





Test Report issued under the responsibility of:

TEST REPORT EN 50438 Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks	
Report Number	SJS20191000217S02
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Test specification:	
Standard	EN 50438:2013
Non-standard test method	N/A
Test Report Form No.	EN 50438A
Test Report Form(s) Originator	SJS
Master TRF	Dated 2019-05
Test item description	Solar Micro Inverter
Trade Mark	N/A
Manufacturer	Dongguan Kaideng Energy Technology Co., Ltd.
Model/Type reference	WVC-600, WVC-350, WVC-1200, WVC-300, WVC-295, WVC- 700, WVC-1400
Ratings	Input: DC 22-50V, 1-25A, 630W Output: AC110/220V, 5A/2.5A, 590W



Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Solar Micro Inverter		
Model: WVC-600		
Input: DC 22-50V, 1-25A, 630W		
Output: AC110/220V, 5A/2.5A, 590W		
Dongguan Kaideng Energy Technology Co., Ltd.		
4th Floor, Fuyuan Business Building, No.1, Lane 13, Maiyuan		
Road, Xin'an Community, Chang'an Town, Dongguan,		
Guangdong, China		
Importer:xxxxx	Address:xxxxx	S/N:
Made In China		



Test item particulars	
Equipment mobility	<input type="checkbox"/> movable <input type="checkbox"/> hand-held <input type="checkbox"/> stationary <input checked="" type="checkbox"/> fixed <input type="checkbox"/> transportable <input type="checkbox"/> for building-in
Connection to the mains	<input type="checkbox"/> pluggable equipment <input type="checkbox"/> direct plug-in <input checked="" type="checkbox"/> permanent connection <input type="checkbox"/> for building-in
Environmental category	<input type="checkbox"/> outdoor <input checked="" type="checkbox"/> indoor unconditional <input type="checkbox"/> indoor conditional
Over voltage category Mains	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Over voltage category PV	<input type="checkbox"/> OVC I <input checked="" type="checkbox"/> OVC II <input type="checkbox"/> OVC III <input type="checkbox"/> OVC IV
Mains supply tolerance (%)	-90 / +110 %
IT testing, phase-phase voltage (V)	---
Class of equipment	<input checked="" type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III <input type="checkbox"/> Not classified
Mass of equipment (kg)	<7Kg
Pollution degree	IP20
IP protection class	---
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement	F (Fail)
Testing	
Date of receipt of test item	October 25, 2019
Date (s) of performance of tests	October 25, 2019 to November 05, 2019
General product information:	
Solar Micro Inverter, DC input AC output	



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Clause	Requirement + Test	Result - Remark	Verdict
4	Technical REQUIREMENTS		-
4.1	Electrical installation		-
4.1.1	General		-
4.1.2	Over-current protection		P
4.1.3	Earthing		P
	- Earthing shall be according to HD 60364-5-551 and the relevant national standards.		P
	- When a micro-generator is operating in parallel with the distribution network, there shall be no direct connection between the generator winding (or pole of the primary energy source in the case of a DC sourced micro-generator) and the DSO's earth terminal. For installations where the customer provides his own earth terminal, e.g. when connected to a TT system, it is also advisable to avoid connecting the generator winding to this earth terminal.		P
	- For a micro-generator which is designed to operate in parallel with a distribution network but which is connected via an inverter (e.g. a PV array or a stationary fuel cell power system) it is permissible to connect one pole or the DC side of the inverter to the distribution network if there is insulation between the AC and the DC sides of the inverter. In such cases, the installer/manufacturer shall take all reasonable precautions to ensure that the micro-generator will not impair the integrity of the distribution network and will not suffer unacceptable damage for all credible operating conditions, including faults on the distribution network.		P
4.2	Normal operating range		--
4.2.1	General		-
4.2.2	Continuous voltage operation range	Input :DC 22-50V; Output: 110/220V	P
	The generating plant shall be capable not to disconnect due to voltage when the voltage at the point of connection stays within the range of 0,85 Un to 1,1 Un.		P
	The generating plant owner shall take into account the voltage rise and voltage drop within the installation when considering the wider operating range for the generator unit itself.		P
4.2.3	Continuous frequency operation range		P
	The generating plant shall be capable to operate continuously when the frequency at the point of connection stays within the range of 49 Hz to 51 Hz.	50/60Hz	P
	Linear generators, coupled directly and synchronously to the grid, and powered by free piston stirling engines are permitted to disconnect below 49,5 Hz and above 50,5 Hz.		N/A
4.2.4	Response to under-frequencies		P
	A generating plant shall be resilient to reductions of		P



