnection sequence starts in no less than 20 seconds for restoration of voltage and frequency to within the stage 1 settings of table 2.

Over Voltage	
Time delay setting [s]	Measured delay [s]
20	33,0
Under Voltage	
Time delay setting [s]	Measured delay [s]
20	32,4
Over Frequency	
Time delay setting [s]	Measured delay [s]
20	33,0
Under Frequency	
Time delay setting [s]	Measured delay [s]
20	33,4

	Checks on no reconnection when voltage or frequency is brought to just outside stage 1 limits of table 1.			
	At 266,2V	At 180,0V	At 47,4Hz	At 52,1Hz
Confirmation that the Generating Unit does not re-connect.	No reconnection	No reconnection	No reconnection	No reconnection



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Protection. Frequency change, Stability test.

	Start Frequency [Hz]	Change	Test Duration	Confirm no trip
Positive Vector Shift	49,5	+50 degrees		No trip
Negative Vector Shift	50,5	-50 degrees		No trip
Positive Frequency drift	49,0 to 51,0	+0,95Hz/sec	2,1s	No trip
Negative Frequency drift	51,0 to 49,0	-0,95Hz/sec	2,1s	No trip

Limited Frequency Sensitive Mode – Over Frequency

1-min mean value [Hz]:	a) 50,00	b) 50,45	c) 50,70	d) 51,15	e) 50,70	f) 50,45	g) 50,00
1. Measurement a) to g): Active power output > 80% P_n							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P _{expected} [W]:	500,0	495,0	470,0	425,0	470,0	495,0	500,0
P _{measured} [W]:	501,6	494,1	469,1	424,8	469,4	494,0	501,6
2. Measurement a) to g): Active power output 40% and 60% after freezing > 80% P_n							
Frequency [Hz]:	50,00	50,45	50,70	51,15	50,70	50,45	50,00
P _{expected} [W]:	250,0	245,0	220,0	175,0	220,0	245,0	500,0
P _{measured} [W]:	251,1	243,2	218,8	178,9	218,3	242,4	502,3

Output Power with falling 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	47,50
Active power [W]:	502,4	517,5	517,9
ΔP/P _{max} [%]:			3,58

Note.

No power reduction takes place for electronic inverter.



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Power Quality. Harmonics.

HYX-M500-SW

SSEG rating per phase (rpp)							
	At 45-55% of rated outputs 267,9 W		100% of rated output 516,7 W				
Harmonic	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Measured Value (MV) in [A]	Measured Value (MV) in [%]	Limit in BS EN61000-3-2 in Amps	Higher limit for odd harmonics 21 and above	
2nd	0,002	0,038	0,039	0,903	1,080		
3rd	0,001	0,020	0,067	1,539	2,300		
4th	0,001	0,022	0,027	0,632	0,430		
5th	0,008	0,178	0,026	0,606	1,140		
6th	0,000	0,008	0,048	1,093	0,300		
7th	0,007	0,153	0,028	0,636	0,770		
8th	0,001	0,014	0,035	0,815	0,230		
9th	0,001	0,014	0,027	0,629	0,400		
10th	0,001	0,020	0,021	0,486	0,184		
11th	0,002	0,041	0,047	1,088	0,330		
12th	0,000	0,009	0,016	0,360	0,153		
13th	0,002	0,041	0,049	1,118	0,210		
14th	0,001	0,012	0,015	0,335	0,131		
15th	0,000	0,009	0,047	1,084	0,150		
16th	0,000	0,010	0,014	0,312	0,115		
17th	0,001	0,021	0,046	1,058	0,132		
18th	0,000	0,005	0,012	0,267	0,102		
19th	0,001	0,020	0,036	0,825	0,118		
20th	0,000	0,009	0,009	0,202	0,092		
21th	0,000	0,006	0,020	0,456	0,107	0,160	
22th	0,000	0,010	0,008	0,194	0,084		
23th	0,001	0,019	0,013	0,306	0,098	0,147	
24th	0,000	0,003	0,008	0,186	0,077		
25th	0,001	0,017	0,017	0,391	0,090	0,135	
26th	0,000	0,004	0,008	0,173	0,071		
27th	0,000	0,003	0,019	0,430	0,083	0,124	
28th	0,000	0,003	0,008	0,174	0,066		
29th	0,001	0,012	0,012	0,281	0,078	0,117	
30th	0,000	0,002	0,008	0,176	0,061		
31th	0,000	0,009	0,022	0,512	0,073	0,109	
32th	0,000	0,002	0,007	0,166	0,058		
33th	0,000	0,002	0,025	0,564	0,068	0,102	
34th	0,000	0,002	0,007	0,168	0,054		
35th	0,000	0,004	0,023	0,520	0,064	0,096	
36th	0,000	0,001	0,007	0,163	0,051		
37th	0,000	0,003	0,013	0,310	0,061	0,091	
38th	0,000	0,005	0,007	0,167	0,048		
39th	0,000	0,002	0,013	0,291	0,058	0,087	
40th	0,000	0,003	0,008	0,192	0,046		
THD ₄₀	--	0,253	--	3,843	23%	13%	
PWHD	--	0,226	--	10,813	23%	22%	

Note the higher limits for odd harmonics 21 and above are only allowable under certain conditions, if these higher limits are utilised please state the exemption used as detailed in part 6.2.3.4 of BS EN 61000-3-2 in the box below.



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Power Quality. Power factor.

