



TEST REPORT

IEC 61683

Photovoltaic systems – Power conditioners – Procedure for measuring efficiency

Report Number..... : 64.290.21.30205.01C

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Testing laboratory: TÜV SÜD Certification and Testing (China) Co., Ltd. Guangzhou Branch

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Testing location: Shenzhen SOFARSOLAR Co., Ltd.
401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong. P.R.China

Applicant's name : Evolve Energy Group Co., Limited

Address.....: RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HONG KONG.

Test specification:

Standard : IEC 61683:1999 (First Edition)

Test procedure : Test report

Nonstandard test method : N/A

Test Report Form No. : IEC61683A

Test Report Form(s) Originator : TÜV SÜD Product Service GmbH

Master TRF : Dated 201410

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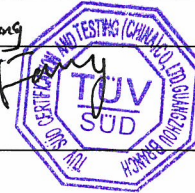
General disclaimer:

The test results presented in this report relate only to the object tested.

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Test item description	Solar Grid-tied Inverter
Trade Mark	EWVO
Manufacturer.....	Same as applicant
Model/Type reference	E-250KTL-HV, E-255KTL-HV
Ratings	See page 6
Tested by (name + signature)	
Jenn Huang	<i>Jenn Huang</i>
Approved by (+ signature).....	
Max Fang	<i>Max Fang</i>



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.

Below electric ratings and warnings are silkscreen on label and affixed side of enclosure.

EVVO Solar Grid-tied Inverter

Model No:	E-250KTL-HV
Max.DC Input Voltage	1500V
Operating MPPT Voltage Range	500~1500V
Max. Input Current	30A*12
Max. PV Isc	50A*12
Rated Grid Voltage	3 / PE,800Vac
Max. Output Current	180.5A
Rated Grid Frequency	50/60Hz
Rated Output Power	250KW
Max. Output Power	250KVA
Power Factor	1 (adjustable+/-0.8)
Ingress Protection	IP66
Operating Temperature Range	-30°C~+60°C
Protective Class	Class I
Overvoltage Category	AC III,DC II
Made in China	

Manufacturer : EVOLVE ENERGY GROUP CO., LIMITED
 Address : RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
 Global Head Quarters 371 Sidco Industrial Estate Chennai 600098 India

VDE0126-1-1,VDE-AR-N4105,G99,IEC61727 IEC62116,AS4777

EVVO Solar Grid-tied Inverter

Model No:	E-255KTL-HV
Max.DC Input Voltage	1500V
Operating MPPT Voltage Range	500~1500V
Max. Input Current	30A*12
Max. PV Isc	50A*12
Rated Grid Voltage	3 / PE,800Vac
Max. Output Current	184A
Rated Grid Frequency	50/60Hz
Rated Output Power	255KW
Max. Output Power	255KVA
Power Factor	1 (adjustable+/-0.8)
Ingress Protection	IP66
Operating Temperature Range	-30°C~+60°C
Protective Class	Class I
Overvoltage Category	AC III,DC II
Made in China	

Manufacturer : EVOLVE ENERGY GROUP CO., LIMITED
 Address : RM 702, 7/F FU FAI COMM CTR 27 HILLIER ST SHEUNG WAN, HK
 Global Head Quarters 371 Sidco Industrial Estate Chennai 600098 India

