Applicant	:	**Hitachi Hi-Rel Power Electronics Pvt. Ltd.**
Address	:	SM 3 & 4, Sanand – II GIDC, Industrial Estate, Boll Village, Sanand – 382 110, Gujarat, India.
Report No	:	191012014GZU-004 **Issue Date** : 25 Nov., 2019
Total Pages	:	34 Pages

Sample Description

Name of Sample	:	Solar Grid Tied Inverter
Model Number	:	Hiverter Si-4.4K, Hiverter Si-5.5K, Hiverter Si-6.6K, Hiverter Si-8.8K, Hiverter Si-11K, Hiverter Si-12K
Sample Condition	:	Prototype, Hardware version : V1.0, Software version : V1.50
Quantity of Sample(s)	:	6 pcs
Date of Receival	:	12 Oct., 2019
Date of test Conducted	:	12 Oct., 2019 – 21 Nov., 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:

Tommy Zhong
Technical Manager

Approved by:

Jason Fu
Technical Team Leader

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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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The test report only allows to be revised only within the report defined retention period unless standard or regulation was withdrawn or invalid.

This report is based on original report 190920146GZU-001, dated 14 Nov 2019 and changes the applicant, trade mark, product name and model name to apply for a new certificate.

The model Hiverter Si-4.4K, Hiverter Si-5.5K, Hiverter Si-6.6K, Hiverter Si-8.8K, Hiverter Si-11K, Hiverter Si-12K in this report are same as the model SOFAR 4.4KTL-X, SOFAR 5.5KTL-X, SOFAR 6.6KTL-X, SOFAR 8.8KTL-X,SOFAR 11KTL-X, SOFAR 12KTL-X respectively in the report 190920146GZU-001, except the product name, model name and the trade Mark.

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Rating:

Model	Hiverter Si-4.4K	Hiverter Si-5.5K	Hiverter Si-6.6K	Hiverter Si-8.8K	Hiverter Si-11K	Hiverter Si-12K
PV input						
Max. input voltage	1000 V					
MPPT voltage range (full load)	190V-850V	240V-850V	290V-850V	380V-850V	480V-850V	575V-850V
Max. input current	11/11A					
MPP quantity	2					
AC Output						
Grid voltage	3/N/PE 230/400V					
Grid frequency	50Hz					
Nominal power	4000W	5000W	6000W	8000W	10000W	12000W
Max. apparent power	4400VA	5500VA	6600VA	8800VA	11000VA	13200VA
Max. output current	3*6.4A	3*8.0A	3*9.6A	3*12.8A	3*15.9A	3*19.1A
Operational temperature	-25--60℃					
Protection class	Class I					
Ingress protection	IP65					

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Test Result: Report No.: 191012014GZU-004

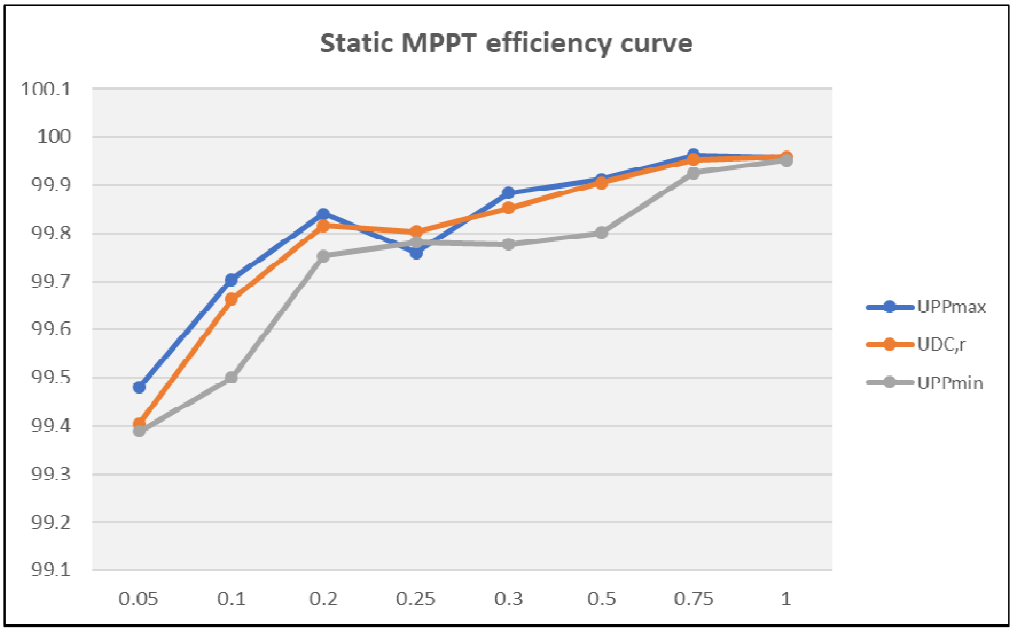
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-4.4K

Simulated I/U characteristic	c-Si	Rated input power ($P_{DC,r}$)	--
Maximum input voltage U_{DCmax} (V)	1000	Maximum input current ($I_{DC,max}$)	22A
Minimum input voltage U_{DCmin} (V)	160	Rated grid voltage ($U_{AC,r}$)	230V
Rated input voltage $U_{DC,r}$ (V)	600	Rated power ($P_{AC,r}$)	4000W
Maximum MPP voltage U_{MPPmax} (V)	850	Minimum MPP voltage (U_{MPPmin})	190

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		
$U_{MPP\,max}$	800	99.48	99.70	99.84	99.76	99.88	99.91	99.96	99.96	99.88	99.93
$U_{DC,r}$	600	99.40	99.66	99.82	99.80	99.85	99.91	99.95	99.96	99.87	99.91
$U_{MPP\,min}$	190	99.39	99.50	99.75	99.78	99.78	99.80	99.93	99.95	99.79	99.86

Static MPPT efficiency: 99.96% max. European MPPT efficiency:99.85%, CEC MPPT efficiency:99.90%



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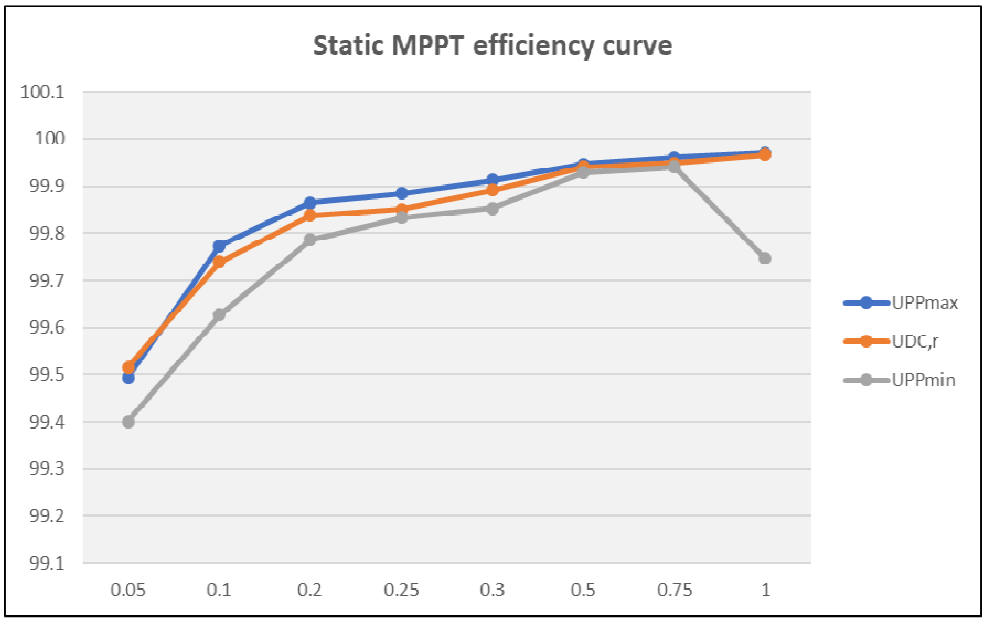
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-5.5K

Simulated I/U characteristic	c-Si	Rated input power ($P_{DC,r}$)	--
Maximum input voltage U_{DCmax} (V)	1000	Maximum input current ($I_{DC,max}$)	22A
Minimum input voltage U_{DCmin} (V)	160	Rated grid voltage ($U_{AC,r}$)	230V
Rated input voltage $U_{DC,r}$ (V)	600	Rated power ($P_{AC,r}$)	5000W
Maximum MPP voltage U_{MPPmax} (V)	850	Minimum MPP voltage (U_{MPPmin})	240

