TEST REPORT
DIN V VDE V 0126-1-1
Automatic disconnecting device between a generator and the public low-voltage grid

Report Reference No. .....:	210902250SHA-002	
Tested by (name + signature) .....:	Billy Chen	Billee .....
Approved by (name + signature) .....:	Selif Sui	Sleifsui .....
Date of issue.....:	2021-09-29	
Contents .....:	16 pages	
Testing Laboratory .....:	Intertek Testing Services Shanghai.	
Address.....:	Building No.86, 1198 Qinzhou Road (North), Shanghai 200233, China.	
Testing location / procedure .....:	TL ☒ SMT ☐ TMP ☐	
Testing location / address.....:	Same as above	
Applicant's name .....:	Dongguan Kaideng Energy Technology Co., Ltd.	
Address.....:	4 th floor, Fuyuan business building, no. 1, Lane 13, xin'an maiyuan Road, Chang 'an town, Dongguan City, Guangdong, China.	
Test specification:		
Standard .....:	DIN V VDE V 0126-1-1: 2013	
Test procedure.....:	Type test	
Non-standard test method.....:	N/A	
Test Report Form/blank test report		
Test Report Form No. .....:	VDE 0126-1-1_TTRF V1.0	
TRF Originator .....:	Intertek Shanghai	
Master TRF.....:	2016-07	

Test item description .....:	Utility-Interactive Micro Inverter
Trade Mark .....:	KDWVC, CRAFTSTROM
Manufacturer.....:	Same as applicant
Model/Type reference.....:	WVC-350W, WVC-300W, Hedy
Rating.....:	See below Specifications table

Specifications table			
Model	KDWVC-350W	KDWVC-300W	Hedy
Input:			
Vmax PV (Vdc)	60	60	100
Isc PV (absolute Max.) (A)	20	15	7
Number MPP trackers	1	1	1
Number input strings	1	1	1
Max. PV input current(A)	14	13.6	6
MPPT voltage range (Vdc)	25 to 60	25 to 60	60 to 100
Output			
Normal Voltage(V)	☒1/N/PE 230Vac ☐3 ϕ /N/PE 230/400Vac		
Frequency (Hz)	☒50 Hz ☐60Hz		
Current (Max. continuous) (A)	1.52	1.3	1.3
Power rating (W)	350	300	300
Power Rating (VA)	350	300	300
Power factor /rated	≥0.99	≥0.99	≥0.99
others			
Protective class	Class I		
Ingress protection (IP)	IP 65		
Temperature (°C)	-40°C to +50°C		
Inverter Isolation	☐Non-isolated ☒High frequency isolated		
Overvoltage category	OVC III (AC Main), OVC II (PV)		
Weight (kg)	0.82		
Dimensions (WxHxD) (mm)	165 x 176 x 38		

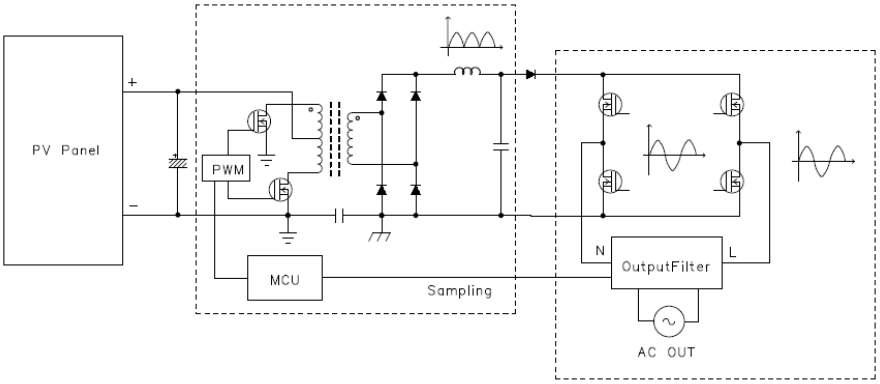
Possible test case verdicts:
- test case does not apply to the test object..... : N/A
- test case does not verify to the test object..... N/E
- test object does meet the requirement ..... : P(Pass)
- test object does not meet the requirement ..... : F(Fail)
Testing..... :
Date of receipt of test item..... : 2021-06-12
Date (s) of performance of tests..... : 2021-06-22 to 2021-08-17
General remarks:
The test results presented in this report relate only to the object (single PV inverter unit) tested. The testing voltage is 230Vac single phase. The information about Generating Plant is not considered and tested.
The inverter is high-frequency isolated and without a power relay at AC output. There is a controller in inverter but is not constructed redundantly protection.
NS protection don't consider in the report. NS protection should be considered after the installation.
Installer and relevant persons shall comply with VDE0126-1-1 and relevant standard and Grid Code in this standard.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(see Enclosure #)" refers to additional information appended to the report.
"(see appended table)" refers to a table appended to the report.
Throughout this report a point is used as the decimal separator.
Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.
The test results presented in this report relate only to the item tested. See general product information next for details information.
The test does not include the faults inside the CPU and software evaluation as agreed with Applicant.
All the tests are performed on single unit.