VDE0126-1-1,VDE-AR-N4105,G99,IEC61727 IEC62116,AS4777

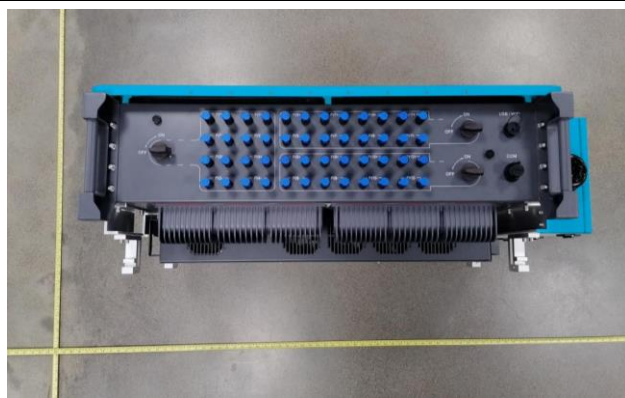
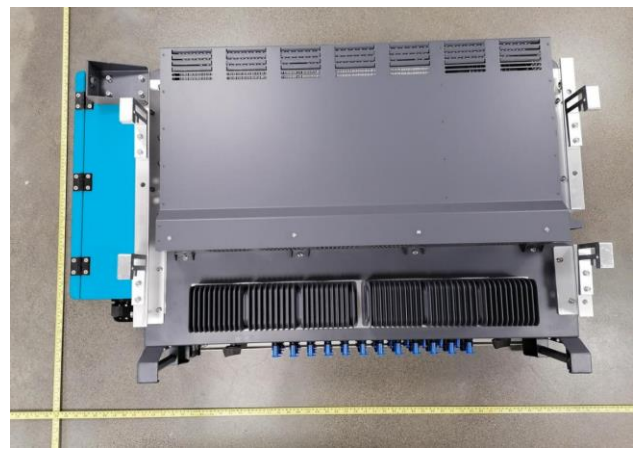
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→ S:V020012 28 ←

→ WZ WIFI

→ 900.01723000-0

Picture of the product:





Test item particulars :	
Classification of installation and use :	Fixed, outdoor
Supply Connection	permanent connection
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	2021-03-25, 2021-09-13
Date (s) of performance of tests	2021-03-29 to 2021-05-14, 2021-09-14 to 2021-09-30
General remarks:	
"(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 <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer's Declaration per subclause 4.2.5 of IEC 60384-11:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
Characteristic data Factory:	
Factory name: Dongguan SOFARSOLAR Co., Ltd.	
Address: 1F – 6F, Building E, No.1 JinQi Road, Bihu Industrial Park, Wulian Villiage, Fenggang Town, Dongguan City, P.R. China.	
General product information:	
(1) The PV grid-tied inverter is non-isolated (transformerless) solar inverter for connection in parallel to public grid;	
(2) In order to protect the PCE, user and installer, external DC and AC circuit breakers shall be equipped at the end-use application;	
(3) Low voltage electrical installations shall comply with national and local regulation. Only qualified electricians are allowed to install and maintain the inverter;	

Characteristic data:

Model:	E-250KTL-HV	E-255KTL-HV
PV input terminal parameters:		
Max. input voltage	1500Vd.c.	
Rated input voltage	1160Vd.c.	
Start-up voltage	550Vd.c.	
MPPT operating voltage range	500Vd.c.~1500Vd.c.	
Full power MPPT voltage range	800Vd.c.~1300Vd.c.	
Number for DC inputs	24	
Max. input MPPT current	30Ad.c.*12	
Max. input short circuit current	50Ad.c.*12	
AC output rating		
AC output power	250kVA@30°C / 235kVA@40°C / 220kVA@50°C	255kVA@30°C / 235kVA@40°C / 220kVA@50°C
Max. Output current	180.5Aa.c.	184Aa.c.
Nominal grid voltage	3 / PE, 800Va.c.	
Nominal frequency	50Hz	
Power factor	0.8 leading ~ 0.8 lagging	

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Clause	Requirement – Test	Measuring result – Remark	Verdict