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	frequency at the point of connection while reducing the maximum power as little as possible.		
	The admissible active power reduction due to under-frequency below 49,5 Hz is limited by a reduction rate of 10% of the momentary power PM per 1 Hz frequency drop as given by the full line in Figure 2.		P
	Respecting the legal framework, it is possible that a more stringent power reduction characteristic is required by the DSO in coordination with the TSO. Nevertheless this requirement shall be limited to an admissible active power reduction due to under-frequency below 49,0 Hz with a reduction rate of 2% of the momentary power Pm per 1 Hz frequency drop as indicated by the dotted line in Figure 2.		P
	Acceptance of this reduction is limited to a selection of affected generation technologies and may be subject to further conditions decided by the relevant TSO.		P
4.2.5	Power response to over-frequency		P
	A generating plant shall be resilient to over-frequency at the point of connection.		P
	Unless otherwise required by the DSO, the micro-generating plant shall be capable of activating active power frequency response at a programmable frequency threshold f, at least between and including 50,2 Hz and 52 Hz with a programmable droop in a range of at least 2%-12%. The droop is relative to PM, the actual AC output power at the instance when the frequency reaches the threshold f. The resolution of the frequency measurement shall be +/- 10 mHz or less. After the programmable intentional delay, the active power frequency response shall be delivered with an accuracy of 10% Pn and with a settling time less than 2 s.		P
	The generator shall be capable of activating active power frequency response as fast as technically feasible with an initial delay that shall be as short as possible with a maximum of 2 s. If the initial delay is below 2 s an intentional delay shall be programmable to adjust the total response time to a value between the initial response time and 2s.		P
	After activation, the frequency droop function shall use the actual frequency at any time.		P
	If the initial delay is greater than 2 s it shall be reasonably justified by the manufacturer to the DSO.		P
	The settings for the threshold frequency f1, the droop and the intentional delay are provided by the DSO and shall be field adjustable. If no settings are provided, the default settings in Table 3 shall be applied.		P
	For field adjustable settings means shall be provided to protect the settings from unpermitted interference (e.g. password or seal) if required by the DSO.		P
	When applying active power response to over-frequency, the frequency threshold f1 should be set to a value from 50,2 Hz up to 50,5 Hz.		P



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	It shall be taken into account that,in case of islanding,a power reduction would correct any excess of generation leading to a generation-consumption balance.In these circumstances,an islanding situation with stable frequency would take place,in which the correct behaviour of any LoM detection based on frequency as those mentioned in 4.6.2(Table 4)might be hindered.		P
	Generators for which it is technically not feasible to reduce power over the full droop range in the required time shall activate active power frequency response as above in the fast controllable range of output power.Once the limit of fast controllable frequency response is reached,this power level is maintained constant.The unit has to shut off at a random frequency between the frequency threshold F_1 and f_{max} with f_{max} the disconnection limit for over-frequency as provided by the DSO.If no setting is provided,the default setting for f_{max} is 51,5 Hz.		P
	After European Network Codes will come into force,the decision about the ability should be according to the derogation process.		P
4.3	Reactive power capability		-
4.3.1	Inverter based micro-generator		P
	The micro-generator shall be capable to operate,under normal stationary operating conditions in the voltage tolerance band according to 4.2.2,with the following reactive power exchange(see Figure 3):		P
	- following a characteristic curve provided by the DSO(see 4.4)within the active factors $\cos \phi = 0,90$ under-exdited to $0,90_{over-exdited}$ when the active power output of the micro-generator is more than or equal to 20% of its nominal active power;		P
	- not exchanging more reactive power than 10%of the micro-generator's nominal active power when the active power output is less than 20%of its nominal active power.		P
4.3.2	Directly coupled micro-generator with no inverter		N/A
	The power factor of the micro-generator at normal steady-state operating conditions across the statutory tolerance band of nominal voltage shall be above 0,95,provided the output active power of the micro-generator is above 20%the nominal output power of the unit.Below 20%nominal output power the micro-generator shall not exchange more reactive power than 10%of its nominal active output power.		N/A
4.4	Reactive power control modes		N/A
4.4.1	General		N/A
	Only when a reactive power exchange capability following a characteristic curve is required(see 4.3), the requirements of 4.4.3 shall apply.		N/A
	The control shall be delivered at the terminals of the micro-generator.The micro-generator shall be capable of operating in the following control modes within the limits stated in 4.3		N/A
	The configuration of the control modes shall be field		N/A



