

Applicant : **Shenzhen SOFAR SOLAR Co., Ltd.**
Address : 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, China

Report No : 190920148GZU-001 **Issue Date** : 08 Nov 2019
Total Pages : 25 Pages

Sample Description

Name of Sample : Solar Grid-tied Inverter
Model Number : SOFAR 20000TL-G2, SOFAR 25000TL-G2,
SOFAR 30000TL-G2, SOFAR 33000TL-G2
Sample Condition : Prototype,
Hardware version : V1.00
Software version : V3.00
Quantity of Sample(s) : 4 pcs
Date of Receival : 20 Sep 2019
Date of test Conducted : 20 Sep 2019 - 15 Oct 2019

Test

Test Requested : Static MPPT efficiency, Static power conversion efficiency, European efficiency
Test Method : EN 50530: 2010 + A1:2013 -Overall efficiency of grid connected photovoltaic inverters
Clause 4.3 Conversion and static MPPT efficiency
Clause 4.4 Dynamic MPPT efficiency
Annex D.1 and D.2: European efficiency and CEC efficiency
Annex F: Inverter efficiency
Test Conclusion: : Refer to test result
Other information : --
Remark :

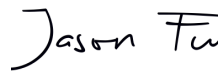
- This test report is only for evaluation of the specified standard clauses listed in Test Requested.
- When determine the test result, measurement uncertainty has been considered.

Tested by:



Sunny Lin
Engineer

Approved by:



Jason Fu
Technical Team Leader

Intertek Testing Services Shenzhen Ltd. Guangzhou Branch

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General remarks:

Throughout this report a point is used as the decimal separator.

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

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Rating:

SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 20000TL-G2
Max.DC Input Voltage	1100V
Operating MPPT Voltage Range	230~960V
Max. Input Current	24A/24A
Max. PV Isc	30A/30A
Nominal Grid Voltage	3/N/PE,400Vac
Max. Output Current	3x32A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	20000W
Max. Output Power	22000VA
Power Factor	>0.99(adjustable +/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25°C~+60°C
Protective Class	Class I
Made in China	

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 VDE0126-1-1,VDE-AR-N4105,G99,IEC61727,
 IEC62116,UTE C15-7 12-1,AS4777

SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 25000TL-G2
Max.DC Input Voltage	1100V
Operating MPPT Voltage Range	230~960V
Max. Input Current	28A/28A
Max. PV Isc	35A/35A
Nominal Grid Voltage	3/N/PE,400Vac
Max. Output Current	3x40A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	25000W
Max. Output Power	27500VA
Power Factor	>0.99(adjustable +/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25°C~+60°C
Protective Class	Class I
Made in China	

Manufacturer : Shenzhen SOFAR SOLAR Co.,Ltd.
 Address : 401, Building 4, An TongDa Industrial Park,
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 BaoAn District, Shenzhen, China
 VDE0126-1-1,VDE-AR-N4105,G99,IEC61727,
 IEC62116,UTE C15-7 12-1,AS4777

SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 30000TL-G2
Max.DC Input Voltage	1100V
Operating MPPT Voltage Range	230~960V
Max. Input Current	30A/30A
Max. PV Isc	37.5A/37.5A
Nominal Grid Voltage	3/N/PE,400Vac
Max. Output Current	3x48A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	30000W
Max. Output Power	33000VA
Power Factor	>0.99(adjustable +/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25°C~+60°C
Protective Class	Class I

Made in China

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 VDE0126-1-1,VDE-AR-N4105,G99,IEC61727,
 IEC62116,UTE C15-7 12-1,AS4777



SOFAR SOLAR Solar Grid-tied Inverter

Model No:	SOFAR 33000TL-G2
Max.DC Input Voltage	1100V
Operating MPPT Voltage Range	230~960V
Max. Input Current	30A/30A
Max. PV Isc	37.5A/37.5A
Nominal Grid Voltage	3/N/PE,400Vac
Max. Output Current	3x53A
Nominal Grid Frequency	50/60Hz
Nominal Output Power	33000W
Max. Output Power	36300VA
Power Factor	>0.99(adjustable +/-0.8)
Ingress Protection	IP65
Operating Temperature Range	-25°C~+60°C
Protective Class	Class I

Made in China

Manufacturer : Shenzhen SOFAR SOLAR Co.,Ltd.
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 VDE0126-1-1,VDE-AR-N4105,G99,IEC61727,
 IEC62116,UTE C15-7 12-1,AS4777



Test Result:

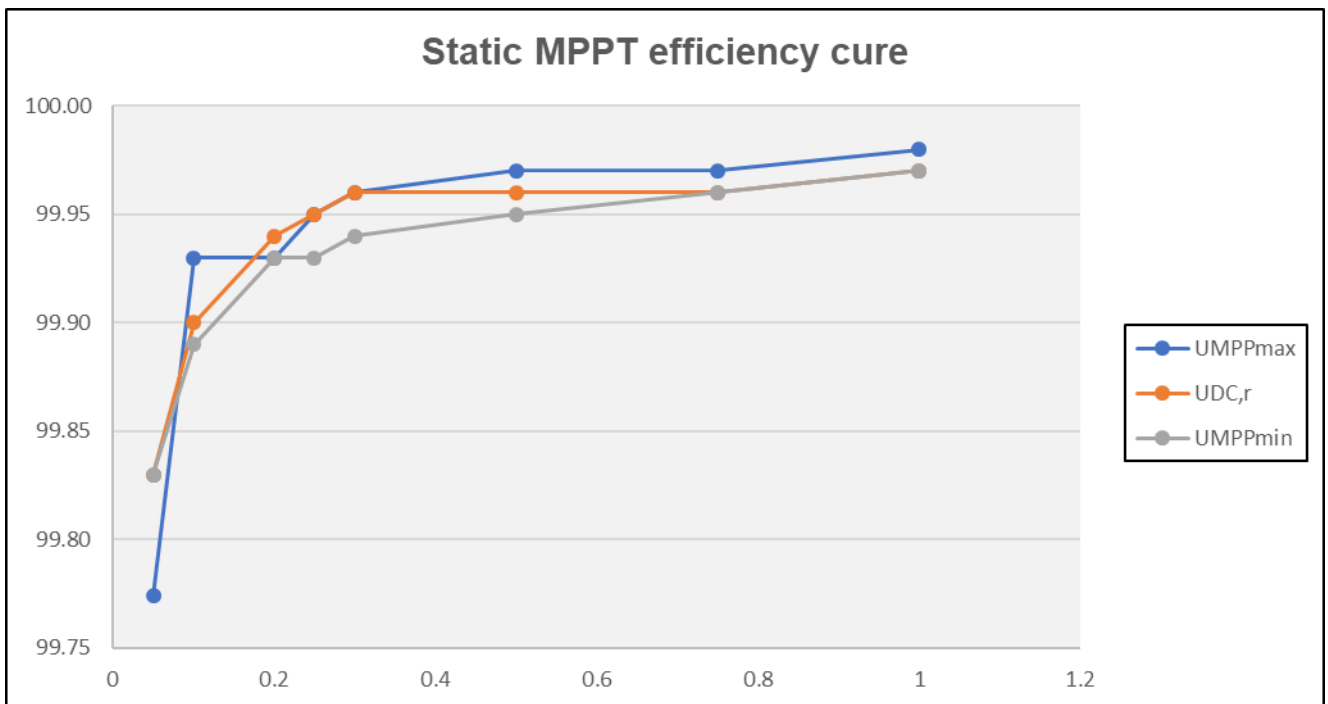
Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
 Model : SOFAR 20000TL-G2

Simulated I/U characteristic	c-Si	Rated input power (PDC,r)	--
Maximum input voltage UDCmax (V)	1100	Maximum input current (IDC,max)	24A/24A
Minimum input voltage UDCmin (V)	230	Rated grid voltage (UAC,r)	3/N/PE,230/400 Vac
Rated input voltage UDC,r (V)	620	Rated power (PAC,r)	20000W
Maximum MPP voltage UMPPmax (V)	800	Minimum MPP voltage (UMPPmin)	480

Static MPPT efficiency

MPP voltage of the simulated I/U characteristic of the PV generator		MPP power of the simulated I/U characteristic normalised to rated DC power d, PMPP,PVS/PDC,r (%)								European MPPT efficiency (%)	CEC MPPT efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPPmax	800	99.77	99.93	99.93	99.95	99.96	99.97	99.97	99.98	99.96	99.97
UDC,r	620	99.83	99.90	99.94	99.95	99.96	99.96	99.96	99.97	99.95	99.96
UMPPmin	480	99.83	99.89	99.93	99.93	99.94	99.95	99.96	99.97	99.94	99.95

Static MPPT efficiency: 99.98% max. European MPPT efficiency:99.95% CEC MPPT efficiency:99.96%