4	Efficiency measurement conditions		P
	Efficiency is measured under the conditions in the following clauses.		P
	Specific conditions may be excluded by mutual agreement when those conditions are outside the manufacturer's allowable operating range.		P
4.1	DC power source for testing		P
	For power conditioners operating with fixed input voltage, the d.c. power source is a storage battery or constant voltage power source to maintain the input voltage.		N/A
	For power conditioners that employ maximum power point tracking (MPPT) and shunttype power conditioners, either a photovoltaic array or a photovoltaic array simulator is utilized.	PV simulator used.	P
4.2	Temperature		P
	All measurements are to be made at an ambient temperature of 25 °C ± 2 °C.		P
	Other ambient temperatures may be allowed by mutual agreement. However, the temperature used must be clearly stated in all documentation.		N/A
4.3	Output voltage and frequency		P
	The output voltage and frequency are maintained at the manufacturer's stated nominal values.	See appendix table.	P
4.4	Input voltage		P
	Measurements performed in each of the following tests are repeated at three power conditioner input voltages: a) manufacturer's minimum rated input voltage; b) the inverter's nominal voltage or the average of its rated input range; c) 90 % of the inverter's maximum input voltage.	See appendix table.	P
	In the case where a power conditioner is to be connected with a battery at its input terminals, only the nominal or rated input voltage may be applied.	No battery connected.	N/A
4.5	Ripple and distortion		P
	Record input voltage and current ripple for each measurement. Also record output voltage and current distortion (if a.c.) or ripple (if d.c.). Ensure that these measurements remain within the manufacturer's specified values.		P
4.6	Resistive loads/utility grid		P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
	At unity power factor, or at the intrinsic power factor of gridconnected inverters without power factor adjustment, measure the efficiency for power levels of 10 %, 25 %, 50 %, 75 %, 100 % and 120 % of the inverter's rating.		P
	Standalone inverters are also measured at a power level of 5 % of rated. The power conditioner test is conducted with a specified resistive and reactive grid impedance.	Grid-connected inverter, without standalone mode.	N/A
4.7	Reactive loads		N/A
	For standalone inverters, measure the efficiency with a load which provides a power factor equal to the manufacturer's specified minimum level (or 0,25, whichever is greater) and at power levels of 25 %, 50 % and 100 % of rated VA.	Grid-connected inverter, without standalone mode.	N/A
	Repeat for power factors of 0,5 and 0,75 (do not go below the manufacturer's specified minimum PF) and power levels of 25 %, 50 %, and 100 % of rated VA.		N/A
4.8	Resistive plus nonlinear loads		N/A
	For standalone inverters, measure the efficiency with a fixed nonlinear load (total harmonic distortion (THD) = $(80 \pm 5) \%$) equal to $(25 \pm 5) \%$ of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 25 %, 50 % and 100 % of rated VA.		N/A
	Repeat the measurements with a fixed nonlinear load equivalent to $(50 \pm 5) \%$ of the inverter's rated VA plus sufficient resistive load in parallel to achieve a total load of 50% and 100% of rated VA.		N/A
	The type of nonlinear load must be clearly stated in all documentation.		N/A
4.9	Complex loads		N/A
	When a nonlinear plus a sufficient reactive load condition is specified for standalone inverters, measure the efficiency with a fixed nonlinear load (THD = $(80 \pm 5) \%$) equal to $(50 \pm 5) \%$ of the inverter's rated VA plus a sufficient reactive load (PF = 0,5) in parallel to achieve a total load of 50 % and 100 % of rated VA.		N/A
	The type of complex load is clearly stated in all documentation.		N/A
5	Efficiency calculations		P
5.1	Rated output efficiency		P
5.2	Partial output efficiency		P

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Clause	Requirement – Test	Measuring result – Remark	Verdict
5.3	Energy efficiency		P
5.4	Efficiency tolerances	No deviation by manufacturer	N/A
6	Conditions of loading for output ports		P
6.1	Test circuit		P
	Figure 1a is applied to standard alone power conditioners		N/A
	<p>Figure 1a – Stand-alone type</p> <p>IEC 1566/99</p>		N/A
	Figure 1b is applied to utility interactive power conditioners		P
	<p>Figure 1b – Utility-interactive type</p> <p>IEC 1567/99</p> <p>PC power conditioner PS variable voltage-current d.c. power supply A1 DC ammeter A2 AC or d.c. ammeter W1 DC wattmeter W2 AC or d.c. wattmeter L load F frequency meter V1 DC voltmeter V2 AC or d.c. voltmeter PF power factor meter</p>		P
6.2	Measurement procedure		P
7	Loss measurement		P
7.1	No load loss		P
	See appended table		
7.2	Standby loss		P
	See appended table		
Annex A	Power conditioner description		P
Annex B	Power efficiency and conversion factor		P
Annex C	Weighted average energy efficiency		N/A
Annex D	Derivation of efficiency tolerance in table 2		N/A