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	adjustable.The activation and deactivation of the control modes shall be field adjustable.		
	For field adjustable configurations and activation/deactivation of the control mode,means shall be provided to protect the settings from unpermitted interference(e.g.password or seal)if required by the DSO.		N/A
	The accuracy for controlled reactive power shall be below2%of nominal power of the micro-generator.The accuracy is always stated in reactive power,even if the used control mode is referring to the active factor.		N/A
	The type of contribution to voltage control by reactive power shall be specified by the DSO.If no characteristic curve is specified by the DSO,the micro-generator shall operate with an active factor=1.		N/A
4.4.2	Fix control mode $\cos \varphi$ fix		N/A
	The fix control mode controls the active factor \cos of the micro-generator's output according to a setpoint set in the control of the micro-generator.		N/A
4.4.3	Voltage related control mode Q(U)		P
	The voltage related control mode Q(U)controls the reactive power output as a function of the voltage.		P
	For evaluating the voltage one of the following methods shall be used:		P
	- the positive sequence of the symmetrical components;		P
	- the average voltage of a three phase system;		P
	- phase independently the voltage of every phase to determine the reactive power for every phase.		P
	A characteristic curve according to Figure 4 shall be configurable. Additional to the characteristic the dynamic response of the control should be configurable.The dynamics of the control should correspond with a first order filter having a time constant that is configurable in the range of 3 s to 60 s.The time to reach 95%of a new set point due to a change in voltage will be 3 times the time constant.		P
4.4.4	Power related control mode $\cos \varphi$ (P)		P
	The power related control mode $\cos p$ (P)controls the active factor $\cos p$ of the micro-generator's output as a function of its active power output.		P
	A characteristic according to Figure 4 has to be configurable.		P
	New set values due to a change of the active power output have to be adjusted within a settling time of 10 s.The rate of change of reactive power should be in the same time range as and synchronised with the rate of change of active power.		P
4.5	Voltage control by active power		P
	In order to avoid disconnection due to the over-voltage protection the micro-generating plant is allowed to reduce active power output as a function of this rising voltage.If this function is activated, the micro-generating plant may reduce active power according to a logic chosen by the		P



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	manufacturer. Nevertheless, this logic shall not result in steps of output power.		
4.6	Interface protection		P
4.6.1	General		P
4.6.1	Introduction		P
	The purpose of the interface protection is to ensure that the connection of a micro-generator will not impair the integrity or degrade the safety of the distribution network. The interface protection shall be insensitive to voltage and frequency variations in the distribution network within the voltage and frequency settings.		P
	The interface protection, monitoring and control functions may be incorporated into the micro-generator control system, or may be fitted as discrete separate mounted devices.		P
	For field adjustable settings means shall be provided to protect the settings from unpermitted interference (e.g. password or seal) if required by the DSO.		P
	The protection functions have to evaluate at least all phases where micro-generators, covered by this protection system, are connected to.		P
	In case of three phase generating units/plants and when the protection system is implemented as an external protection system in a three phase supply system, all phase to phase or all phase to neutral voltages have to be evaluated.	signal phase	N/A
	If multiple signals (e.g. three phase to phase voltages) are to be evaluated by one protection function, this function has to evaluate all of the signals separately. The output of each evaluation has to be OR connected, so that if one signal passes the threshold of a function, the function has to trip the protection in the specified time.		N/A
	The minimum required accuracy is:		P
	- for frequency measurement +0,05 Hz		P
	The measurement point can be inside the micro-generator or anywhere between the micro-generator terminals and up to the point of connection.		P
	If the interface protection system is external to the generating unit, it should measure as close as possible to the point of connection. The voltage rise between the point of connection and the measurement input of the interface protection system should be kept as small as possible to avoid nuisance tripping of the overvoltage protection.		P
	In order to avoid continuous starting and disengaging operations of the interface protection relay, the disengaging value of frequency and voltage functions shall be above 2% deviating from the operate value.		P
4.6.1.2	Response to protection operation		P
	The micro-generator shall disconnect from the network in response to an interface protection operation.		P
4.6.1.3	Place of the interface protection		P
	The interface protection can either be incorporated within the micro-generator or implemented by separate devices. In		P



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	either case,the interface protection shall meet the relevant requirements of IEC 60255-127 and the manufacturer of the micro-generator shall declare that the combined devices fulfil these requirements.		
4.6.1.4	Changing settings of the interface protection		N/A
	The interface protection settings may only be altered from the settings chosen at the time of commissioning or during later reconfiguration,with the written agreement of the DSO and then only in accordance with the manufacturer instructions.It shall not be permissible for the user to alter the interface protection settings.		N/A
4.6.1.5	Combined protection device for multiple generators		N/A
	It is allowed to use a protection system that provides interface protection for two or more micro- generators up to and including 16 A per phase in aggregate.However,the possibility to use Inform and Fit then depends on the conditions of the type of conformity assessment of the protection system.		N/A
	If two or more micro-generators,each with their own interface device,are placed in parallel,the proper combined working of the protection devices shall be ensured.In the case of adding a generator to the combined protection device,the DSO shall be consulted.		N/A
4.6.2	Interface protection settings		P
	The interface protection settings are provided by the DSO.If no settings are provided,the default settings in Table 4 should be applied.		P
4.6.3	Requirements regarding single fault tolerance of interface protection system		P
	The interface protection system consisting of the interface protection relay and the interface switch shall meet the requirements of single fault tolerance.		P
	A single fault shall not lead to a loss of the safety functions.Faults of common cause shall be taken into account if the probability for the occurrence of such a fault is significant.Whenever reasonably practical,the individual fault shall be displayed and lead to the disconnection of the power generation unit or system.		P
	Series-connected switches shall each have independently a breaking capacity corresponding to the rated current of the micro-generator and corresponding to the short circuit contribution of the micro-generator.		P
	The short-time withstand current of the switching devices shall be coordinated with maximum short circuit power at the connection point.		P
	At least one of the switches shall be a switch-disconnector suitable for over-voltage category 2.For single-phase micro-generators,the switch shall have one contact of this over-voltage category each for both the neutral conductor and the line conductor.For poly-phase supply systems,it is required to have one contact of this over-voltage category each for all active conductors.The second switch may		P