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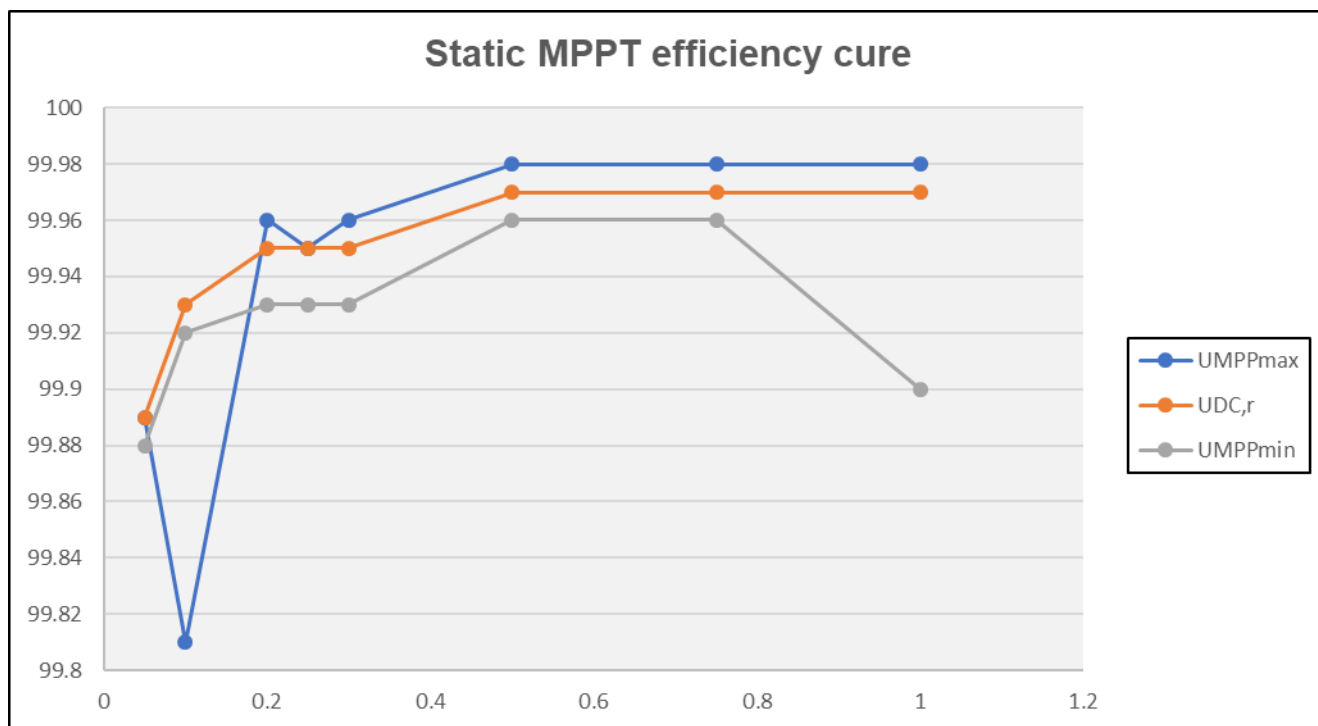
Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
 Model : SOFAR 25000TL-G2

Simulated I/U characteristic	c-Si	Rated input power (PDC,r)	--
Maximum input voltage UDCmax (V)	1100	Maximum input current (IDC,max)	28A/28A
Minimum input voltage UDCmin (V)	230	Rated grid voltage (UAC,r)	3/N/PE,230/400 Vac
Rated input voltage UDC,r (V)	620	Rated power (PAC,r)	25000W
Maximum MPP voltage UMPPmax (V)	800	Minimum MPP voltage (UMPPmin)	460

Static MPPT efficiency

MPP voltage of the simulated I/U characteristic of the PV generator	MPP power of the simulated I/U characteristic normalised to rated DC power d, PMPP,PVS/PDC,r (%)									European MPPT efficiency (%)	CEC MPPT efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPPmax	800	99.89	99.81	99.96	99.95	99.96	99.98	99.98	99.98	99.96	99.97
UDC,r	620	99.89	99.93	99.95	99.95	99.95	99.97	99.97	99.97	99.96	99.97
UMPPmin	460	99.88	99.92	99.93	99.93	99.93	99.96	99.96	99.90	99.94	99.95

Static MPPT efficiency: 99.98% max. European MPPT efficiency:99.95% CEC MPPT efficiency:99.96%



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Test Result:

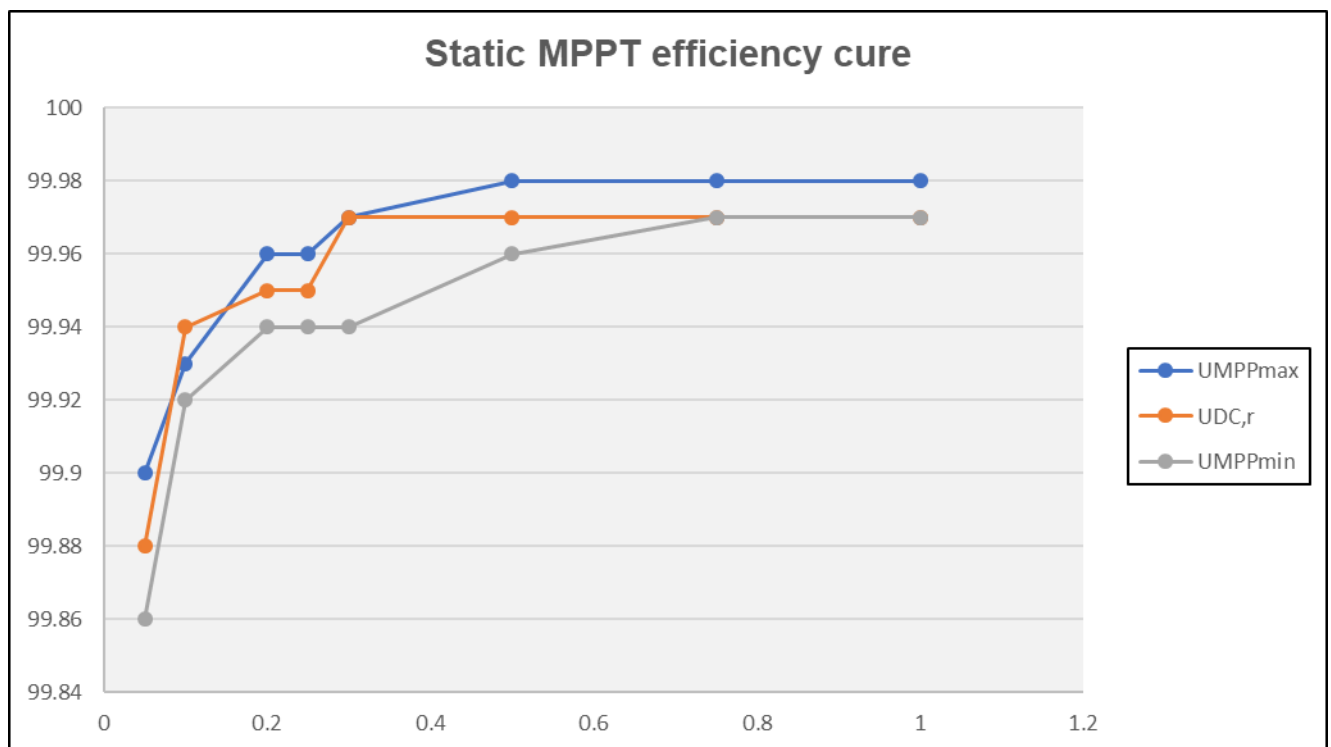
Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
 Model : SOFAR 30000TL-G2

Simulated I/U characteristic	c-Si	Rated input power (PDC,r)	--
Maximum input voltage UDCmax (V)	1100	Maximum input current (IDC,max)	30A/30A
Minimum input voltage UDCmin (V)	230	Rated grid voltage (UAC,r)	3/N/PE,230/400 Vac
Rated input voltage UDC,r (V)	620	Rated power (PAC,r)	30000W
Maximum MPP voltage UMPPmax (V)	800	Minimum MPP voltage (UMPPmin)	520

Static MPPT efficiency

MPP voltage of the simulated I/U characteristic of the PV generator		MPP power of the simulated I/U characteristic normalised to rated DC power d, PMPP,PVS/PDC,r (%)								European MPPT efficiency (%)	CEC MPPT efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPPmax	800	99.90	99.93	99.96	99.96	99.97	99.98	99.98	99.98	99.97	99.98
UDC,r	620	99.88	99.94	99.95	99.95	99.97	99.97	99.97	99.97	99.96	99.97
UMPPmin	520	99.86	99.92	99.94	99.94	99.94	99.96	99.97	99.97	99.95	99.96

Static MPPT efficiency: 99.98% max. European MPPT efficiency:99.96% CEC MPPT efficiency:99.97%



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Test Result:

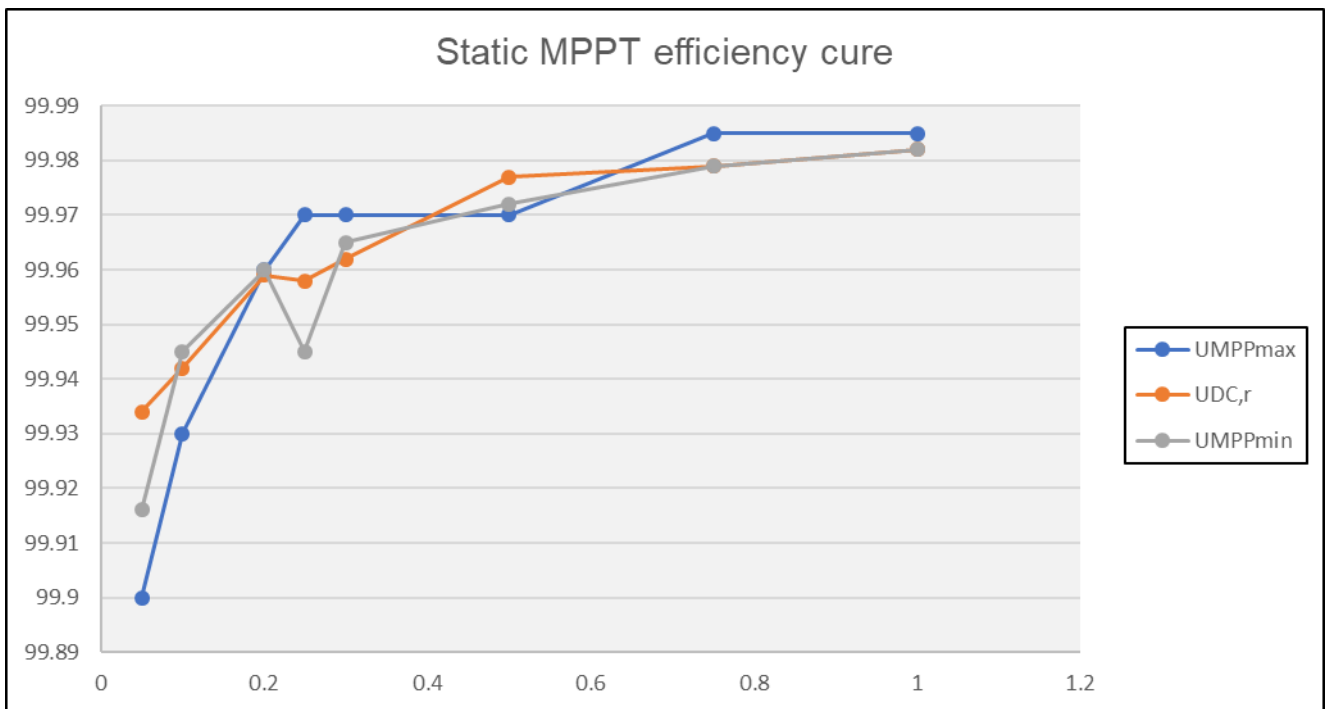
Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
 Model : SOFAR33000TL-G2

Simulated I/U characteristic	c-Si	Rated input power (PDC,r)	--
Maximum input voltage UDCmax (V)	1100	Maximum input current (IDC,max)	30A/30A
Minimum input voltage UDCmin (V)	230	Rated grid voltage (UAC,r)	3/N/PE,230/400 Vac
Rated input voltage UDC,r (V)	620	Rated power (PAC,r)	33000W
Maximum MPP voltage UMPPmax (V)	800	Minimum MPP voltage (UMPPmin)	580

Static MPPT efficiency

MPP voltage of the simulated I/U characteristic of the PV generator		MPP power of the simulated I/U characteristic normalised to rated DC power d, PMPP,PVS/PDC,r (%)								European MPPT efficiency (%)	CEC MPPT efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPPmax	800	99.90	99.93	99.96	99.97	99.97	99.97	99.99	99.99	99.97	99.98
UDC,r	620	99.93	99.94	99.96	99.96	99.96	99.98	99.98	99.98	99.97	99.97
UMPPmin	580	99.92	99.95	99.96	99.95	99.97	99.97	99.98	99.98	99.97	99.97

Static MPPT efficiency: 99.99% max. European MPPT efficiency:99.97% CEC MPPT efficiency:99.97%



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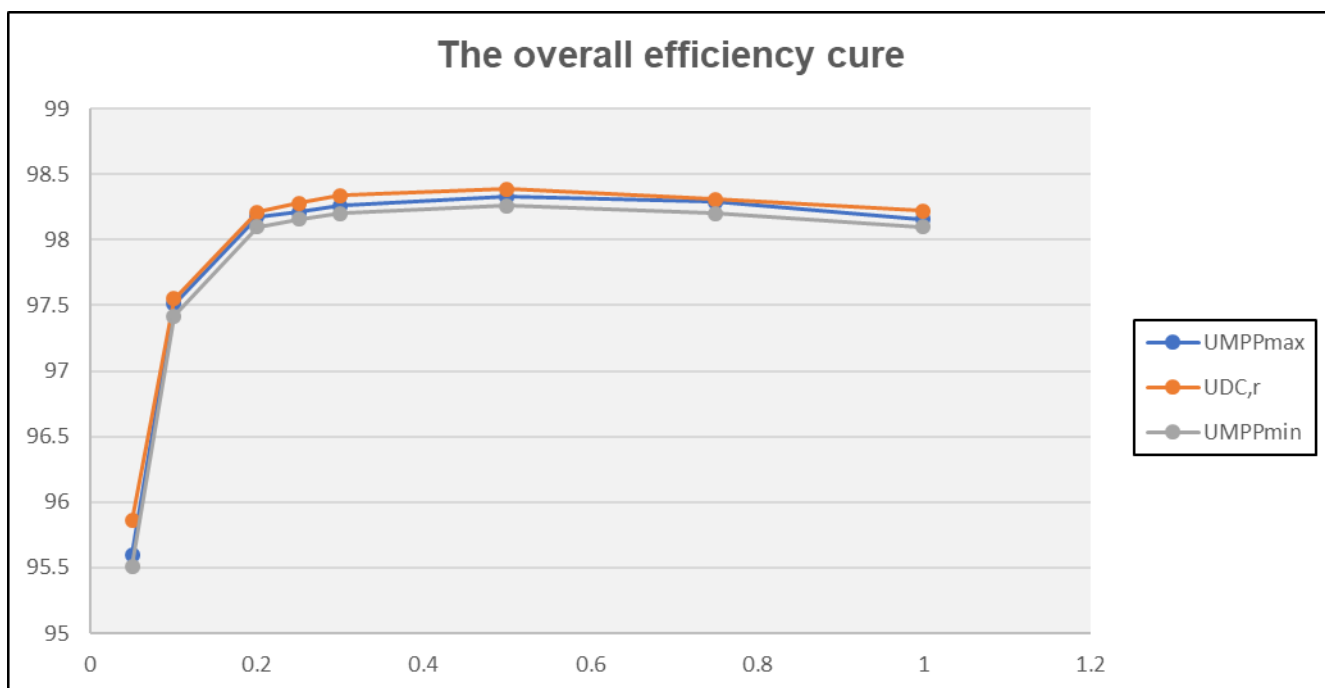
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
 Model : SOFAR 20000TL-G2

Conversion efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		Conversion efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.60	97.51	98.18	98.21	98.26	98.33	98.29	98.16	98.14	98.25
UDC,r	620	95.86	97.55	98.21	98.28	98.34	98.39	98.31	98.22	98.20	98.29
UMPP _{min}	480	95.51	97.42	98.10	98.16	98.20	98.26	98.20	98.10	98.07	98.17

Conversion efficiency: 98.39% max. European efficiency:98.14% CEC efficiency:98.24%



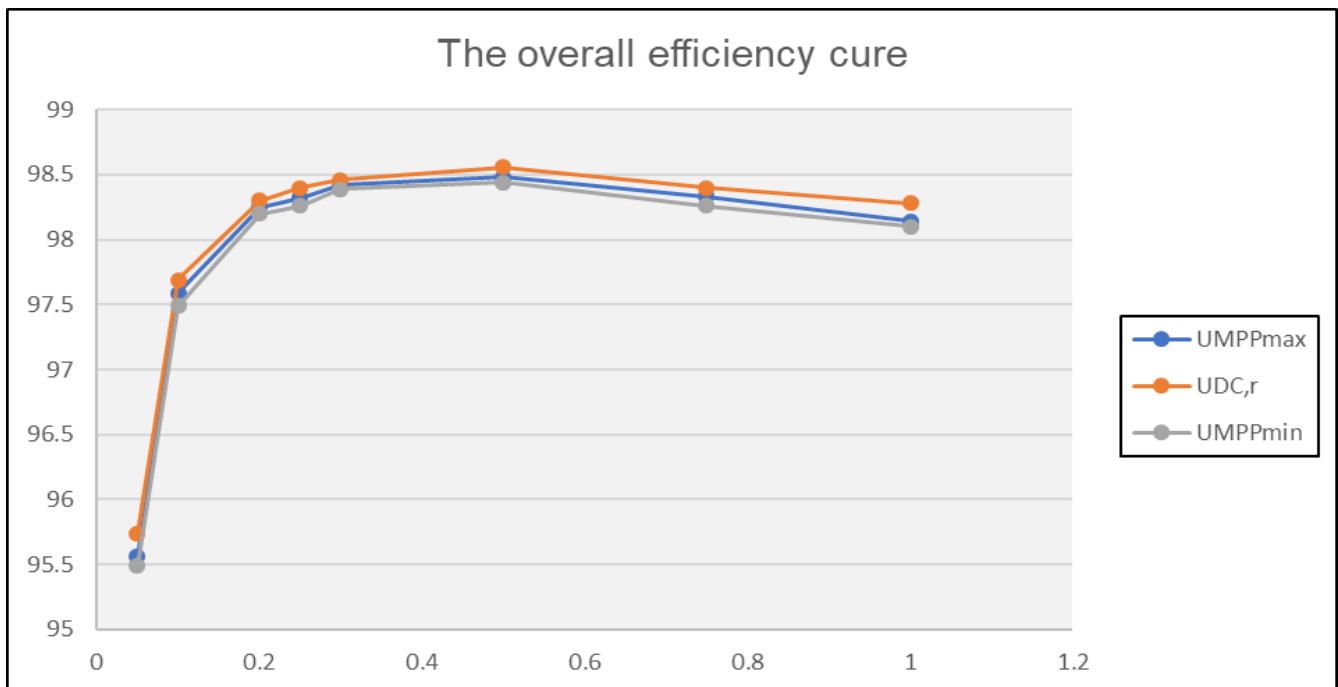
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
Model : SOFAR 25000TL-G2