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		
$U_{MPP\,max}$	800	99.49	99.77	99.87	99.89	99.91	99.95	99.96	99.97	99.91	99.94
$U_{DC,r}$	600	99.52	99.74	99.84	99.85	99.89	99.94	99.95	99.97	99.90	99.93
$U_{MPP\,min}$	240	99.40	99.63	99.79	99.83	99.85	99.93	99.94	99.75	99.83	99.90

Static MPPT efficiency: 99.97% max. European MPPT efficiency:99.88% CEC MPPT efficiency:99.92%



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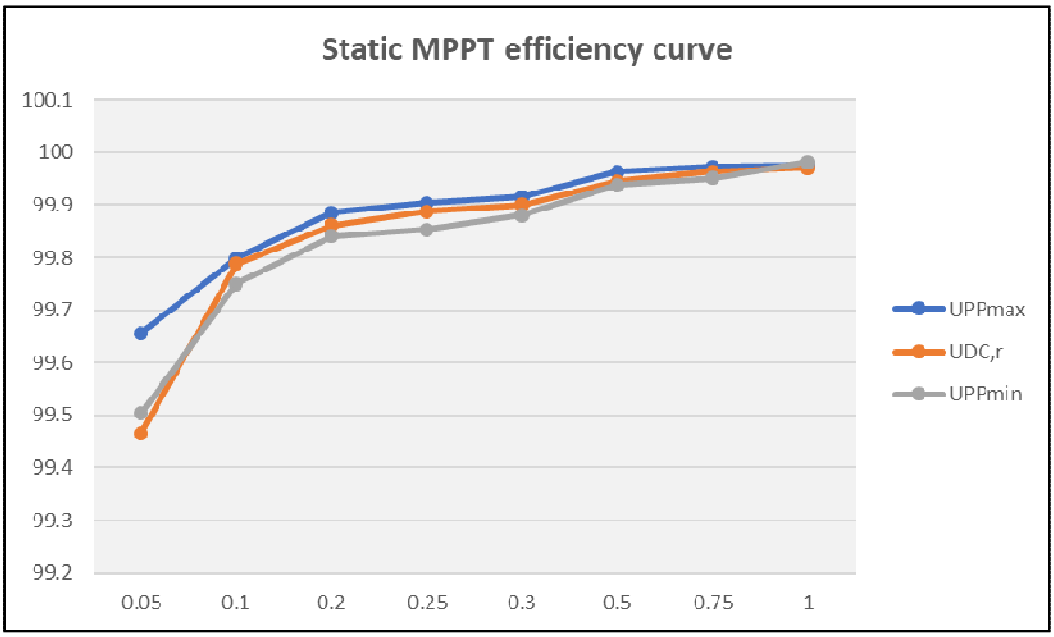
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-6.6K

Simulated I/U characteristic	c-Si	Rated input power ($P_{DC,r}$)	--
Maximum input voltage U_{DCmax} (V)	1000	Maximum input current ($I_{DC,max}$)	22A
Minimum input voltage U_{DCmin} (V)	160	Rated grid voltage ($U_{AC,r}$)	230V
Rated input voltage $U_{DC,r}$ (V)	600	Rated power ($P_{AC,r}$)	6000W
Maximum MPP voltage U_{MPPmax} (V)	850	Minimum MPP voltage (U_{MPPmin})	290

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		
$U_{MPP\,max}$	800	99.66	99.80	99.89	99.90	99.92	99.96	99.97	99.98	99.93	99.95
$U_{DC,r}$	600	99.47	99.79	99.86	99.89	99.90	99.95	99.96	99.97	99.91	99.94
$U_{MPP\,min}$	290	99.50	99.75	99.84	99.85	99.88	99.94	99.95	99.98	99.90	99.93

Static MPPT efficiency: 99.98% max. European MPPT efficiency:99.92% CEC MPPT efficiency:99.94%



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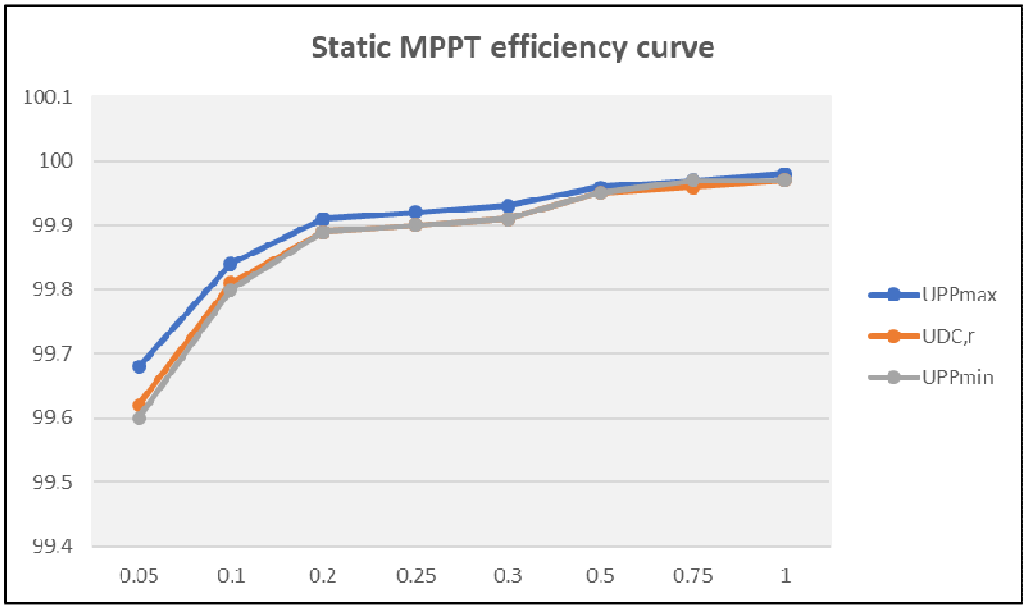
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-8.8K

Simulated I/U characteristic	c-Si	Rated input power ($P_{DC,r}$)	--
Maximum input voltage U_{DCmax} (V)	1000	Maximum input current ($I_{DC,max}$)	22A
Minimum input voltage U_{DCmin} (V)	160	Rated grid voltage ($U_{AC,r}$)	230V
Rated input voltage $U_{DC,r}$ (V)	600	Rated power ($P_{AC,r}$)	8000W
Maximum MPP voltage U_{MPPmax} (V)	850	Minimum MPP voltage (U_{MPPmin})	380

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		
$U_{MPP\,max}$	800	99.68	99.84	99.91	99.92	99.93	99.96	99.97	99.98	99.94	99.96
$U_{DC,r}$	600	99.62	99.81	99.89	99.90	99.91	99.95	99.96	99.97	99.92	99.94
$U_{MPP\,min}$	380	99.60	99.80	99.89	99.90	99.91	99.95	99.97	99.97	99.92	99.95

Static MPPT efficiency: 99.98% max. European MPPT efficiency:99.93% CEC MPPT efficiency:99.95%



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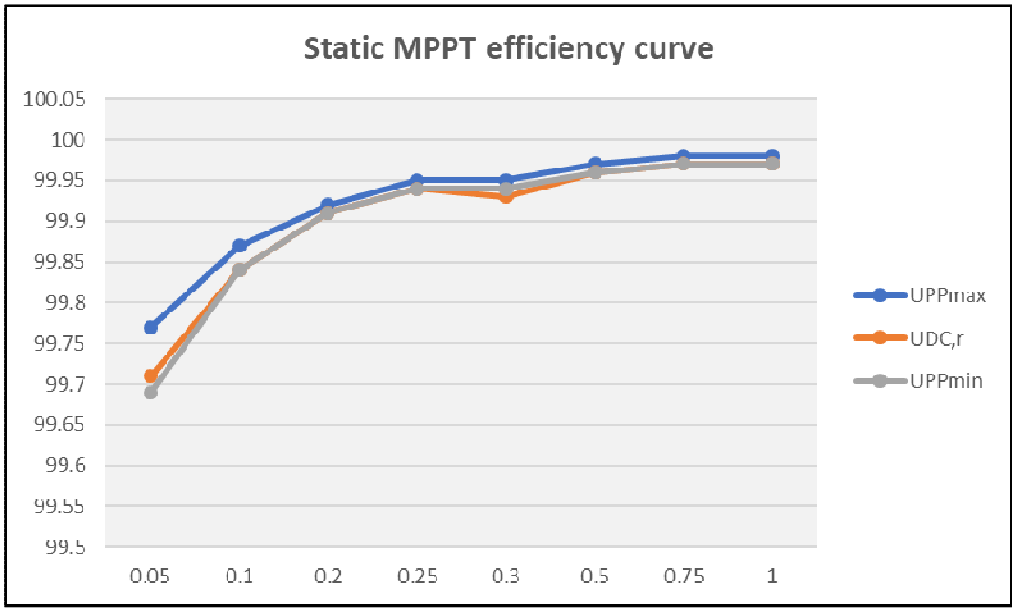
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-11K