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	be formed by electronic switching components of an inverter bridge or another circuit provided that the electronic switching components can be switched off by control signals and that it is ensured that a failure is detected and leads to prevention of the operation at the latest at the next reconnection.		
	For PV-inverters without simple separation between the network and the PV generator(e.g.PV- Inverter without transformer)both switches mentioned in the paragraph above shall be switch- disconnectors with the requirements described therein,although one switching device is permitted to be located between PV generator and PV inverter.		P
4.7	Connection and starting to generate electrical power		P
4.7.1	General		P
	Connection and starting to generate electrical power is only allowed after voltage and frequency is within the allowed voltage range and the allowed frequency range for at least the specified observation time.It shall be impossible to overrule these conditions.The setting of the conditions depends on whether the connection is due to a normal operational start-up or an automatic reconnection after tripping of the interface protection.		
	The frequency range,the voltage range,the observation time and the power gradient shall be field adjustable.		P
	For field adjustable settings,means shall be provided to protect the settings from unpermitted interference (e.g.password or seal)if required by the DSO.		P
4.7.2	Automatic reconnection after tripping		P
	If no settings are specified by the DSO,the default settings for the reconnection after tripping of the interface protection are:		P
	- Frequency range:47,5Hzsfs50,05Hz;		P
	- Voltage range:0,85UnSUs1,10 Un		P
	- Minimum observation time:60 s.		P
	After reconnection the active power generated by the generating plant shall not exceed a specified gradient expressed as a percentage of the active nominal power of the unit per minute.If no gradient is specified by the DSO,the default setting is 10%P,/min.Non-adjustable or partly adjustable generating units may connect after 1 min to 10 min(randomised value)or later.		P
4.7.3	Starting to generate electrical power		P
	If no settings are specified by the DSO the default settings for connection or starting to generate electrical power due to normal operational start-up or activity are:		
	- Frequency range:47,5 Hz sfs 50,1 Hz;		P
	- Voltage range:0,85 UnsUs1,10 Un;		P
	Minimum observation time:60 s.		P
	If applicable,the power gradient shall not exceed the maximum gradient specified by the DSO in the connection agreement.Heat driven CHP micro-generators do not need to keep a maximum gradient, since the start up is		P



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	randomised by the nature of the heat demand.		
	For manual operations performed on site(e.g.for the purpose of initial start-up or maintenance)it is permitted to deviate from the observation time and ramp rate.		P
4.7.4	Synchronisation		N/A
	Synchronising a micro-generator with the distribution network shall be fully automatic i.e.it shall not be possible to manually close the switch between the two systems to carry out synchronisation.		N/A
4.8	Power quality		P
4.8.1	General		P
	As any other apparatus or fixed installation,micro-generators have to comply with the requirements on electromagnetic compatibility established in Directive 2004/108/EC.		P
	They are also expected to be compatible with voltage characteristics at the point of connection to the public network,as described in 4.2.		P
	As long as specific tests for generators are not available,generic EMC standards,regarding immunity as well as emission,should be applied.The applicable standards,which in turn describe the test in accordance with basic standards(EN 61000-3,all parts,and EN61000-4,all parts),are:		P
	- Immunity:EN 61000-6-1(residential,commercial and light-industrial environments);		P
	- Emission:EN 61000-6-3(residential,commercial and light-industrial environments):		P
	in this generic emission standard reference is made to e.g.the harmonics and voltage variation basic standards listed in Table 5.		P
	In addition,the application of the requirements and tests described in IEC/TR 61000-3-15 is recommended,with the exception of those aspects already regulated by specific national rules.		P
	Generating plants can also disturb mains signaling(ripple control or power line carrier systems). EMC requirements on inter-harmonics and on conducted disturbances in frequency range between 2 kHz and 150 kHz are under development.In countries where such communication systems are used,national requirement may apply.		P
4.8.2	DC injection		P
	The generating unit shall not inject a direct current.		P
5	Operation and safety of the micro-generator		-
5.1	General		-
	The micro-generator shall operate safely over the entire designed and declared operating range.		P
	The settings of(country-specific)field adjustable set-points shall be readable from the micro- generator, for example on a display panel,user interface,or via a communication port.		P
5.2	Safety		P