Conversion efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		Conversion efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.56	97.59	98.25	98.32	98.42	98.48	98.33	98.14	98.24	98.33
UDC,r	620	95.74	97.69	98.30	98.40	98.46	98.56	98.40	98.28	98.32	98.40
UMPP _{min}	460	95.49	97.49	98.20	98.26	98.39	98.44	98.26	98.10	98.19	98.27

Conversion efficiency: 98.56% max. European efficiency:98.25% CEC efficiency:98.33%



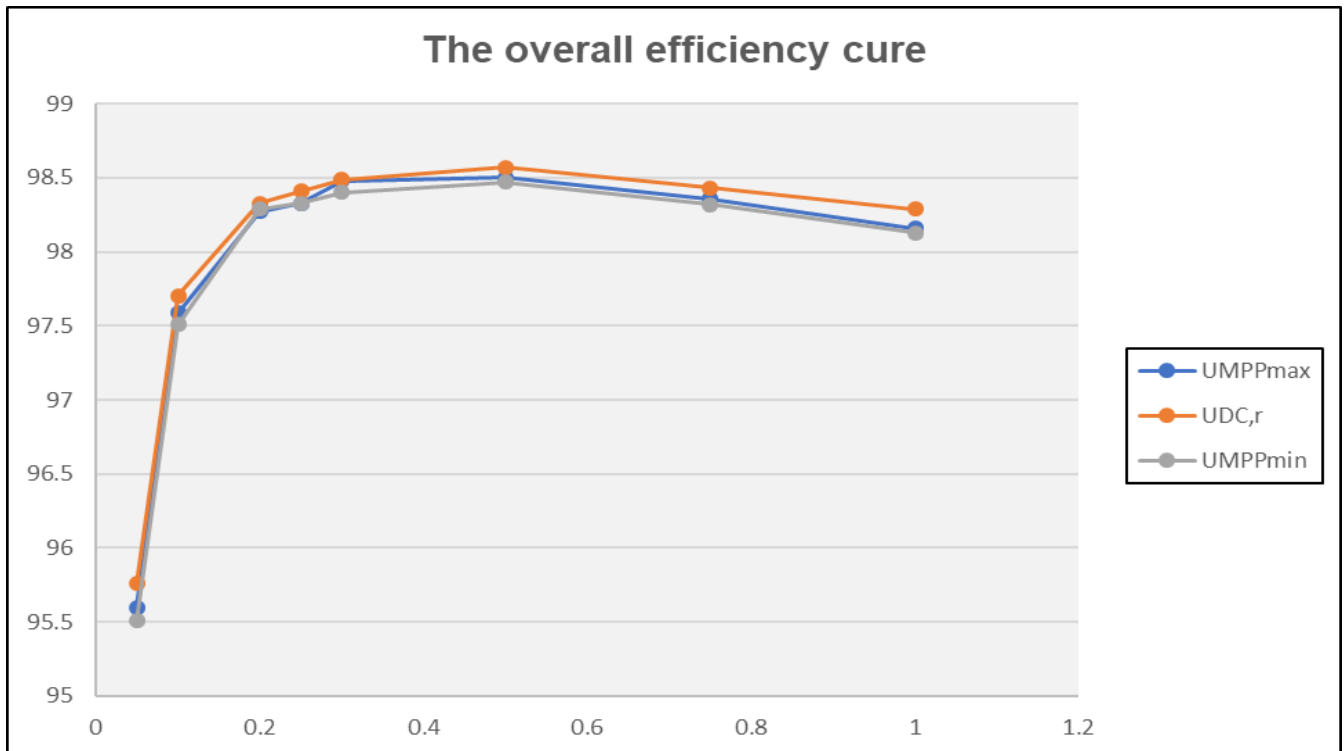
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
Model : SOFAR 30000TL-G2

Conversion efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		Conversion efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.60	97.59	98.27	98.33	98.48	98.50	98.36	98.16	98.26	98.36
UDC,r	620	95.76	97.70	98.33	98.41	98.49	98.57	98.43	98.29	98.34	98.43
UMPP _{min}	520	95.51	97.51	98.29	98.33	98.40	98.47	98.32	98.13	98.22	98.32

Conversion efficiency: 98.57% max. European efficiency:98.27% CEC efficiency:98.37%



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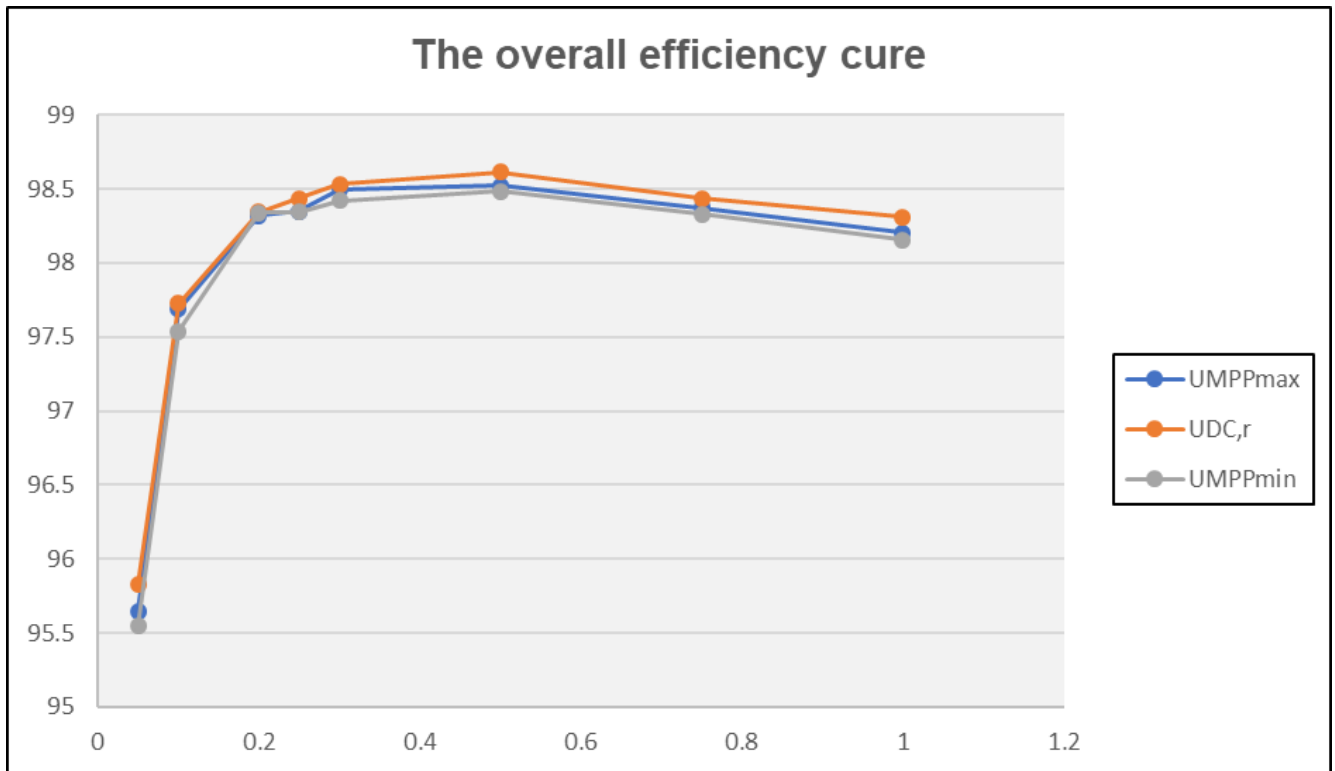
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
Model : SOFAR 33000TL-G2

Conversion efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		Conversion efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.65	97.69	98.32	98.35	98.50	98.52	98.37	98.20	98.29	98.38
UDC,r	620	95.83	97.73	98.35	98.44	98.53	98.61	98.44	98.31	98.37	98.45
UMPP _{min}	580	95.55	97.54	98.34	98.34	98.42	98.48	98.33	98.16	98.25	98.33

Conversion efficiency: 98.61% max. European efficiency:98.30% CEC efficiency:98.39%