TABLE		Efficiency recording and efficient calculation sheet					
power conditioner type	Solar Grid-tied Inverter						
Model:	E-250KTL-HV						
Parameters of power conditioner	Minimum rated input voltage: <u>800</u> V Nominal voltage: <u>1160</u> V Maximum input voltage: <u>1300</u> V Rated output voltage: <u>800</u> V Rated output frequency: <u>50</u> Hz Rated output power: <u>250</u> KW						
PV input voltage	a) Manufacturer's minimum rated input voltage						
Temperature (°C)	<u>25.3</u> °C						
Operating period for energy measurement (min)	<u>3</u> mins						
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	
Input voltage (V)	800.1	800.1	799.7	799.3	798.8	795.4	
Input current (A)	18.5	33.3	78.4	158.4	238.3	312.3	
Output voltage (V)	799.6	801.4	801.9	802.3	802.7	803.2	
Output current (A)	9.5	18.4	44.6	90.3	135.7	177.2	
Input power (Pi) (W)	13208	25773	62452	126432	190230	248349	
Output power (Po) (W)	12541	25194	61615	125014	188035	245262	
Output efficiency (%)	94.95%	97.75%	98.66%	98.88%	98.85%	98.76%	
Input energy (Wi) (Wh)	660.2	1288.3	3122.6	6321.6	9511.5	12414.7	
Output energy (Wo) (Wh)	627.0	1259.7	3080.8	6250.8	9401.8	12260.4	
Energy conversion efficiency (%)	94.97%	97.78%	98.66%	98.88%	98.85%	98.76%	
PV input voltage	b) The inverter's nominal voltage						
Temperature (°C)	<u>25.3</u> °C						
Operating period for energy measurement (min)	<u>3</u> mins						
Percentage of rated output VA	5%	10%	25%	50%	75%	100%	
Input voltage (V)	1160.5	1160.5	1160.3	1160.0	1159.6	1159.2	
Input current (A)	14.5	24.1	54.2	109.1	162.8	218.7	
Output voltage (V)	799.6	801.4	801.7	802.1	802.5	803.0	
Output current (A)	9.5	18.4	44.6	90.3	134.8	181.2	
Input power (Pi) (W)	13124	25662	62360	126233	188581	253278	

Output power (Po) (W)	12570	25172	61635	124988	186715	250476
Output efficiency (%)	95.78%	98.09%	98.84%	99.01%	99.01%	98.89%
Input energy (Wi) (Wh)	656.0	1283.1	3118.0	6311.7	9429.1	12663.9
Output energy (Wo) (Wh)	628.5	1258.6	3081.8	6249.4	9335.7	12523.8
Energy conversion efficiency (%)	95.81%	98.09%	98.84%	99.01%	99.01%	98.89%
PV input voltage	c) Manufacturer's maximum input voltage					
Temperature (°C)	25.3 °C					
Operating period for energy measurement (min)	3 mins					
Percentage of rated output VA	5%	10%	25%	50%	75%	100%
Input voltage (V)	1300.7	1300.6	1300.4	1300.2	1299.8	1299.5
Input current (A)	12.4	21.4	49.4	97.4	146.9	195.8
Output voltage (V)	799.7	801.5	801.9	802.1	802.5	803.0
Output current (A)	9.5	18.6	45.5	90.4	136.5	182.1
Input power (Pi) (W)	12980	25705	63627	126389	190734	254329
Output power (Po) (W)	12445	25251	62903	125144	188849	251566
Output efficiency (%)	95.88%	98.24%	98.86%	99.02%	99.01%	98.91%
Input energy (Wi) (Wh)	648.8	1285.2	3181.4	6319.5	9536.7	12716.4
Output energy (Wo) (Wh)	622.3	1262.6	3145.1	6257.2	9442.5	12578.3
Energy conversion efficiency (%)	95.91%	98.24%	98.86%	99.01%	99.01%	98.91%
Remark:--						