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	This European Standard does not cover the safety of DSO personnel or their contracted parties,as their safety is a combination of electrical conditions and working instructions.		P
	General requirements for safety of persons at work in or near and operation of electrical installations are given in EN 50110(all parts),also national regulations can be applicable.		P
5.3	Information plate		P
	In absence of product specific standards(e.g.EN 50524)the following information shall appear on the micro-generator nameplate:		P
	- manufacturer's name or trade mark;		P
	- type designation or identification number,or any other means of identification making it possible to obtain relevant information from the manufacturer;		P
	- nominal power;		P
	- nominal voltage;		P
	- nominal frequency;		P
	- phases;		P
	-active factor range or,if no active factor is adjustable,the minimal power factor.		P
	This information shall be provided on a plate on or in the micro-generator and shall be copied in the user manual as well as other related documentation.In addition,a serial number may be added to the plate only.		P
	This information could be part of the information plate of the entire micro-generator system.		P
	All the information shall be given in the language and in accordance with the practice of the country in which the micro-generator is intended to be installed or alternatively in English language.		P
5.4	Labelling		P
	A warning notice shall be placed in such a position that any person gaining access to live parts will be warned in advance of the need to isolate those live parts from all points of supply.		P
	Special attention should be paid that the power supply,measuring circuits(sense lines)and other parts may not be isolated from the network when the switch of the interface protection is open. As a minimum,warning labels shall be placed:		P
	- on the switchboard(DSO panel and consumer unit)that has the micro-generator connected to it;		N/A
	-on all switchboards in between the consumer unit and the micro-generator itself;		P
	-on,or in the micro-generator itself;		P
	- at all points of isolation for the micro-generator.		P
	All the information shall be given in the language and in accordance with the practice of the country in which the micro-generator is intended to be installed.		P
5.5	Maintenance and routine testing		P
	The manufacturer shall provide a time frame for		P



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	maintenance and routine testing.		
6	Commissioning		P
	This European Standard applies to type-tested micro-generators.		P
	The following conditions shall be met for the installation:		P
	- the micro-generator(including the interface protection)shall fulfil the requirements of this standard and the other applicable standards;		P
	- the manufacturer shall provide an installation instruction in accordance with this standard and national or regional requirements;		P
	-access to the interface protection settings shall be tamper-proof;		P
	- in the absence of product standards the micro-generator shall be type tested against the interface requirements of this standard;		P
	- the installation shall be carried out by installers with recognised and approved qualification related to the fuels used,general electrical installations and a particular qualification relating to installation of micro-generators;		P
	- the installer shall provide a single line diagram of the electricity generating facility.The single line diagram shall show the circuit breaker,the protections,the inverter,etc.		P
	The user respective the installer should be aware that in addition to the DSO the energy supplier and/or the metering authority will need to be informed for contractual reasons. Unless otherwise stated by national legislation or regulation,prior consent of the DSO is necessary.		P

A	National setting and requirments		-
A.1	General		-
A.2	AT-Austria		-
A.3	BE-Belgium		-
A.4	CY-Cyprus		-
A.5	CZ-Czech Republic		-
A.6	DE-Germany		-
A.7	DK-Denmark		-
A.8	EE-Estonia		-
A.9	ES-Spain		-
A.10	FI-Finland		-
A.11	FR-France		-
A.12	GB-United Kingdom		-
A.13	IE-Ireland		-
A.14	IT-Italy		-
A.15	LV-Latvia		-
A.16	NL-The Netherlands		-
A.17	NO-Norway		-
A.18	PL-Poland		-
A.19	SI-Slovenia		-
A.20	SE-Sweden		-