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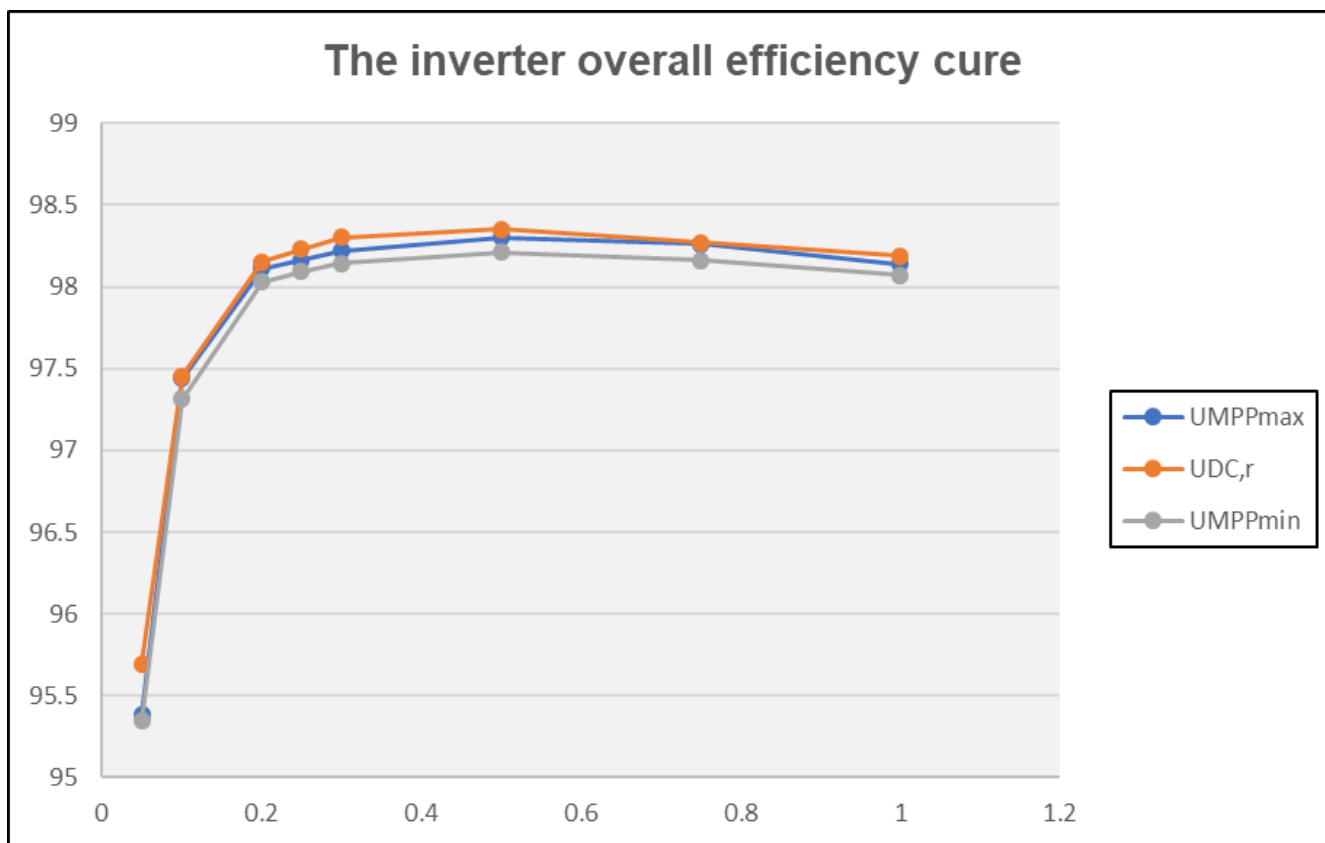
Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.

Model : SOFAR 20000TL-G2

The inverter overall efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		The overall efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.38	97.44	98.11	98.16	98.22	98.30	98.26	98.14	98.10	98.22
UDC,r	620	95.70	97.45	98.15	98.23	98.30	98.35	98.27	98.19	98.15	98.25
UMPP _{min}	480	95.35	97.31	98.03	98.09	98.14	98.21	98.16	98.07	98.01	98.12

The overall efficiency: 98.35% max. European efficiency:98.09% CEC efficiency:98.20%



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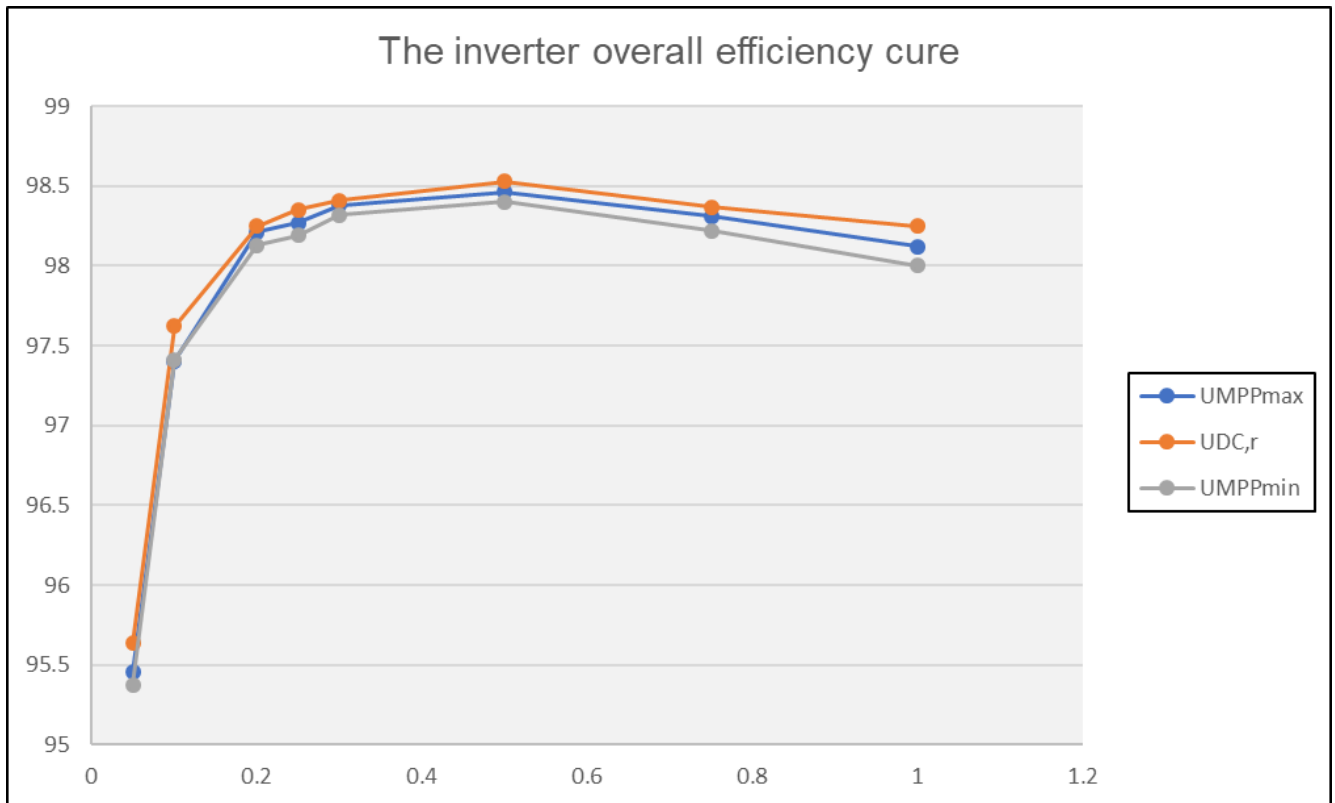
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
Model : SOFAR 25000TL-G2

The inverter overall efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		The overall efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.45	97.40	98.21	98.27	98.38	98.46	98.31	98.12	98.20	98.30
UDC,r	620	95.63	97.62	98.25	98.35	98.41	98.53	98.37	98.25	98.28	98.37
UMPP _{min}	460	95.38	97.41	98.13	98.19	98.32	98.40	98.22	98.00	98.13	98.22

The overall efficiency: 98.53% max. European efficiency:98.20% CEC efficiency:98.30%