Simulated I/U characteristic	c-Si	Rated input power ($P_{DC,r}$)	--
Maximum input voltage U_{DCmax} (V)	1000	Maximum input current ($I_{DC,max}$)	22A
Minimum input voltage U_{DCmin} (V)	160	Rated grid voltage ($U_{AC,r}$)	230V
Rated input voltage $U_{DC,r}$ (V)	600	Rated power ($P_{AC,r}$)	10000W
Maximum MPP voltage U_{MPPmax} (V)	850	Minimum MPP voltage (U_{MPPmin})	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		
$U_{MPP\,max}$	800	99.77	99.87	99.92	99.95	99.95	99.97	99.98	99.98	99.95	99.97
$U_{DC,r}$	600	99.71	99.84	99.91	99.94	99.93	99.96	99.97	99.97	99.94	99.95
$U_{MPP\,min}$	480	99.69	99.84	99.91	99.94	99.94	99.96	99.97	99.97	99.94	99.96

Static MPPT efficiency: 99.98% max. European MPPT efficiency:99.94% CEC MPPT efficiency:99.96%



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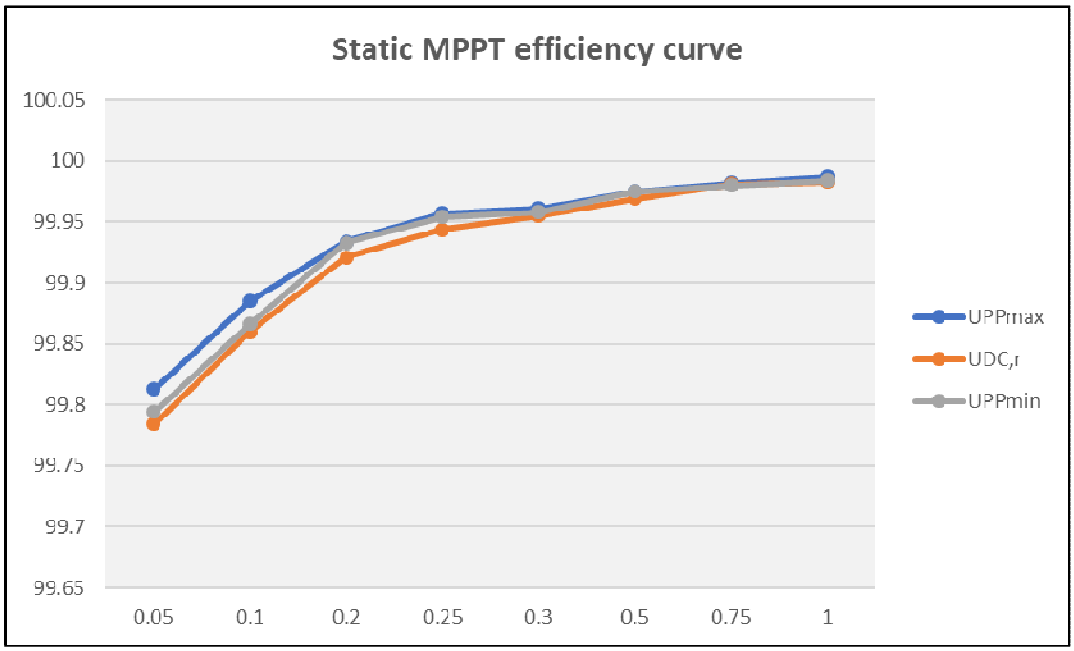
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-12K

Simulated I/U characteristic	c-Si	Rated input power ($P_{DC,r}$)	--
Maximum input voltage U_{DCmax} (V)	1000	Maximum input current ($I_{DC,max}$)	22A
Minimum input voltage U_{DCmin} (V)	160	Rated grid voltage ($U_{AC,r}$)	230V
Rated input voltage $U_{DC,r}$ (V)	600	Rated power ($P_{AC,r}$)	12000W
Maximum MPP voltage U_{MPPmax} (V)	850	Minimum MPP voltage (U_{MPPmin})	575

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		
$U_{MPP\,max}$	800	99.81	99.89	99.93	99.96	99.96	99.98	99.98	99.99	99.96	99.97
$U_{DC,r}$	600	99.78	99.86	99.92	99.94	99.96	99.97	99.98	99.98	99.95	99.97
$U_{MPP\,min}$	575	99.79	99.87	99.93	99.95	99.96	99.98	99.98	99.98	99.96	99.97

Static MPPT efficiency: 99.99% max. European MPPT efficiency:99.96% CEC MPPT efficiency:99.97%



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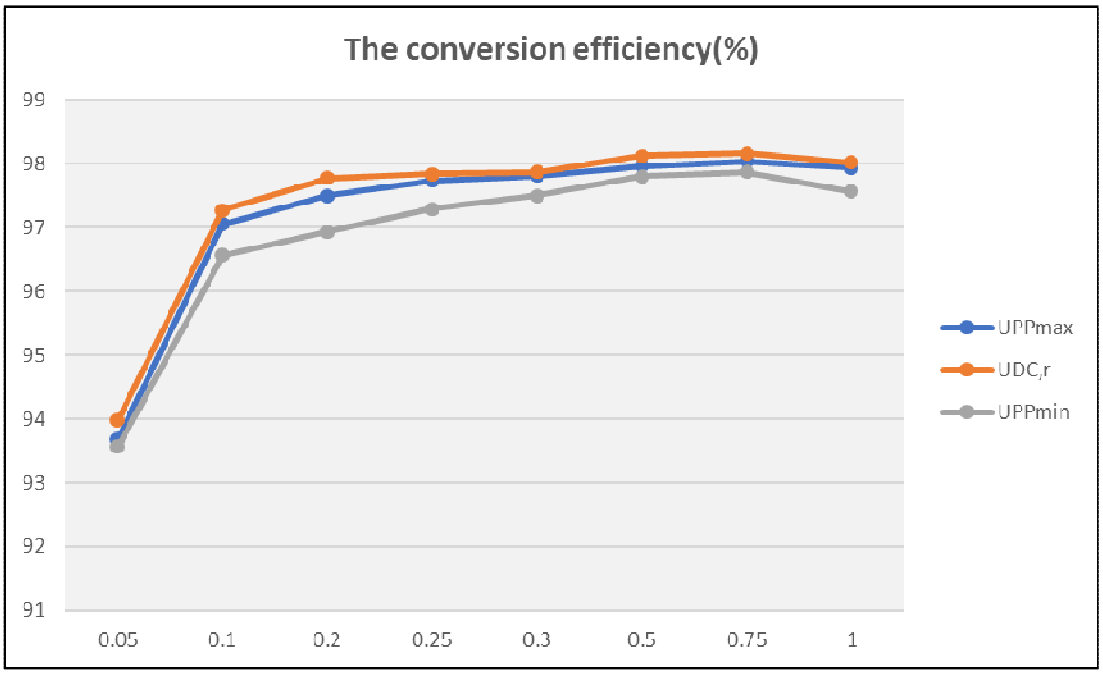
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-4.4K

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		
$U_{MPP\,max}$	800	93.67	97.06	97.50	97.74	97.81	97.96	98.03	97.93	97.70	97.92
$U_{DC,r}$	600	93.97	97.27	97.77	97.84	97.87	98.12	98.16	98.02	97.85	98.06
$U_{MPP\,min}$	190	93.56	96.56	96.93	97.29	97.50	97.80	97.86	97.56	97.41	97.69

Conversion efficiency: 98.16% max. European efficiency:97.65% CEC efficiency:97.89%