Output power	216,2V	230V	253V	Measured at three voltage levels and at full output. Voltage to be maintained within $\pm 1,5\%$ of the stated level during the test.
20%	0,9765	0,9720	0,9618	
50%	0,9904	0,9896	0,9867	
75%	0,9939	0,9932	0,9918	
100%	0,9951	0,9948	0,9939	
Limit	>0,95	>0,95	>0,95	

Power Quality. Voltage fluctuation and Flicker.

	Starting			Stopping			Running	
	d_{max} [%]	dc [%]	$d_{(t)}$ [%]	d_{max} [%]	dc [%]	$d_{(t)}$ [%]	Pst	Plt 2 hours
Measured values at test impedance	0,375	0,157	0,00	0,345	0,133	0,00	0,192	0,166
Measured values at standard impedance	0,375	0,157	0,00	0,345	0,133	0,00	0,192	0,166
Values for maximum impedance	4,00%	3,30%	3,3% 500ms	4,00%	3,30%	3,3% 500ms	1,00	0,650
Limits set under BS EN 61000-3-11	4,0	3,3	3,3 500ms	4,0	3,3	3,3 500ms	1,0	0,65
Test impedance	R	0,24 0,4	Ω	XI	0,15 0,25	Ω		
	Z		Ω					
Standard impedance	R	0,24 0,4	Ω	XI	0,15 0,25	Ω		
	Z		Ω					
Maximum impedance	R	0,24 0,4	Ω	XI	0,15 0,25	Ω		
	Zmax		Ω					



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Power Quality. DC injection.

HYX-M600-SW

Test level power [%]	20	50	75	100
Recorded value [mA]	0,071	-0,163	-0,315	-0,079
Recorded value [%]	0,00	-0,01	-0,01	0,00
Limit [%]	0,25	0,25	0,25	0,25

HYX-M300-SW

Test level power [%]	20	50	75	100
Recorded value [mA]	0,143	-0,288	-0,653	-0,148
Recorded value [%]	0,01	-0,02	-0,05	-0,01
Limit [%]	0,25	0,25	0,25	0,25

Note:

The Inverter is a single-phase inverter.

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Fault level Contribution.

For a directly coupled SSEG			For a Inverter SSEG		
Parameter	Symbol	Value	Time after fault	Volts [V]	Amps [mA]
Peak Short Circuit current	I_p	N/A	20 ms	23,5V	694,2
Initial Value of aperiodic current	A	N/A	100 ms	N/A	N/A
Initial symmetrical short-circuit current*	I_k	N/A	250 ms	N/A	N/A
Decaying (aperiodic) component of short circuit current*	i_{DC}	N/A	500 ms	N/A	N/A
Reactance/Resistance Ratio of source*	X/R	N/A	Time to Trip [ms]	2,65	

For rotating machines and linear piston machines the test should produce a 0s – 2s plot of the short circuit current as seen at the Generating Unit terminals.

* Values for these parameters should be provided where the short circuit duration is sufficiently long to enable interpolation of the plot.

Self Monitoring – Solid state switching.	P
It has been verified that in the event of the solid state switching device failing to disconnect the Generating Unit, the voltage on the output side of the switching device is reduced to a value below 50 volts within 0,5 seconds.	Yes
Note. Unit do not provide solid state switching relays. In case the semiconductor bridge is switched off, then the voltage on the output drops to 0. In this case the relays on the output will also open (Functional safety of the internal automatic disconnection device according to VDE 0126-1-1).	

Cyber security	P
Confirm that the Manufacturer or Installer of the Micro-generator has provided a statement describing how the Micro-generator has been designed to comply with cyber security requirements, as detailed in 9.7.	Yes
Note. Different levels of access, all are password protected, only certain parameters can be changed on maintenance level. Manufacturer information provided.	



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security requirements of the standard G98-1

We hereby declared that all Hybrid inverter listed as below meet the cyber security requirements of the standard G98-1.


Models :

HYX-M300-S/SW;
 HYX-M400-S/SW;
 HYX-M500-S/SW;

The inverters meet the requirement of the standard G99-1 and the cyber security requirement mentioned in the flow standards:

- ETSI EN 303 645;
- relevant aspects of PAS 1879 "Energy smart appliances – Demand side response operation – Code of practice";
- relevant aspects of "Distributed Energy Resources – Cyber Security Connection Guidance" published by BEIS and the ENA;
- Any other relevant standard that has been incorporated in the design of the Power Generating Module

Manufacturer: Zhejiang Hxyi Technology Co., Ltd.

Company's Registered Seal/Stamp: 

Authorized Person: Bin Hu

Authorized Signature:

Date of Issue: Aug 20th, 2023

Logic Interface (input port) Required by paragraph 9.4.4	N/A
Confirm that an input port is provided and can be used to reduce the Active Power output to zero	N/A
Note. Manufacturer information provided.	
Provide high level description of logic interface, e.g. details in 9.4.4 such as AC or DC signal	N/A

2.4 Communication Technology

HYX-M2000-SW micro inverter series adopts a new wifi wireless communication solution.

Wi-Fi communication solution: It operates in the 2.4GHz frequency band, and the transmission distance is weaker than the Sub-1G frequency band. It does not need additional communication equipment and can directly communicate with Hxyi Cloud.

HYX-M500-SW, HYX-M400-SW, HYX-M300-SW



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2.4 Communication Technology

1-in-4 Sub-1G version series micro inverters adopt a new Sub-1GHz wireless communication solution.

HYX-M500-S, HYX-M400-S, HYX-M300-S