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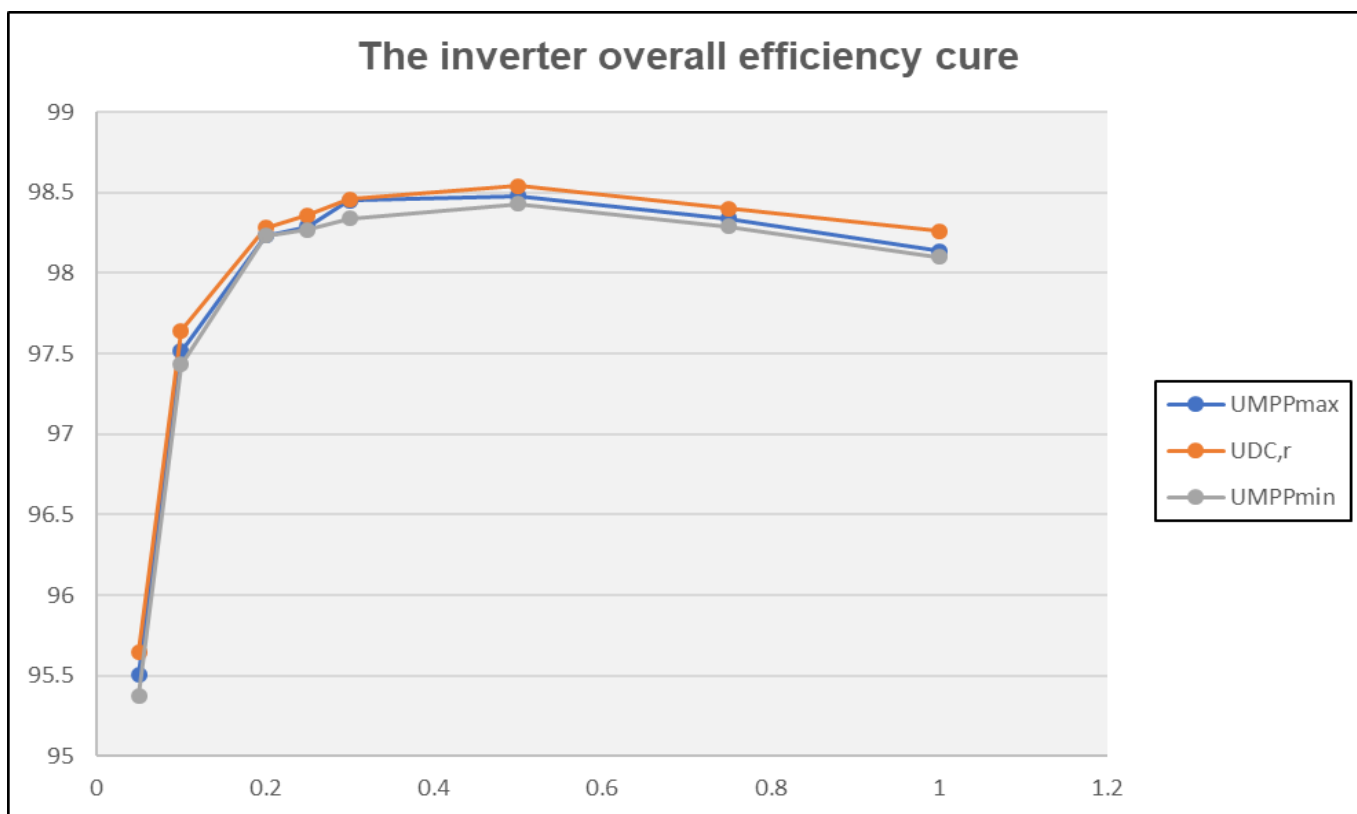
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
Model : SOFAR 30000TL-G2

The inverter overall efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		The overall efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.50	97.52	98.23	98.29	98.45	98.48	98.34	98.14	98.23	98.33
UDC,r	620	95.65	97.64	98.28	98.36	98.46	98.54	98.40	98.26	98.30	98.39
UMPP _{min}	520	95.37	97.43	98.23	98.27	98.34	98.43	98.29	98.10	98.18	98.28

The overall efficiency: 98.54% max. European efficiency:98.24% CEC efficiency:98.34%



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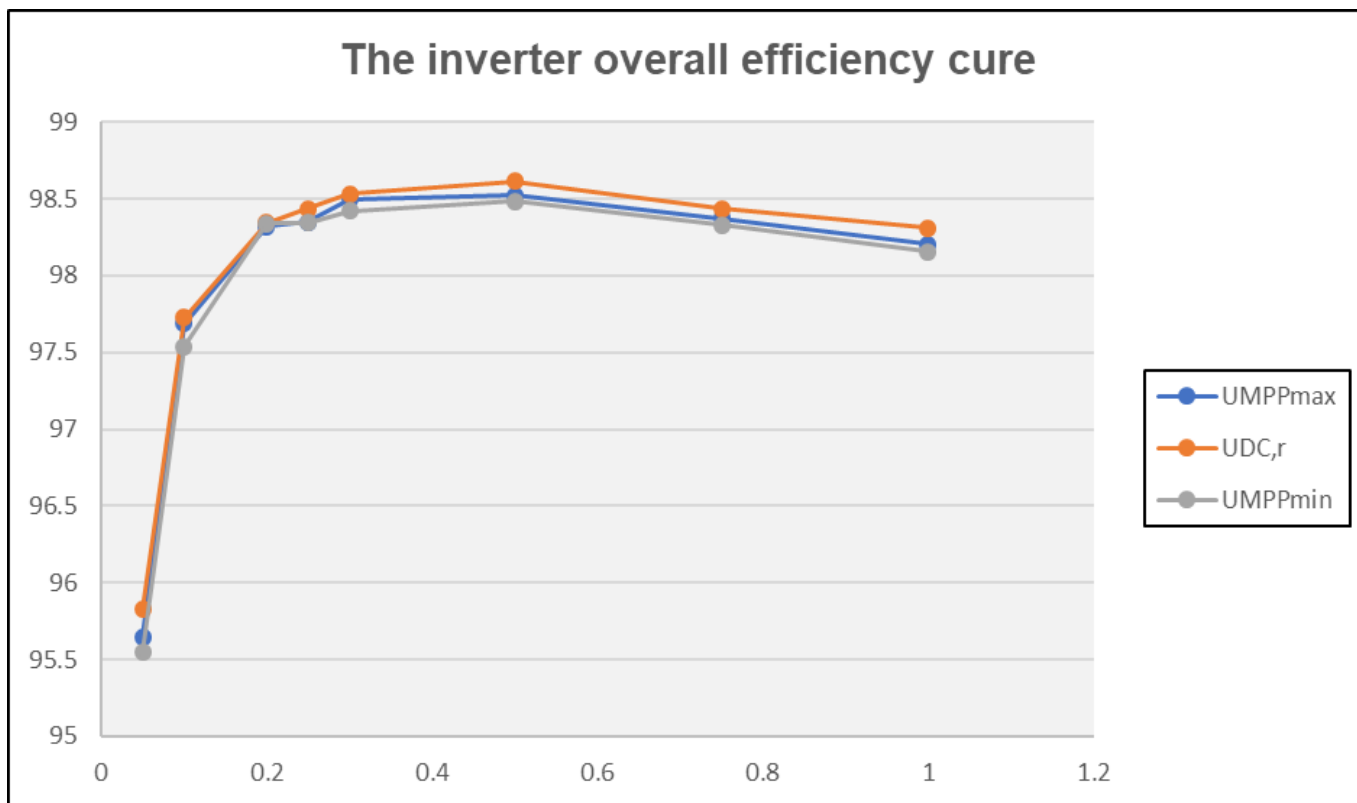
Test Result:

Manufacturer: Shenzhen SOFAR SOLAR Co., Ltd.
 Model : SOFAR 33000TL-G2

The inverter overall efficiency:

MPP voltage of the simulated I/U characteristic of the PV generator		The overall efficiency (%)								European efficiency (%)	CEC efficiency (%)
		0.05	0.10	0.20	0.25	0.30	0.50	0.75	1.00		
UMPP _{max}	800	95.55	97.62	98.28	98.32	98.47	98.49	98.36	98.19	98.26	98.36
UDC,r	620	95.76	97.67	98.30	98.40	98.49	98.59	98.42	98.29	98.34	98.42
UMPP _{min}	580	95.47	97.48	98.30	98.29	98.39	98.45	98.31	98.14	98.22	98.31

The overall efficiency: 98.59% max. European efficiency:98.27% CEC efficiency:98.36%



Test Result:

Model : SOFAR 20000TL-G2

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % P_{DCn}

Irradiance 100-500W/m ² (10%-50%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
2	0.5	800	10	800	10	3540	99.499
2	1	400	10	400	10	1940	98.837
3	2	200	10	200	10	1560	96.483
4	3	133	10	133	10	1447	98.577
6	5	80	10	80	10	1300	98.191
8	7	57	10	57	10	1374	98.003
10	10	40	10	40	10	1700	98.830
10	14	29	10	29	10	1071	97.519
10	20	20	10	20	10	900	97.919
10	30	13	10	13	10	767	98.292
10	50	8	10	8	10	660	97.842

B.3 Test sequence with ramps 30 % - 100 % P_{DCn}

Irradiance 300-1000W/m ² (30%-100%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
10	10	70	10	70	10	1900	99.807
10	14	50	10	50	10	1500	99.724
10	20	35	10	35	10	1200	99.830
10	30	23	10	23	10	967	99.867
10	50	14	10	14	10	780	99.860
10	100	7	10	7	10	640	99.890

B.4 Start-up and shut-down test with slow ramps

Irradiance 10-100W/m ² (slow ramps)							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
1	0.1	980	30	980	30	2320	99.779

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.819
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Test Result:

Model : SOFAR 25000TL-G2

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % P_{DCn}

Irradiance 100-500W/m ² (10%-50%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
2	0.5	800	10	800	10	3540	99.503
2	1	400	10	400	10	1940	98.726
3	2	200	10	200	10	1560	96.652
4	3	133	10	133	10	1447	97.666
6	5	80	10	80	10	1300	97.728
8	7	57	10	57	10	1374	97.846
10	10	40	10	40	10	1700	97.391
10	14	29	10	29	10	1071	97.746
10	20	20	10	20	10	900	98.193
10	30	13	10	13	10	767	97.734
10	50	8	10	8	10	660	98.053

B.3 Test sequence with ramps 30 % - 100 % P_{DCn}

Irradiance 300-1000W/m ² (30%-100%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
10	10	70	10	70	10	1900	99.849
10	14	50	10	50	10	1500	99.838
10	20	35	10	35	10	1200	99.787
10	30	23	10	23	10	967	99.805
10	50	14	10	14	10	780	99.861
10	100	7	10	7	10	640	99.872