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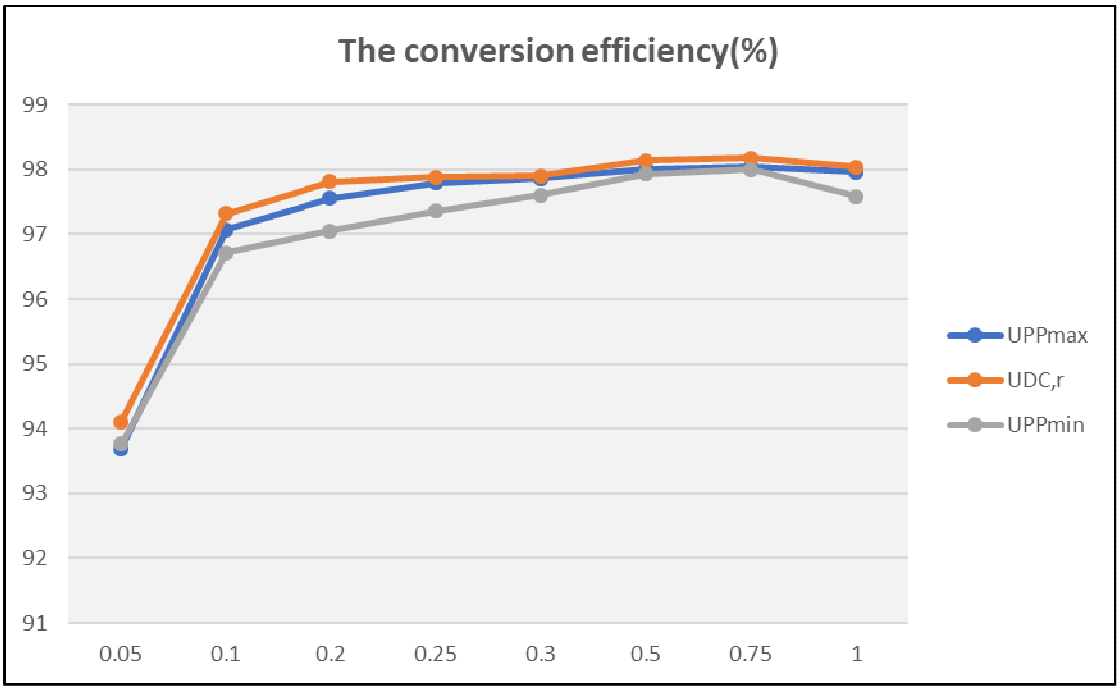
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-5.5K

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		
$U_{MPP\,max}$	800	93.70	97.07	97.56	97.80	97.86	98.01	98.05	97.96	97.74	97.95
$U_{DC,r}$	600	94.11	97.32	97.82	97.89	97.91	98.14	98.18	98.04	97.89	98.08
$U_{MPP\,min}$	240	93.77	96.72	97.06	97.36	97.61	97.93	98.01	97.58	97.52	97.82

Conversion efficiency: 98.18% max. European efficiency:97.72% CEC efficiency:97.95%



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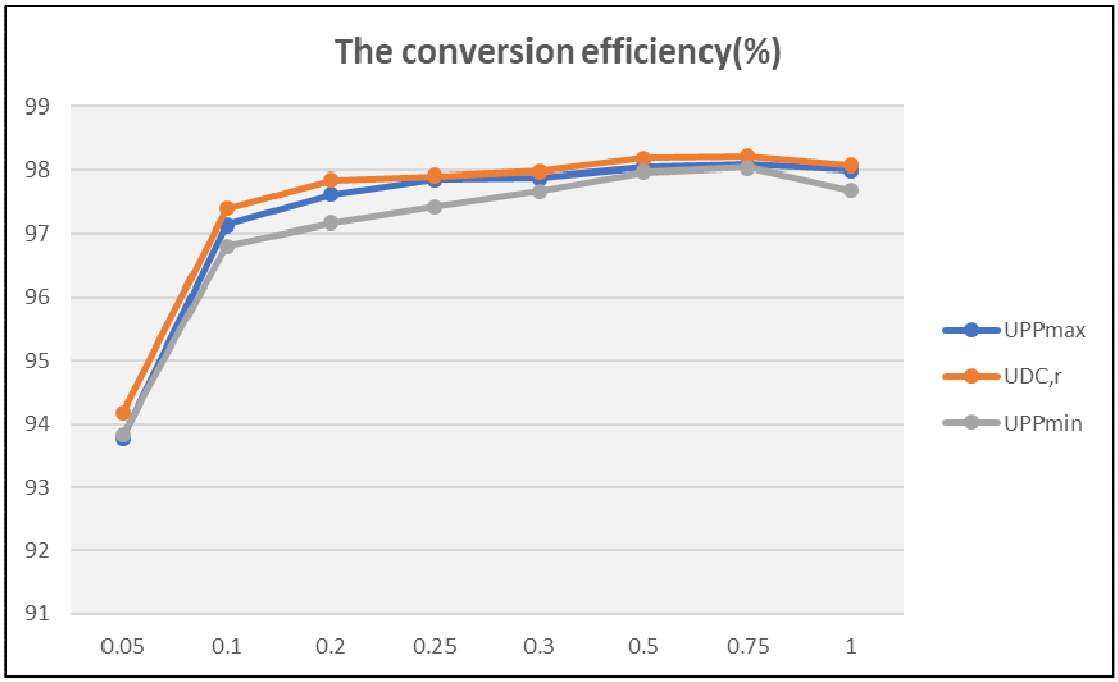
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-6.6K

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		
$U_{MPP\,max}$	800	93.77	97.13	97.61	97.85	97.88	98.05	98.08	98.00	97.78	97.99
$U_{DC,r}$	600	94.17	97.39	97.85	97.91	97.98	98.18	98.22	98.07	97.93	98.12
$U_{MPP\,min}$	290	93.82	96.80	97.16	97.42	97.67	97.97	98.04	97.68	97.58	97.87

Conversion efficiency: 98.22% max. European efficiency:97.77% CEC efficiency:97.99%



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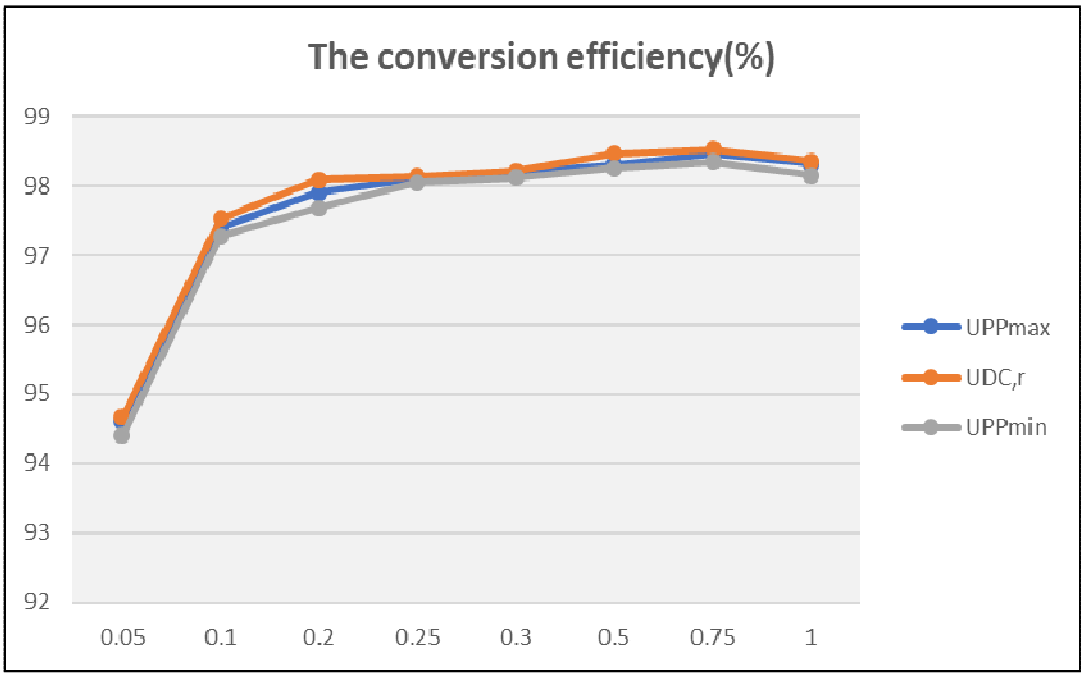
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-8.8K