General product information:

The Solar inverter converts DC power into AC power.

The unit is providing EMC filtering at the output toward mains. The unit provided galvanic insulation from input to output (high frequency transformer isolation). The interface switch is not provided in the solar inverter, the external NS protection device shall be provided at the end use.

Block diagram:



The model KDWVC-300W is identical to model KDWVC-350W except the power de-rating by software; the model Hedy is identical to model KDWVC-300W except the input voltage range.

The testing performed on typical model KDWVC-350W, is valid for model KDWVC-300W and Hedy.

The software version used for the testing is:

300W and Hedy Firmware version: WVC300R3-55-100-433-c3

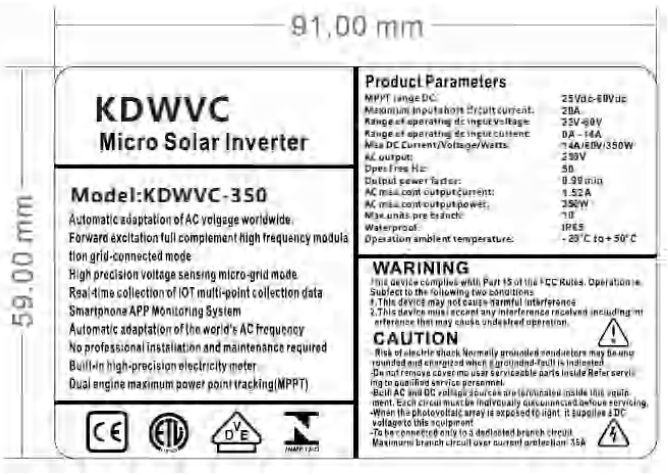
350W Firmware version: WVC350R3-55-100-433-c3

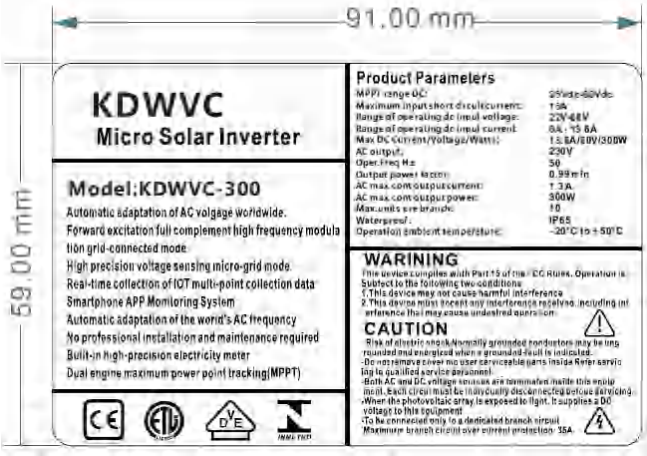
Abbreviations used in the report:

PGU: Power Generation unit. PGS: Power Generation System

In: Rated current of power generation unit.

Copy of marking plate:





VDE-0126-1-1:2013			
Clause	Requirement - Test	Result - Remark	Verdict
4	REQUIREMENTS.		P
	These requirements apply to integrated or separate (independent) disconnecting devices unless otherwise noted.		P
	The disconnection device has to cut off the power generating system on the ac side from the grid by two switches in series when: • the voltage and/or the frequency of the grid is deviating, • direct current (DC) is fed into the Grid. • unintentional islanding operation occurs, • intentional islanding operation using grid backup systems (emergency supplies).	The external central NS protection used; it shall be considered after the installation.	N/E
4.1	Functional safety The safety must be assured under all operating conditions complying with the defined functions 4.3 to 4.6 and – if applicable – 4.8 of the disconnection device. The disconnection device can be an independent unit or an integrated part of the power generating unit and must switch off in case of a fault and indicate the fault status	The external central NS protection used; it shall be considered after the installation.	N/E
4.1.1	Single fault safety.		N/E
	The disconnection device must comply with the single fault tolerance requirements of VDE-AR-N 4105:2011-08, A.6	The external central NS protection used; it shall be considered after the installation.	N/E
4.1.2	Interface Switch		N/E
	The interface switch must, in case it is integrated into a PV-inverter, comply with the requirements of DIN EN 62109-2(VDE 0126-14-2):2012-04, 4.4.4.15.2 and in all other cases with the requirements according to VDE-AR-N 4105:2011-08, 6.4.	The external central NS protection used; it shall be considered after the installation.	N/E
4.2	Connection conditions		P
	The connection, the reconnection after a grid-fault and the reconnection after short interruption shall be carried out according to VDE-AR-N 4105:2011-08, 8.3.1	See appended table	P
4.3	Monitoring the voltage		P
4.3.1	voltage drop U<		P
	The disconnection because of a voltage drop shall be carried out according to VDE-AR-N 4105:2011-08, 6.5.1 and 6.5.2	See appended table	P
4.3.2	rise-in-voltage U>>		P
	The disconnection because of a rise-in-voltage shall be carried out according to VDE-AR-N 4105:2011-08, 6.5.1 and 6.5.2	See appended table	P
4.3.3	slow rise-in-voltage U>		N/E
	The disconnection because of a slow rise-in-voltage (10-minute-average) shall be carried out according to VDE-AR-N 4105:2011-08, 6.5.1 and 6.5.2	No such function, the external central NS protection used; it shall be considered after the installation	N/E