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Annex B	Loss of Mains and overall system security		-
Annex C	Example notification sheets		-
C.1	General		P
C.2	Application for connection of micro-generators		P
C.3	Notification of micro-generator decommissioning		P
Annex D	Compliance type testing		-
D.1	General		-
D.2	Type testing of this interface protection		P
D.2.1	Introduction		P
D.2.2	General		P
D.2.3	Over-/under-voltage		P
D.2.4	Over-/under-frequency		P
D.2.5	Loss of Mains(LOM)detection		N/A
D.2.5.1	General		N/A
D.2.5.2	Test on active Lom detection methods		N/A
D.3	Type testing of a micro-gengeator		P
D.3.1	Operating range		P
D.3.2	Active power feed-in at under- frequency		P
D.3.2.1	Tests		P
D.3.2.2	Assessment criterion		P
D.3.2.3	Test documentation		P
D.3.3	Power response to over- frequency		P
D.3.3.1	General		P
D.3.3.2	Tests		P
D.3.3.3	Test procedure for adjustable partly adjustable micro-generators		P
D.3.3.4	Assessment criteria		P
D.3.3.5	Test documentation		P
D.3.4	Reactive power capability		P
D.3.4.1	Test of no controllable reactive power		P
D.3.4.2	Test of controllable reactive power		P
D.3.4.2.1	Reactive power output capaility		P
D.3.4.2.2	Assessment criterion		P
D.3.4.2.3	Test documentation		P
D.3.4.2.4	Reactive power output according to an assigned level		P
D.3.4.2.5	Procedures for performing test and recording results(Q adjustment)		P
D.3.4.2.6	Assessment criterion		P
D.3.4.2.7	Test documentation		P
D.3.5	Voltage control by active power		P
D.3.6	Connection and starting to generate electrical power		P
D.3.6.1	General		P
D.3.6.2	Connection after trip of interface protection		P
D.3.6.3	Start of generating electrical power		P
D.3.6.4	Assessment criteria		P
D.3.7	Short-circuit current contribution		P
D.3.8	Harmonic current emission		P
D.3.9	Voltage fluctuations and flicker		P
D.3.10	DC injection		P



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Clause	Requirement + Test	Result - Remark	Verdict
D.3.10.1	General		P
D.3.10.2	Test		P
D.3.10.3	Acceptance criteria		P

Annex E	Example test results sheet		-
E.1	General details		P
E.1.1	Micro-generator details		P
E.1.2	Test house details		P
E.1.3	Test details		P
E.2	Type testing of the interface protection		P
E.2.1	General		P
E.2.2	Over-/under-frequency tests		P
E.2.3	Over-/under-voltage tests(single stage protection)		P
E.2.4	LoM test		P
E.3	Type testing of a micro-generator		P
E.3.1	Operating Range		P
E.3.2	Active power at under-frequency		P
E.3.3	Power response to over- frequency		P
E.3.4	Reactive power		P
E.3.4.1	Uncontrollable reactive power		P
E.3.4.2	Controllable reactive power		P
E.3.5	Connection and starting to generate electrical power		P
E.3.6	Short-circuit current contribution		P
E.3.6.1	Short-circuit current at micro-generator terminals		P
E.3.6.2	Short-circuit current parameters		P
E.3.7	Power quality		P
E.4	Comments		P

ANNEX F	Commissioning		-
F.1	Installation		P
F.2	Notification procedure		P
F.2.1	Ordinary procedure		P
F.2.2	Inform and Fit for a single installation		N/A

ANNEX G	Countries allowing extension of the scope>16A		-
G.1	General		-
G.2	CY-Cyprus		N/A
G.3	FI-Finland		N/A
G.4	IE-Ireland		N/A

ANNEX H	Abbreviations		-
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ANNEX I	Abbreviations		-
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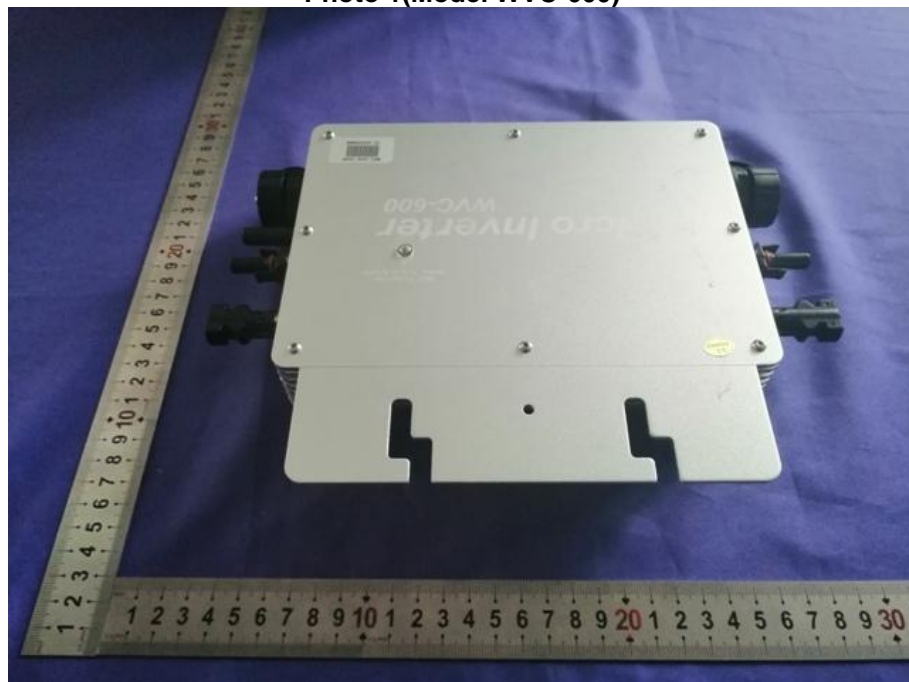