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		
$U_{MPP\,max}$	800	94.61	97.39	97.90	98.11	98.19	98.31	98.46	98.31	98.08	98.32
$U_{DC,r}$	600	94.67	97.53	98.09	98.14	98.21	98.46	98.53	98.35	98.20	98.40
$U_{MPP\,min}$	380	94.40	97.27	97.68	98.05	98.12	98.26	98.34	98.15	97.97	98.21

Conversion efficiency: 98.53% max. European efficiency:98.08% CEC efficiency:98.31%



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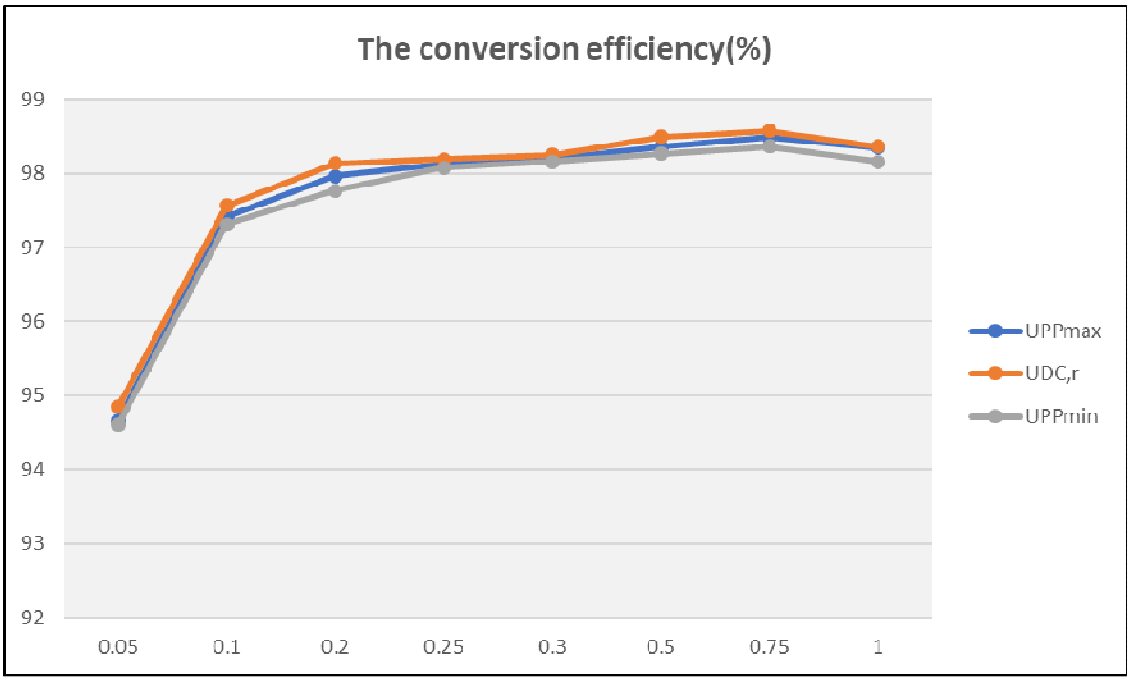
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-11K

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		
$U_{MPP\,max}$	800	94.66	97.42	97.97	98.14	98.20	98.36	98.48	98.35	98.12	98.35
$U_{DC,r}$	600	94.84	97.57	98.14	98.19	98.25	98.50	98.58	98.37	98.23	98.45
$U_{MPP\,min}$	480	94.61	97.32	97.77	98.08	98.16	98.27	98.36	98.16	98.00	98.24

Conversion efficiency: 98.58% max. European efficiency:98.12% CEC efficiency:98.34%



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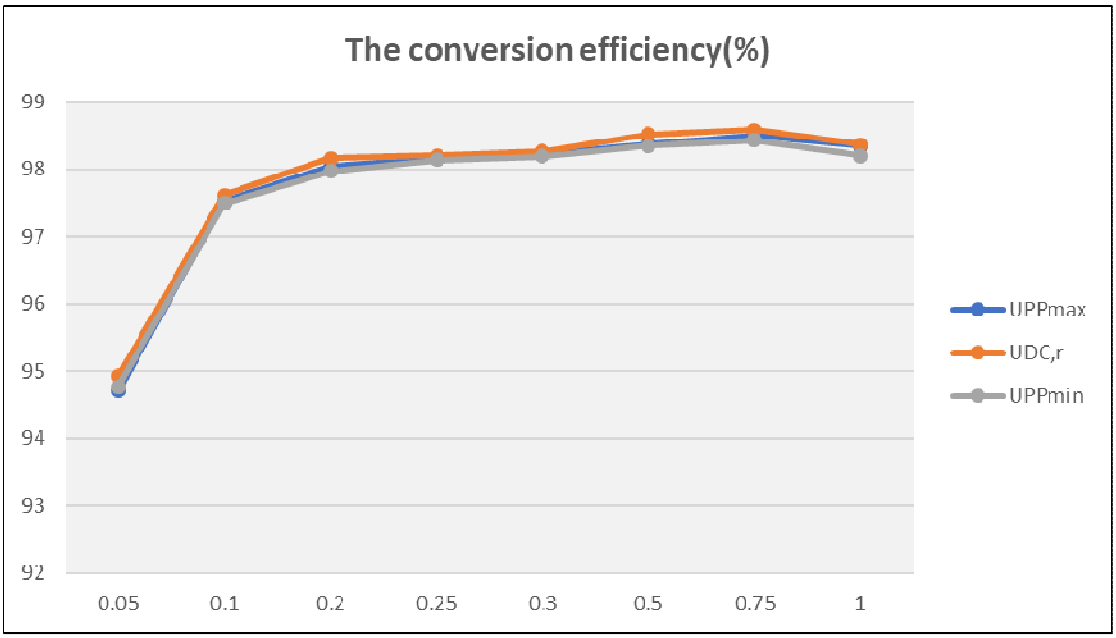
Test Result: Report No.: 191012014GZU-004

Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-12K

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		
$U_{MPP\,max}$	800	94.70	97.53	98.05	98.17	98.22	98.37	98.50	98.35	98.15	98.37
$U_{DC,r}$	600	94.93	97.61	98.17	98.20	98.26	98.52	98.59	98.37	98.26	98.46
$U_{MPP\,min}$	575	94.77	97.50	97.97	98.14	98.19	98.35	98.43	98.20	98.10	98.32

Conversion efficiency: 98.59% max. European efficiency:98.17% CEC efficiency:98.38%



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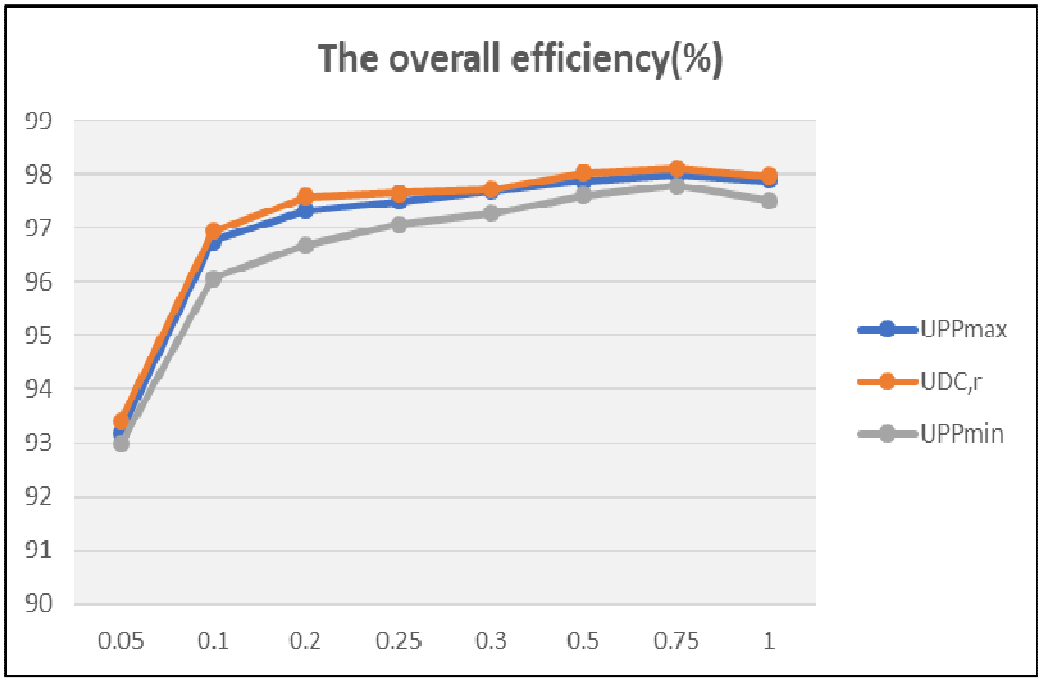
Test Result: Report No.: 191012014GZU-004

Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-4.4K

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		
$U_{MPP\,max}$	800	93.19	96.77	97.34	97.50	97.70	97.87	98.00	97.89	97.58	97.85
$U_{DC,r}$	600	93.41	96.94	97.59	97.65	97.73	98.03	98.11	97.98	97.73	97.97
$U_{MPP\,min}$	190	92.98	96.08	96.69	97.08	97.28	97.61	97.79	97.51	97.21	97.55

The overall efficiency: 98.11% max. European efficiency:97.51% CEC efficiency:97.79%



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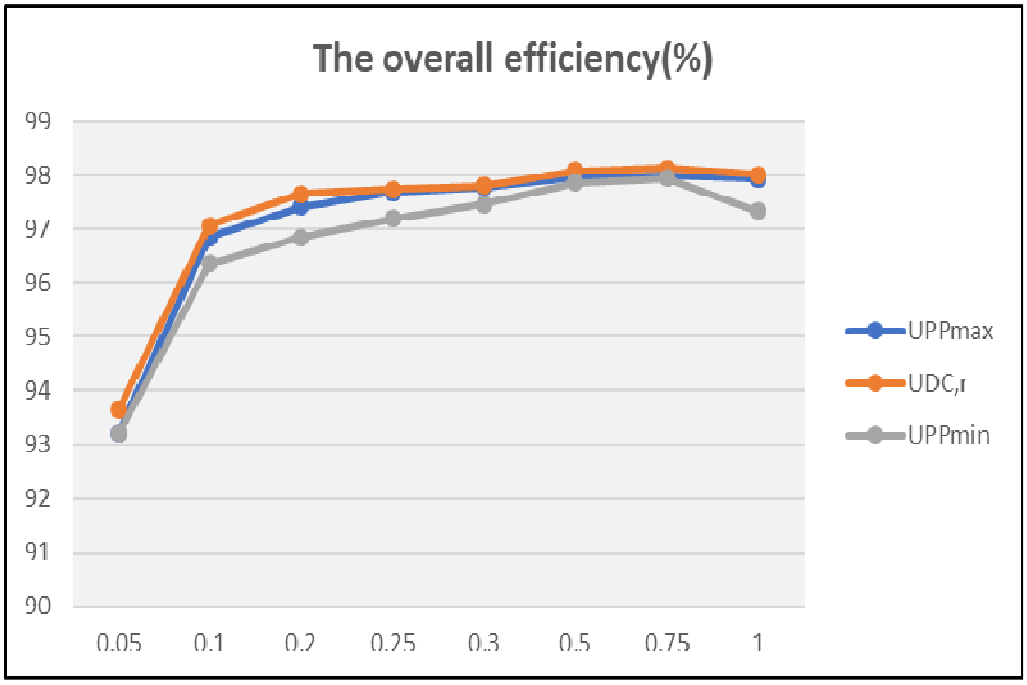
Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-5.5K

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		
$U_{MPP\,max}$	800	93.22	96.85	97.43	97.68	97.77	97.96	98.01	97.93	97.66	97.89
$U_{DC,r}$	600	93.65	97.07	97.66	97.74	97.80	98.09	98.13	98.01	97.79	98.01
$U_{MPP\,min}$	240	93.21	96.36	96.85	97.20	97.47	97.87	97.95	97.34	97.36	97.72

The overall efficiency: 98.13% max. European efficiency:97.60% CEC efficiency:97.87%



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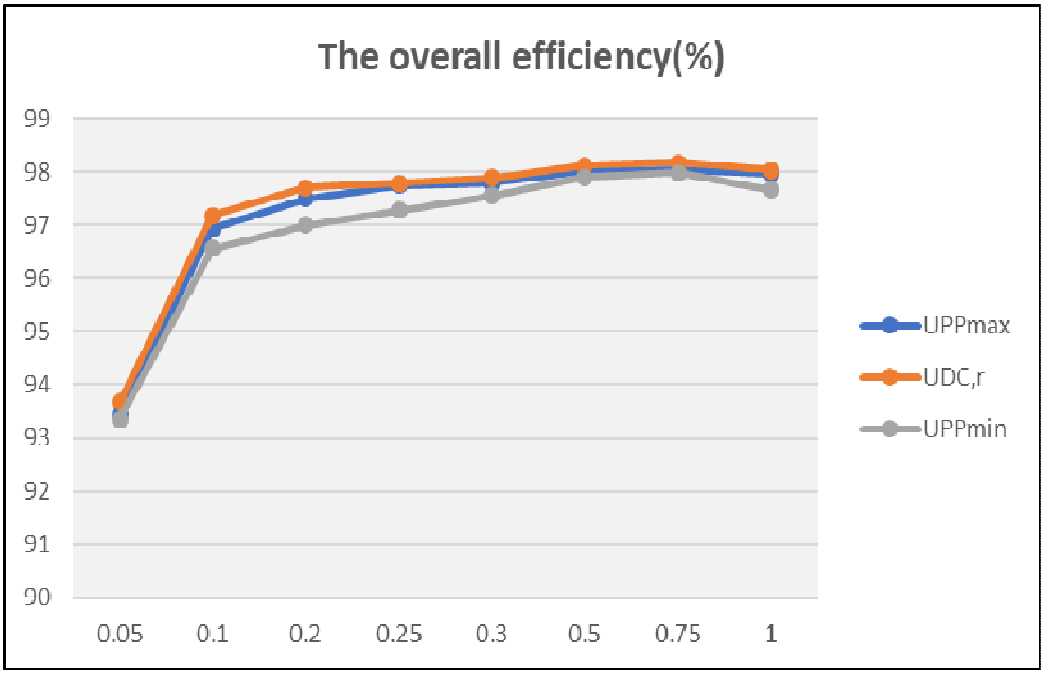
Test Result: Report No.: 191012014GZU-004

Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-6.6K

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		
$U_{MPP\,max}$	800	93.44	96.94	97.50	97.76	97.80	98.02	98.05	97.97	97.72	97.94
$U_{DC,r}$	600	93.67	97.18	97.71	97.80	97.88	98.13	98.18	98.04	97.84	98.06
$U_{MPP\,min}$	290	93.35	96.56	97.01	97.28	97.56	97.91	97.99	97.67	97.49	97.80

The overall efficiency: 98.18% max. European efficiency:97.68% CEC efficiency:97.93%



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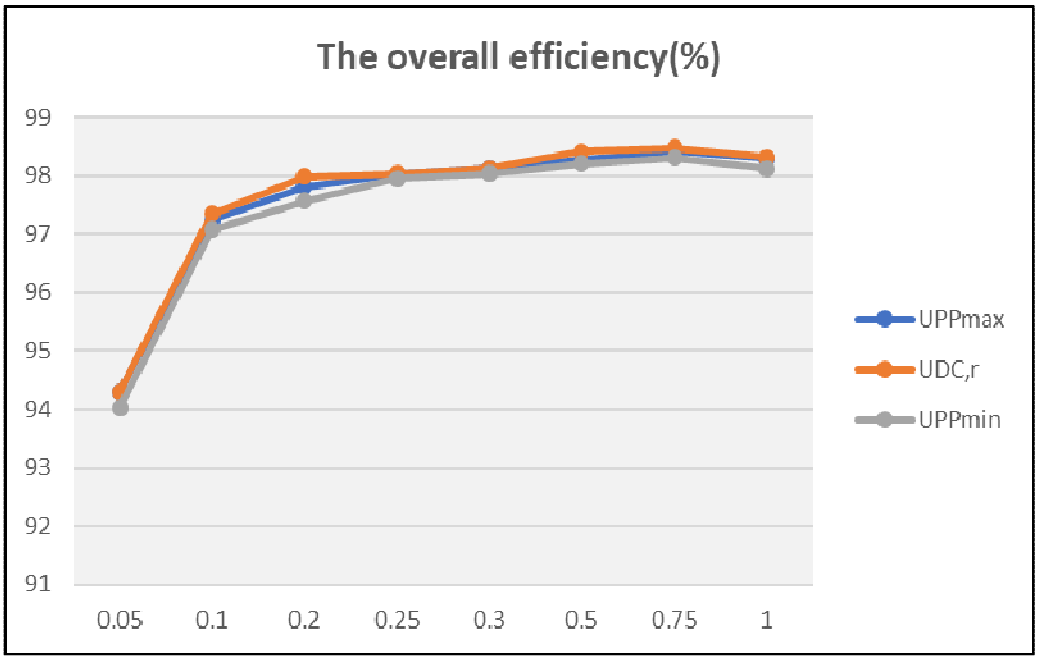
Test Result: Report No.: 191012014GZU-004

Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-8.8K

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		
$U_{MPP\,max}$	800	94.31	97.24	97.82	98.03	98.12	98.27	98.43	98.29	98.02	98.27
$U_{DC,r}$	600	94.31	97.35	97.98	98.04	98.12	98.41	98.49	98.32	98.12	98.35
$U_{MPP\,min}$	380	94.03	97.08	97.57	97.95	98.03	98.21	98.31	98.12	97.90	98.16

The overall efficiency: 98.49% max. European efficiency:98.01% CEC efficiency:98.26%



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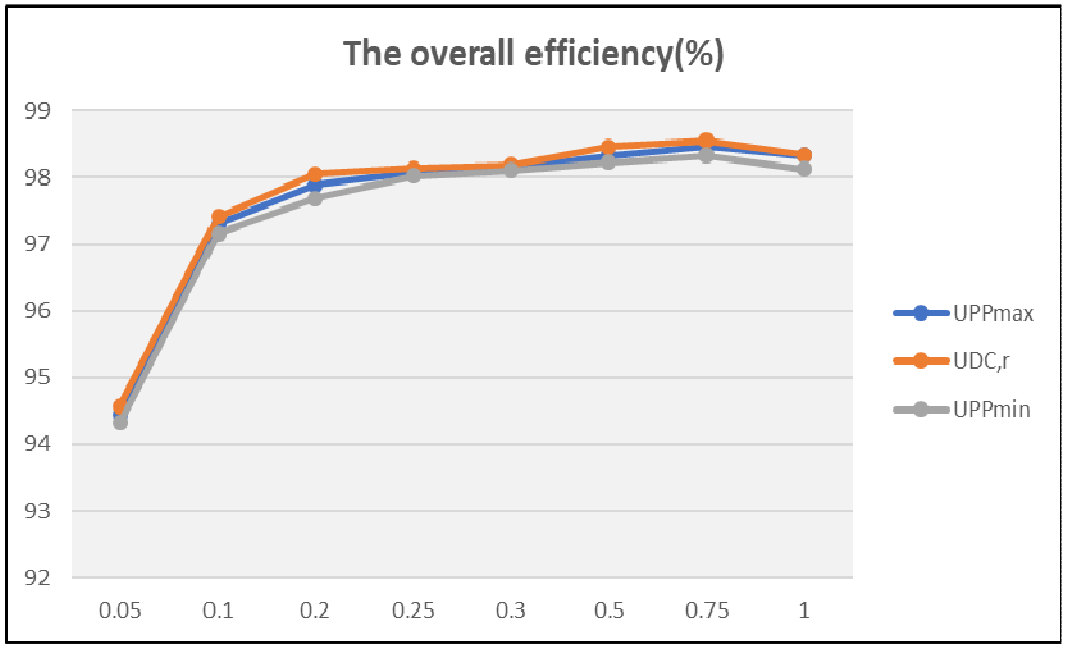
Test Result: Report No.: 191012014GZU-004

Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-11K

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		
$U_{MPP\,max}$	800	94.44	97.30	97.89	98.09	98.15	98.33	98.46	98.33	98.08	98.32
$U_{DC,r}$	600	94.57	97.41	98.05	98.13	98.18	98.46	98.55	98.34	98.17	98.40
$U_{MPP\,min}$	480	94.31	97.16	97.69	98.03	98.10	98.23	98.33	98.13	97.94	98.19

The overall efficiency: 98.55% max. European efficiency:98.06% CEC efficiency:98.30%



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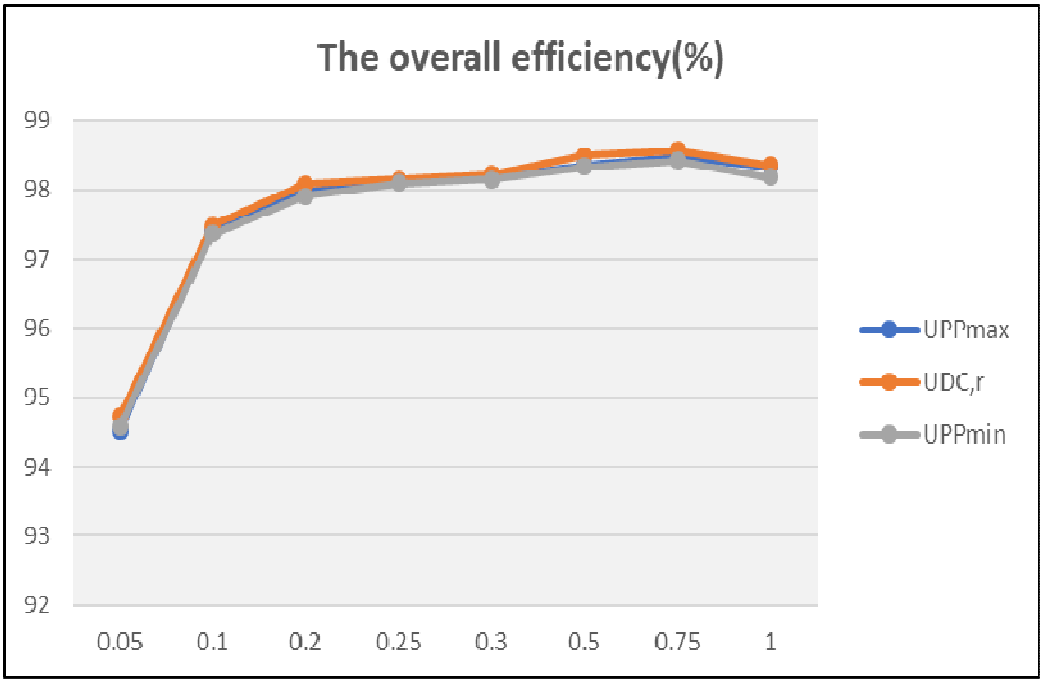
Test Result: Report No.: 191012014GZU-004

Manufacturer: Hitachi Hi-Rel Power Electronics Pvt. Ltd.
Model: Hiverter Si-12K

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		
$U_{MPP\,max}$	800	94.53	97.42	97.98	98.13	98.18	98.35	98.48	98.33	98.11	98.34
$U_{DC,r}$	600	94.72	97.47	98.09	98.15	98.22	98.49	98.57	98.35	98.21	98.43
$U_{MPP\,min}$	575	94.58	97.36	97.91	98.10	98.15	98.33	98.42	98.18	98.06	98.29

The overall efficiency: 98.57% max. European efficiency:98.13% CEC efficiency:98.35%



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Test Result:

Report No.: 191012014GZU-004

Model: Hiverter Si-4.4K

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % PDCn

Irradiance 100-500W/m²(10%-50%P_{DCn})							
# Number	Slope W/m2/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	99.368
2	1	400	10	400	10	1940	97.234
3	2	200	10	200	10	1560	90.391
4	3	133	10	133	10	1447	97.678
6	5	80	10	80	10	1300	98.167
8	7	57	10	57	10	1374	97.100
10	10	40	10	40	10	1700	97.256
10	14	29	10	29	10	1071	96.799
10	20	20	10	20	10	900	96.562
10	30	13	10	13	10	767	96.922
10	50	8	10	8	10	660	96.203

B.3 Test sequence with ramps 30 % - 100 % PDCn

Irradiance 300-1000W/m²(30%-100%P_{DCn})							
# Number	Slope W/m2/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	99.653
10	14	50	10	50	10	1500	99.232
10	20	35	10	35	10	1200	99.310
10	30	23	10	23	10	967	99.189
10	50	14	10	14	10	780	99.394
10	100	7	10	7	10	640	99.182

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

Irradiance 10-100W/m2(slow ramps)							
# Number	Slope W/m2/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	95.751