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Clause	Requirement - Test	Result - Remark	Verdict
4.4	Monitoring the frequency		P
	The disconnection because of a frequency decrease or a frequency increase shall be carried out according to VDE-AR-N 4105:2011-08, 6.5.1 and 6.5.2		P
4.5	Monitoring the dc current		P
	A feed in of d.c current into the low-voltage grid due to defective equipment must lead to a switch off within 0.2 seconds. For this purpose the fault itself or a measurement of the dc component of the current exceeding 1 A can be used as disconnection criteria.	See appended table	P
4.6	Detection of islanding operation		N/E
	The disconnection because of a detection of unintended islanding operation shall be carried out according to VDE-AR-N 4105:2011-08, 6.5.1 and 6.5.3	No such function, the external central NS protection used; it shall be considered after the installation	N/E
4.7	Markings		N/E
	A generating system equipped with an automatic disconnecting device shall be marked with the information “VDE 0126-1-1” which is visible from the outside. This can be done by		N/E
	— the marking plate or — showing it on a display of the disconnection device or — a separate marking	The marking shall be shown on central NS protection device.	N/E
4.8	Requirements for disconnection devices integrated into PV-inverters	The external central NS protection used; it shall be considered after the installation.	N/E
	The requirements of the DIN EN 62109-2 (VDE 0126-14-2):2012-04, 4.8 regarding the residual current detection and the insulation detection of the PV-generator shall be complied with.	The PV is grounded, isolated type PV inverter.	N/A
5	General Requirements		P
	Limits according to DIN EN 61000-6-3 (VDE 0839-6-3) regarding radio interferences must be complied with. For disturbance-free operation disturbance limits according to DIN EN 61000-6-2 (VDE 0839-6-2) shall be complied with.	See EMC report	P
6	Type Testing		P
6.0	General		P
	The following tests are valid for integrated and separated disconnecting devices unless otherwise noted. A separate disconnection device must be tested together with a suitable supply. It has to be ensured that the turn-off signal is caused by the disconnection device and not by the supply.		P
6.1	Functional safety		P
	The testing of the single fault tolerance and the error detection with following disconnection according to 4.1 is carried out according to DIN VDE V 0124-100 (VDE V 0124-100):2012-07, 5.4.5.2.	The external central NS protection used; it shall be considered after the installation.	N/E
6.2	Connection conditions		P

VDE-0126-1-1:2013			
Clause	Requirement - Test	Result - Remark	Verdict
	The testing of the connection and the reconnection is carried out according to DIN VDE V 0124-100 (VDE V 0124):2012-07, 5.5.1 and 5.5.2.	See appended table	P
6.3	Monitoring the voltage		P
	The testing of the voltage monitoring is carried out according to DIN VDE V 0124-100 (VDE V 0124-100):2012-07, 5.4.5.3.	See appended table	P
6.4	Monitoring the frequency		P
	The testing of the frequency monitoring is carried out according to DIN VDE V 0124-100 (VDE V 0124-100):2012-07, 5.4.5.4.	See appended table	P
6.5	Monitoring the dc current		P
	a) The measuring device at the switching point (e.g. current transformer or resistance) is fed with direct current of 1 A. The cut-off must be carried out within 0.2 seconds. b) By means of a fault simulation it is measured if a defective system operation with a d.c. fault current of more than 1 A leads to cut-off within 0.2 seconds.	See appended table	P
6.6	Detection of islanding operation		N/E
	The testing of the disconnection due to unintended islanding operation is carried out according to DIN VDE V 0124-100 (VDE V 0124-100):2012-07, 5.4.6	No such function, the external central NS protection used; it shall be considered after the installation	N/E
7	Routine Test		NA
8	Construction Specification		NA
	Initial tests and re-examination in addition to the routine tests may be omitted. If the disconnection device is a separate unit it must not be used in a TN-C power system. In this case a TN-C-S power system must be created.		NA