TABLE		Efficiency recording and efficient calculation sheet					
power conditioner type							
Model:		E-255KTL-HV					
Parameters of power conditioner		Minimum rated input voltage: <u>800</u> V Nominal voltage: <u>1160</u> V Maximum input voltage: <u>1300</u> V Rated output voltage: <u>800</u> V Rated output frequency: <u>50</u> Hz Rated output power: <u>255</u> KW					
PV input voltage		a) Manufacturer's minimum rated input voltage					
Temperature (°C)		<u>25.3</u> °C					
Operating period for energy measurement (min)		<u>3</u> mins					
Percentage of rated output VA		5%	10%	25%	50%	75%	100%
Input voltage (V)		800.1	800.1	799.7	799.3	798.8	798.2
Input current (A)		18.8	33.6	81.7	161.5	244.9	327.3
Output voltage (V)		799.6	801.3	801.9	802.2	802.7	803.2
Output current (A)		9.6	18.6	46.4	92.1	139.5	186.3
Input power (Pi) (W)		13459	26033	65056	128956	195505	261128
Output power (Po) (W)		12794	25463	64193	127506	193234	257720
Output efficiency (%)		95.06%	97.81%	98.67%	98.88%	98.84%	98.69%
Input energy (Wi) (Wh)		672.8	1301.3	3252.8	6447.8	9775.3	13056.4
Output energy (Wo) (Wh)		639.7	1273.2	3209.7	6375.3	9661.7	12886.0
Energy conversion efficiency (%)		95.09%	97.84%	98.67%	98.88%	98.84%	98.69%
PV input voltage		b) The inverter's nominal voltage					
Temperature (°C)		<u>25.3</u> °C					
Operating period for energy measurement (min)		<u>3</u> mins					
Percentage of rated output VA		5%	10%	25%	50%	75%	100%
Input voltage (V)		1160.5	1160.0	1160.3	1159.9	1159.6	1159.2
Input current (A)		14.6	24.3	56.5	111.4	168.5	225.0
Output voltage (V)		799.6	801.0	801.7	802.1	802.5	803.0
Output current (A)		9.7	18.6	46.4	92.1	139.5	186.4
Input power (Pi) (W)		13371	25917	64945	128849	195198	260642

Output power (Po) (W)	12820	25408	64218	127584	193240	257688
Output efficiency (%)	95.88%	98.04%	98.88%	99.02%	99.00%	98.87%
Input energy (Wi) (Wh)	668.4	1300.0	3247.2	6442.5	9759.9	13032.1
Output energy (Wo) (Wh)	641.0	1270.0	3210.9	6379.2	9662.0	12884.4
Energy conversion efficiency (%)	95.91%	97.69%	98.88%	99.02%	99.00%	98.87%
PV input voltage	c) Manufacturer's maximum input voltage					
Temperature (°C)	<u>25.3</u> °C					
Operating period for energy measurement (min)	<u>3</u> mins					
Percentage of rated output VA	5%	10%	25%	50%	75%	100%
Input voltage (V)	1300.6	1300.6	1300.4	1300.2	1299.8	1299.5
Input current (A)	12.6	21.2	50.4	99.4	151.0	199.9
Output voltage (V)	799.6	801.5	801.9	802.0	802.6	803.0
Output current (A)	9.7	18.4	46.5	92.3	140.3	185.9
Input power (Pi) (W)	13229	25445	64934	128986	196007	259615
Output power (Po) (W)	12699	24986	64204	127722	194072	256753
Output efficiency (%)	95.99%	98.20%	98.88%	99.02%	99.01%	98.90%
Input energy (Wi) (Wh)	647.0	1272.3	3246.7	6449.3	9800.3	12980.7
Output energy (Wo) (Wh)	621.2	1249.3	3210.2	6386.1	9703.6	12837.7
Energy conversion efficiency (%)	96.02%	98.20%	98.88%	99.02%	99.01%	98.90%
Remark: --						

TABLE	No-load loss	
power conditioner type		
Model:	E-250KTL-HV	
Measure input voltage (V)	1160.6 Vd.c.	
Measured input power(W)	81.4 W	
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.		

TABLE	No-load loss	
power conditioner type		
Model:	E-255KTL-HV	
Measure input voltage (V)	1160.6 Vd.c.	
Measured input power(W)	79.7 W	
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.		

TABLE	Standby loss	
power conditioner type		
Model:	E-250KTL-HV	
Measure output voltage (V)	798.6 Va.c.	
Measured output power(W)	53.5 W	
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.		

TABLE	Standby loss	
power conditioner type		
Model:	E-255KTL-HV	
Measure output voltage (V)	798.6 Va.c.	
Measured output power(W)	53.5 W	
Remark: Standby loss is measured when the power conditioner works at rated input voltage and in standby mode.		

..... End of test report.....