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Clause	Requirement + Test	Result - Remark	Verdict

D.2.3	Over-/under-voltage		P
	Ambient temperature (°C)	24.5	—
Voltage(V)	Test voltage(V)	Deviation(%)	Observation
22	22	0	Pass
50	50	0	Pass
Supplementary information:			

D.2.4	Over-/under-frequency		P
	Ambient temperature (°C)	24.6	—
frequency (Hz)	Test frequency	Deviation(Hz)	Observation
50	49.999	0.001	Pass
60	59.999	0.001	Pass
Supplementary information:			

D.3.2.1	Active power feed-in at under- frequency		P
	Ambient temperature (°C)	24.8	—
frequency (Hz)	Test frequency	Deviation(Hz)	Observation
50	49.999	0.001	Pass
60	59.999	0.001	Pass
Supplementary information:			

Product photos**Photo 1(Model WVC-600)****Photo 2**

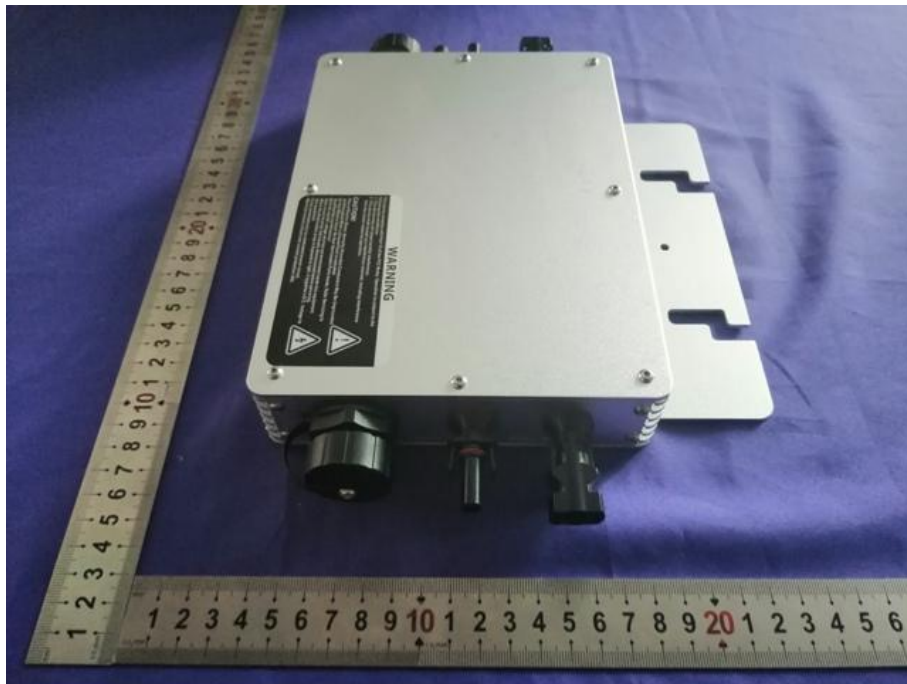


Photo 3

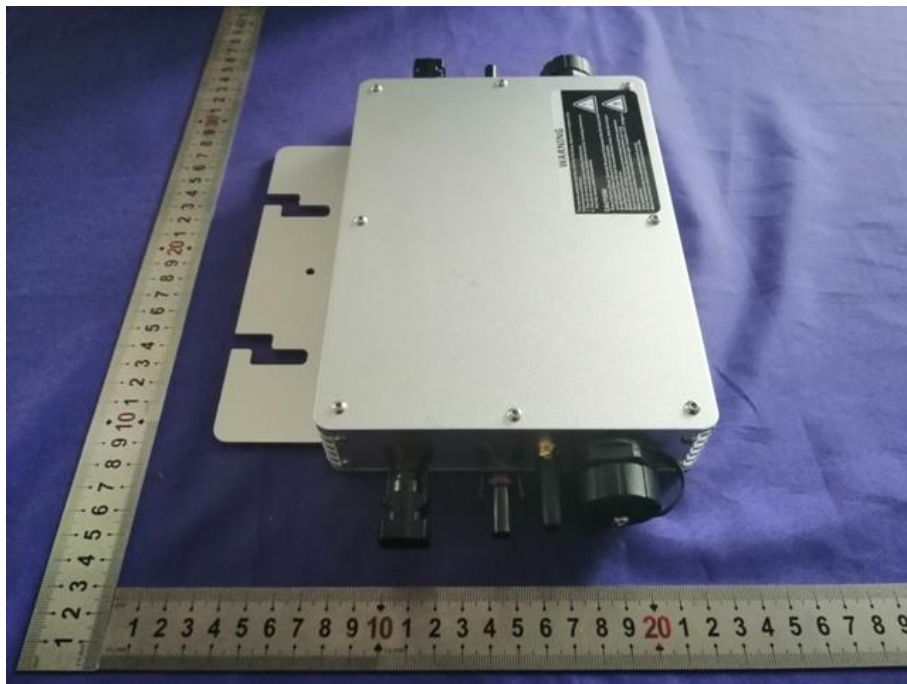


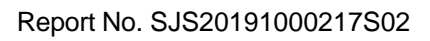
Photo 4

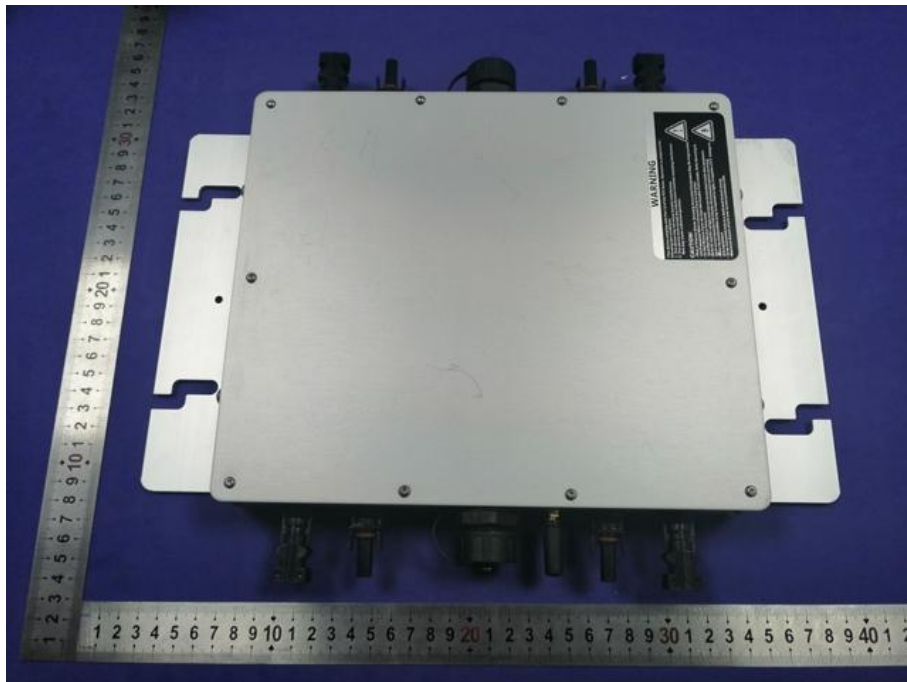


Photo 5

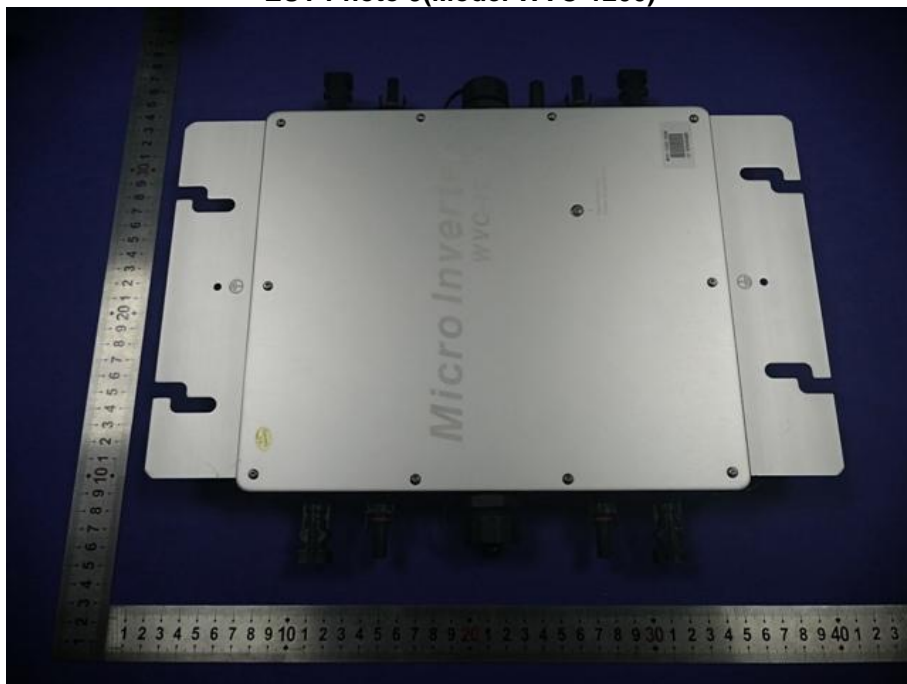


Photo 6





EUT Photo 9(Model WVC-1200)



EUT Photo 10

******* END OF REPORT *******