Appendix table

6.2	TABLE: Connection conditions and synchronization (Reconnection)			P
Condition	Measurement		Limitation	
	Reconnection	Delay time [s]	Reconnection	Delay time [s]
f<47.45Hz	No	--	No	≥60
f≥47.55Hz	Yes	108.5	Yes	≥60
f>50.1Hz	No	--	No	≥60
f≤50.00Hz	Yes	90.4	Yes	≥60
U<0.84Un	No	--	No	≥60
U≥0.86Un	Yes	111.3	Yes	≥60
U>1.11Un	No	--	No	≥60
U≤1.09Un	Yes	111.3	Yes	≥60
Note(s):				

6.3	TABLE: line to neutral voltage monitoring				P	
	Rated voltage Un: 230V					
No.	Set value [V]	Threshold value [V]			Limitation VDE 4105	Remark
		L1	L2	L3		
1	184	182	--	--	80%U_n±1%	Decreasing value ramp of 0.1V.
2		183	--	--		
3		184	--	--		
1	264.5	264	--	--	110%Un-115 %U_n±1%	Increasing value ramp of 0.1V.
2		264	--	--		
3		264	--	--		

UV / OV	Trip time [ms]			
	Measurement			Limitation VDE 4105
	L1	L2	L3	
Un to 77%Un	94	--	--	200
	99	--	--	200
	122	--	--	200
Un to 118%Un	111	--	--	200
	55	--	--	200
	65	--	--	200
Rated: 230Vac, 50Hz.				

6.3	TABLE: over voltage protection as sliding 10-min-average value				N/E
	Rated voltage Un: 230V				
No.	U_{start} [V]	U_{end} [V]	Limitation T [min]	Trigger time [min]	Recover time [s]
1	--	--	--	--	--
2	--	--	--	--	--
3	--	--	--	--	--

6.3	TABLE: Frequency monitoring test				P
Rating frequency: 50Hz, speed: 1 Hz/s					
UF/OF	Trip value [Hz]		Trip time [ms]		
No.	Measurement	Limitation	Measurement	Limitation	Remark
1	47.5	47.5	60	200	48.0Hz -> 47.0Hz Delayed time:500ms is considered.
2	51.5	51.5	101	200	51.0Hz -> 52.0Hz Delayed time:500ms is considered.

6.4	Monitoring the current	
	Limits	Disconnection time(ms)
DC current 1A	DC current >1A, disconnection time within 0.2s	21
Note: By means of fed with direct current of 1A Limit : DC current:1A . Disconnection time 0.2s		

4.3.6	TABLE: Islanding Protection					N/E
Power 100%						
Conditions	P_W [w]	Q_L [VA]	Q_C [VA]	Q_f	Trip time [ms]	Limitation [ms]
R: 100% L / C: 95%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 96%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 97%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 98%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000

	L3:	L3:	L3:			
R: 100% L / C: 99%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 100%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 101%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 102%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 103%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 104%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 105%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
Power 66%						
Conditions	P_W [w]	Q_L [VA]	Q_C [VA]	Q_f	Trip time [ms]	Limitation [ms]
R: 100% L / C: 95%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 96%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 97%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 98%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 99%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			

R: 100% L / C: 100%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 101%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 102%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 103%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 104%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 105%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
Power 33%						
Conditions	P_W [w]	Q_L [VA]	Q_C [VA]	Q_f	Trip time [ms]	Limitation [ms]
R: 100% L / C: 95%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 96%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 97%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 98%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 99%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 100%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100%	L1:	L1:	L1:			

L / C: 101%	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 102%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 103%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 104%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
R: 100% L / C: 105%	L1:	L1:	L1:			
	L2:	L2:	L2:			5000
	L3:	L3:	L3:			
Remark:						

4.8	TABLE: Insulation resistance measurement					P
Conditions	Measurement [I.F. / N.O.]					Identification
	PV / DC Supply Voltage [Vdc]					
	$V_{mpp\ lowest}$	1/4V_{mpp}	1/2 V_{mpp}	3/4 V_{mpp}	$V_{mpp\ highest}$	
PV+ to PE:limit-10% [kΩ]	I.F	I.F	I.F	I.F	I.F	I.F.: Isolation Fault N.O.: Normal Operation
PV- to PE: limit-10% [kΩ]	I.F	I.F	I.F	I.F	I.F	
PV+ to PE:limit+10% [kΩ]	N.O.	N.O.	N.O.	N.O.	N.O	
PV- to PE:limit+10% [kΩ]	N.O.	N.O.	N.O.	N.O.	N.O	

Note:

Array Insulation Resistance Threshold Value R = 3.33 [kΩ] (Should be larger than R = $V_{MAX\ PV}$ / 30mA.)

The accuracy of resistance measurement △R = 0.3 [kΩ] (the value declared by manufacturer)

Appendix -Photos of the product

Overview

Overview -


Internal view-