B.4 Start-up and shut-down test with slow ramps

Irradiance 10-100W/m ² (slow ramps)							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
1	0.1	980	30	980	30	2320	99.799

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.669
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Test Result:

Model : SOFAR 30000TL-G2

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % P_{DCn}

Irradiance 100-500W/m ² (10%-50%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
2	0.5	800	10	800	10	3540	99.522
2	1	400	10	400	10	1940	98.799
3	2	200	10	200	10	1560	98.707
4	3	133	10	133	10	1447	97.554
6	5	80	10	80	10	1300	97.936
8	7	57	10	57	10	1374	97.342
10	10	40	10	40	10	1700	97.445
10	14	29	10	29	10	1071	97.478
10	20	20	10	20	10	900	97.288
10	30	13	10	13	10	767	98.028
10	50	8	10	8	10	660	97.561

B.3 Test sequence with ramps 30 % - 100 % P_{DCn}

Irradiance 300-1000W/m ² (30%-100%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
10	10	70	10	70	10	1900	99.679
10	14	50	10	50	10	1500	99.792
10	20	35	10	35	10	1200	99.718
10	30	23	10	23	10	967	99.754
10	50	14	10	14	10	780	99.680
10	100	7	10	7	10	640	99.661

B.4 Start-up and shut-down test with slow ramps

Irradiance 10-100W/m ² (slow ramps)							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
1	0.1	980	30	980	30	2320	99.421

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.631
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Test Result:

Model : SOFAR 33000TL-G2

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % P_{DCn}

Irradiance 100-500W/m ² (10%-50%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
2	0.5	800	10	800	10	3540	99.523
2	1	400	10	400	10	1940	98.893
3	2	200	10	200	10	1560	96.279
4	3	133	10	133	10	1447	98.105
6	5	80	10	80	10	1300	98.173
8	7	57	10	57	10	1374	98.082
10	10	40	10	40	10	1700	97.917
10	14	29	10	29	10	1071	97.557
10	20	20	10	20	10	900	97.290
10	30	13	10	13	10	767	97.816
10	50	8	10	8	10	660	97.649

B.3 Test sequence with ramps 30 % - 100 % P_{DCn}

Irradiance 300-1000W/m ² (30%-100%P _{DCn})							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
10	10	70	10	70	10	1900	99.759
10	14	50	10	50	10	1500	99.728
10	20	35	10	35	10	1200	99.752
10	30	23	10	23	10	967	99.779
10	50	14	10	14	10	780	99.774
10	100	7	10	7	10	640	99.789

B.4 Start-up and shut-down test with slow ramps

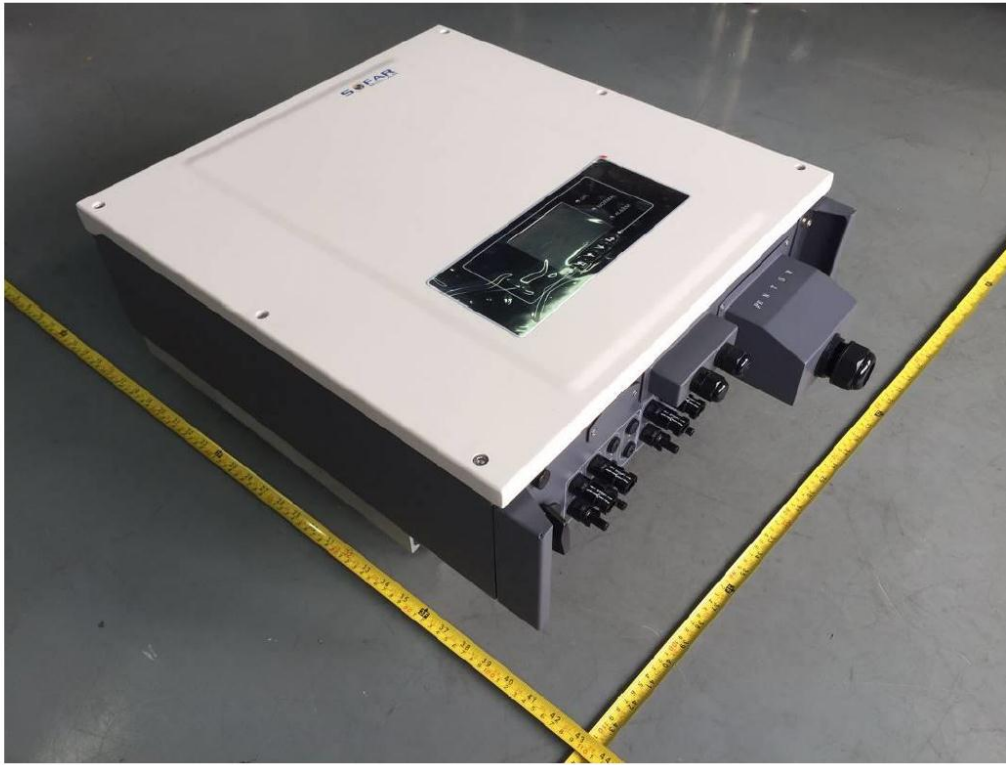
Irradiance 10-100W/m ² (slow ramps)							
# Number	Slope W/m ² /s	Ramp UP s	Dwell time s	Ramp DN s	Dwell time s	Duration s	Dynamic MPPT efficiency- (%)
1	0.1	980	30	980	30	2320	99.378

Calculation of the dynamic MPPT efficiency

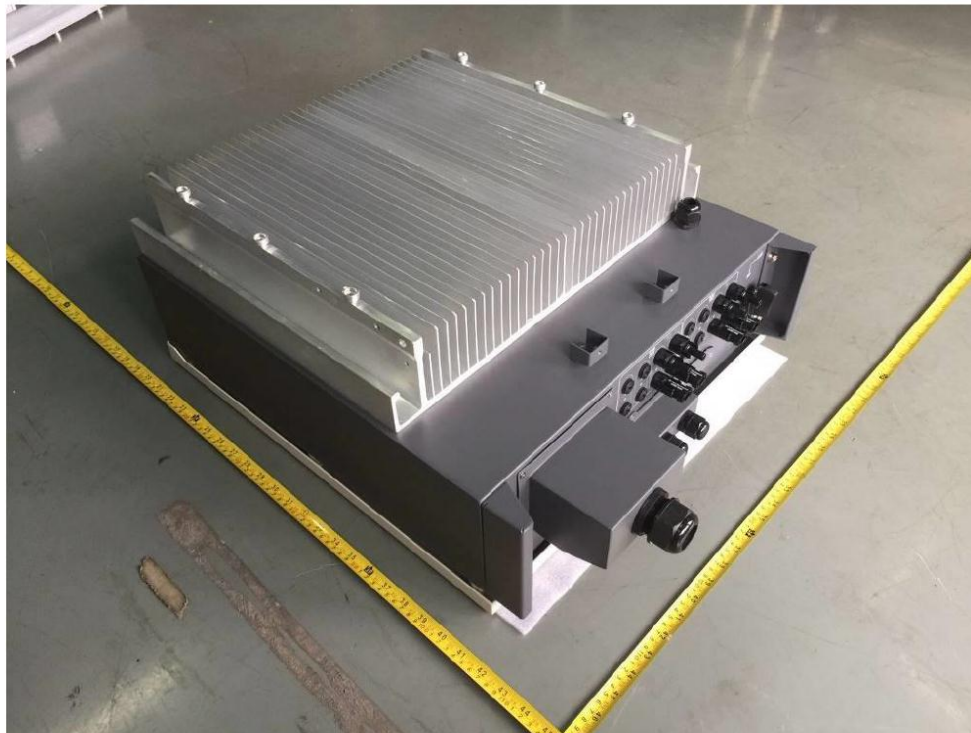
The overall dynamic MPPT efficiency:	98.625
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Appendix Photos:

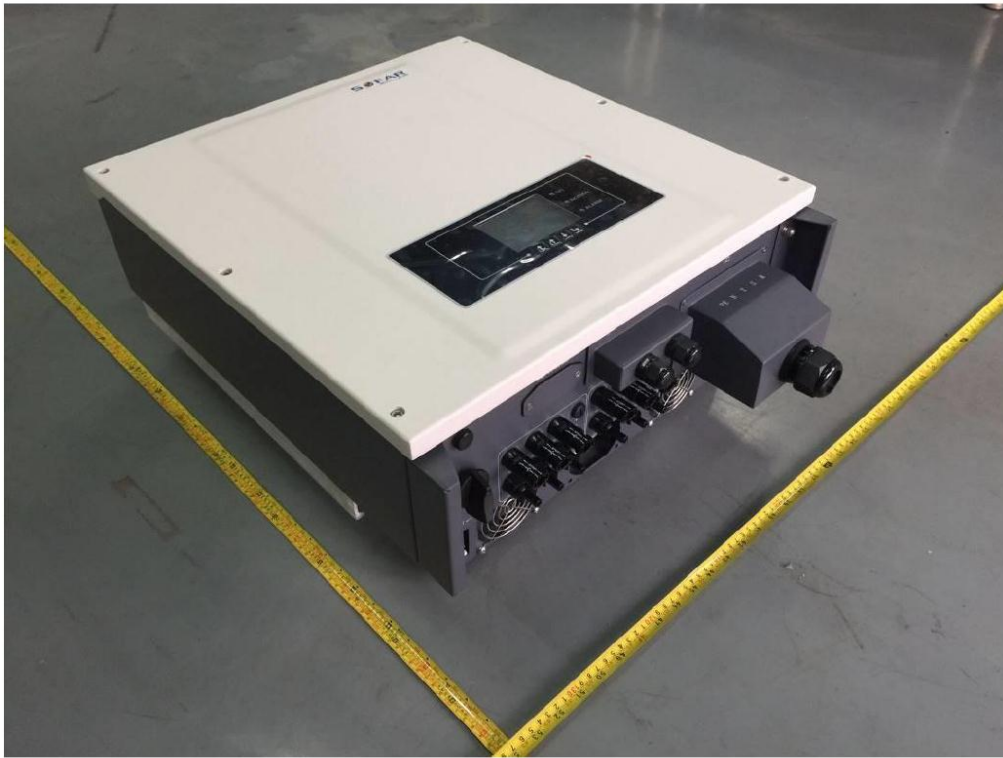
Enclosure front view: SOFAR 20000TL-G2



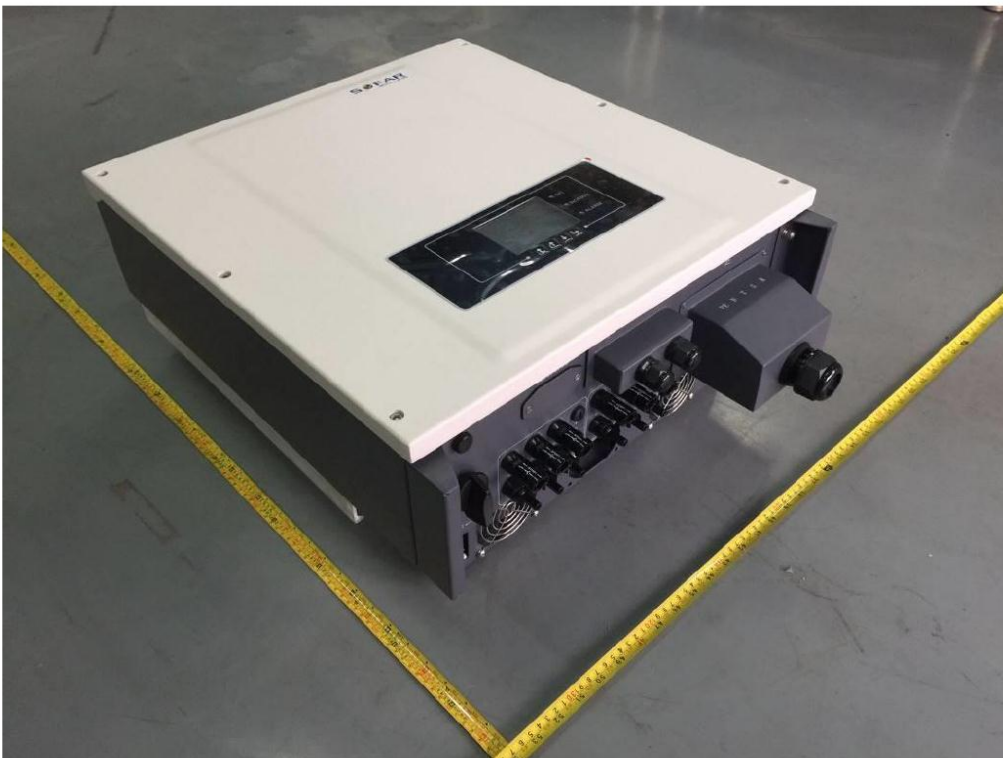
Enclosure rear view: SOFAR 20000TL-G2



Enclosure front view: SOFAR 25000TL-G2



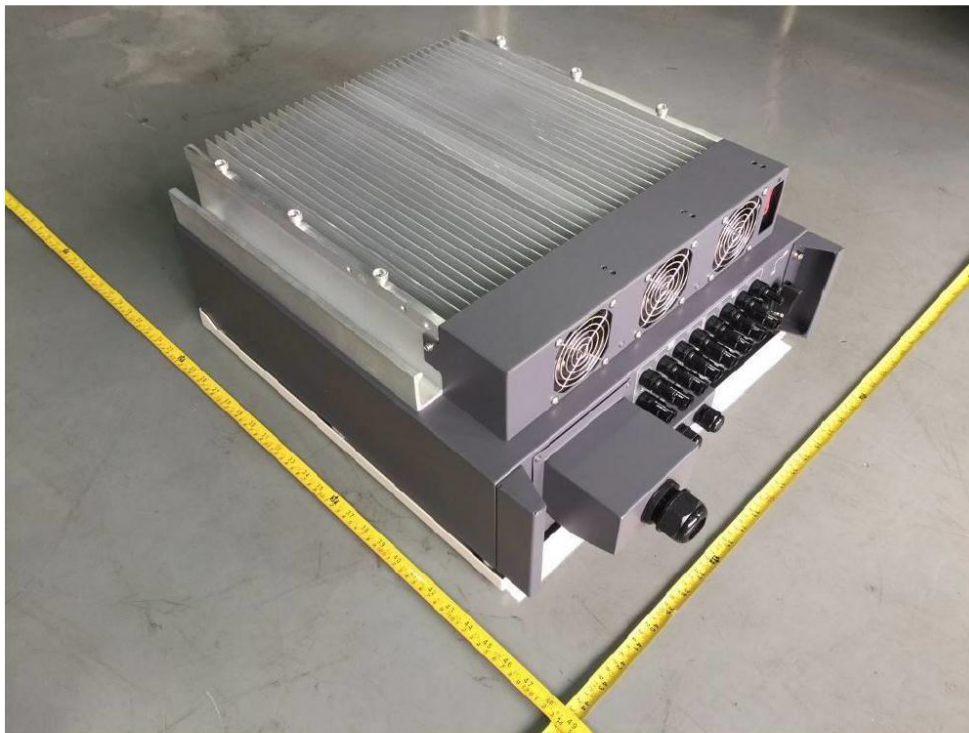
Enclosure rear view: SOFAR 25000TL-G2



Enclosure front view: SOFAR 30000TL-G2, SOFAR 33000TL-G2



Enclosure rear view: SOFAR 30000TL-G2, SOFAR 33000TL-G2



Enclosure terminal view: SOFAR 20000TL-G2



Enclosure terminal view: SOFAR 25000TL-G2



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Enclosure terminal view: SOFAR 30000TL-G2, SOFAR 33000TL-G2



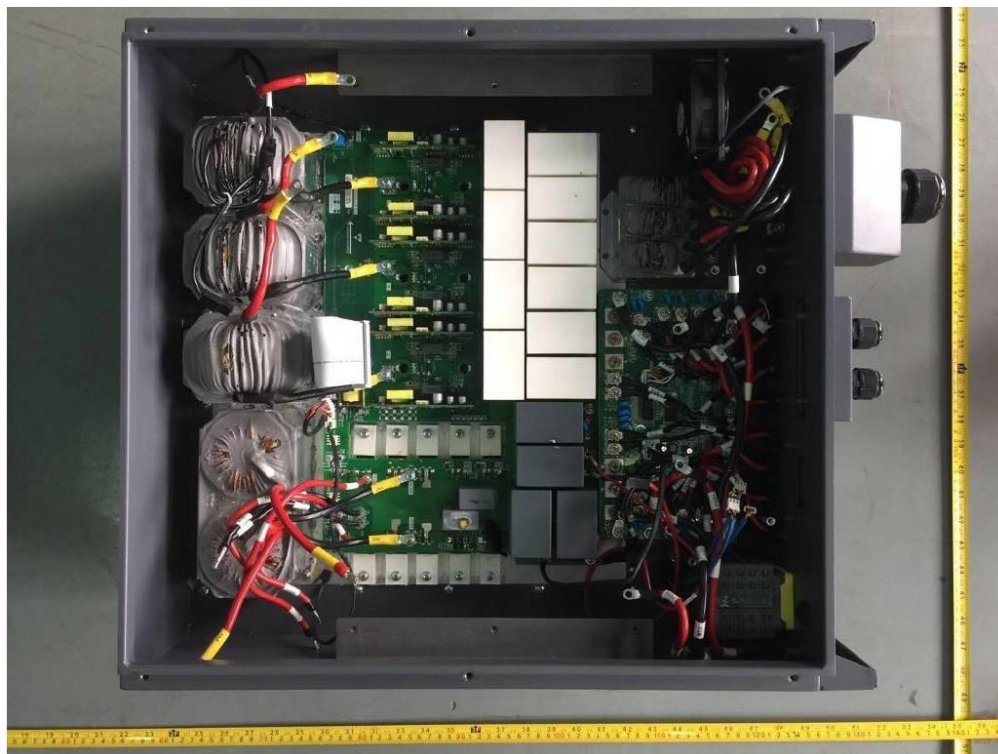
Internal view: SOFAR 20000TL-G2



Internal view: SOFAR 25000TL-G2



Internal view: SOFAR 30000TL-G2, SOFAR 33000TL-G2



(End of report)