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	97.522

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Test Result:

Model: Hiverter Si-5.5K

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % PDCn

Irradiance 100-500W/m²(10%-50%P_{DCn})							
# Number	Slope W/m2/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	99.338
2	1	400	10	400	10	1940	98.172
3	2	200	10	200	10	1560	94.434
4	3	133	10	133	10	1447	98.569
6	5	80	10	80	10	1300	98.039
8	7	57	10	57	10	1374	97.075
10	10	40	10	40	10	1700	97.033
10	14	29	10	29	10	1071	96.792
10	20	20	10	20	10	900	96.973
10	30	13	10	13	10	767	97.204
10	50	8	10	8	10	660	96.545

B.3 Test sequence with ramps 30 % - 100 % PDCn

Irradiance 300-1000W/m²(30%-100%P_{DCn})							
# Number	Slope W/m2/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	99.847
10	14	50	10	50	10	1500	99.761
10	20	35	10	35	10	1200	99.788
10	30	23	10	23	10	967	99.815
10	50	14	10	14	10	780	99.551
10	100	7	10	7	10	640	99.690

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

Irradiance 10-100W/m2(slow ramps)							
# Number	Slope W/m2/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	99.310

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.219

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Test Result:

Model: Hiverter Si-6.6K

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % PDCn

Irradiance 100-500W/m²(10%-50%P_{DCn})							
# Number	Slope W/m2/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	99.235
2	1	400	10	400	10	1940	98.459
3	2	200	10	200	10	1560	98.587
4	3	133	10	133	10	1447	98.554
6	5	80	10	80	10	1300	97.703
8	7	57	10	57	10	1374	96.822
10	10	40	10	40	10	1700	96.774
10	14	29	10	29	10	1071	96.883
10	20	20	10	20	10	900	96.786
10	30	13	10	13	10	767	97.737
10	50	8	10	8	10	660	97.090

B.3 Test sequence with ramps 30 % - 100 % PDCn

Irradiance 300-1000W/m²(30%-100%P_{DCn})							
# Number	Slope W/m2/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	99.846
10	14	50	10	50	10	1500	99.796
10	20	35	10	35	10	1200	99.742
10	30	23	10	23	10	967	99.714
10	50	14	10	14	10	780	99.678
10	100	7	10	7	10	640	99.605

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

Irradiance 10-100W/m2(slow ramps)							
# Number	Slope W/m2/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	99.402

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.467

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Test Result:

Model: Hiverter Si-8.8K

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % PDCn

Irradiance 100-500W/m²(10%-50%P_{DCn})							
# Number	Slope W/m2/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	98.936
2	1	400	10	400	10	1940	98.691
3	2	200	10	200	10	1560	98.778
4	3	133	10	133	10	1447	98.356
6	5	80	10	80	10	1300	97.754
8	7	57	10	57	10	1374	97.795
10	10	40	10	40	10	1700	97.281
10	14	29	10	29	10	1071	97.622
10	20	20	10	20	10	900	96.794
10	30	13	10	13	10	767	97.263
10	50	8	10	8	10	660	97.128

B.3 Test sequence with ramps 30 % - 100 % PDCn

Irradiance 300-1000W/m²(30%-100%P_{DCn})							
# Number	Slope W/m2/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	99.822
10	14	50	10	50	10	1500	99.746
10	20	35	10	35	10	1200	99.702
10	30	23	10	23	10	967	99.640
10	50	14	10	14	10	780	99.606
10	100	7	10	7	10	640	99.653

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

Irradiance 10-100W/m2(slow ramps)							
# Number	Slope W/m2/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	99.402

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.554

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Test Result:

Report No.: 191012014GZU-004

Model: Hiverter Si-11K

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % PDCn

Irradiance 100-500W/m²(10%-50%P_{DCn})							
# Number	Slope W/m2/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	99.108
2	1	400	10	400	10	1940	99.368
3	2	200	10	200	10	1560	98.737
4	3	133	10	133	10	1447	98.524
6	5	80	10	80	10	1300	98.146
8	7	57	10	57	10	1374	97.892
10	10	40	10	40	10	1700	97.384
10	14	29	10	29	10	1071	97.827
10	20	20	10	20	10	900	97.421
10	30	13	10	13	10	767	97.404
10	50	8	10	8	10	660	97.651

B.3 Test sequence with ramps 30 % - 100 % PDCn

Irradiance 300-1000W/m²(30%-100%P_{DCn})							
# Number	Slope W/m2/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	99.791
10	14	50	10	50	10	1500	99.740
10	20	35	10	35	10	1200	99.702
10	30	23	10	23	10	967	99.628
10	50	14	10	14	10	780	99.603
10	100	7	10	7	10	640	99.604

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

Irradiance 10-100W/m2(slow ramps)							
# Number	Slope W/m2/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	99.475

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.723

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Report No.: 191012014GZU-004

Model: Hiverter Si-12K

4.4 Dynamic MPPT efficiency

B.2 Test sequence with ramps 10 % - 50 % PDCn

Irradiance 100-500W/m²(10%-50%P_{DCn})							
# Number	Slope W/m2/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	98.882
2	1	400	10	400	10	1940	98.727
3	2	200	10	200	10	1560	99.102
4	3	133	10	133	10	1447	98.590
6	5	80	10	80	10	1300	98.320
8	7	57	10	57	10	1374	98.509
10	10	40	10	40	10	1700	97.707
10	14	29	10	29	10	1071	97.753
10	20	20	10	20	10	900	97.932
10	30	13	10	13	10	767	96.563
10	50	8	10	8	10	660	98.225

B.3 Test sequence with ramps 30 % - 100 % PDCn

Irradiance 300-1000W/m²(30%-100%P_{DCn})							
# Number	Slope W/m2/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	99.820
10	14	50	10	50	10	1500	99.833
10	20	35	10	35	10	1200	99.760
10	30	23	10	23	10	967	99.778
10	50	14	10	14	10	780	99.785
10	100	7	10	7	10	640	99.721

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

Irradiance 10-100W/m2(slow ramps)							
# Number	Slope W/m2/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	99.635

Calculation of the dynamic MPPT efficiency

The overall dynamic MPPT efficiency:	98.813

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Appendix Photos: Report No.: 191012014GZU-004

Overview

Heatsink view

**********End of report**********

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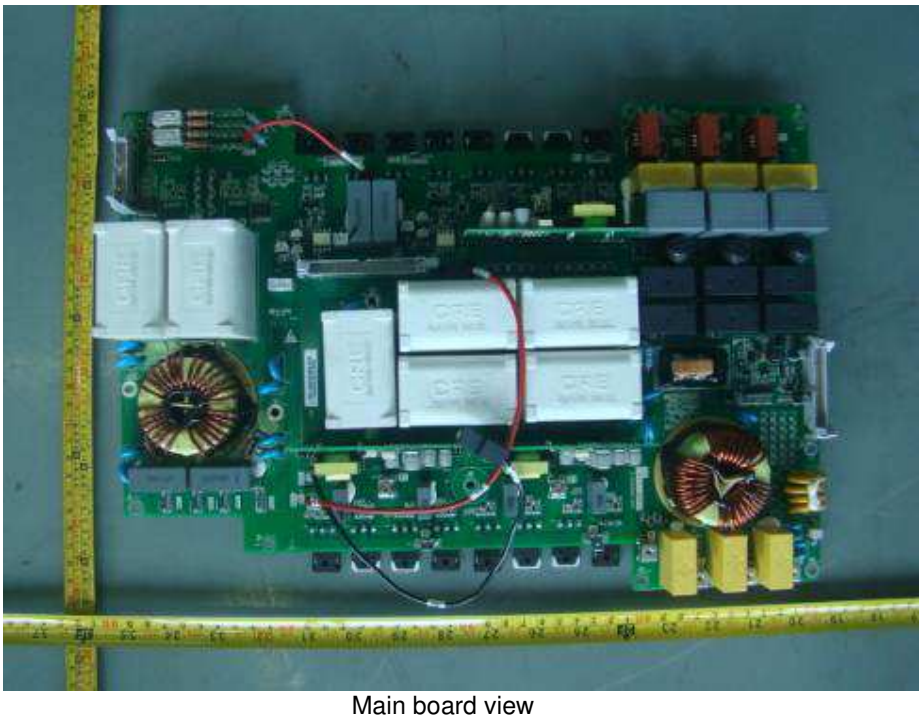
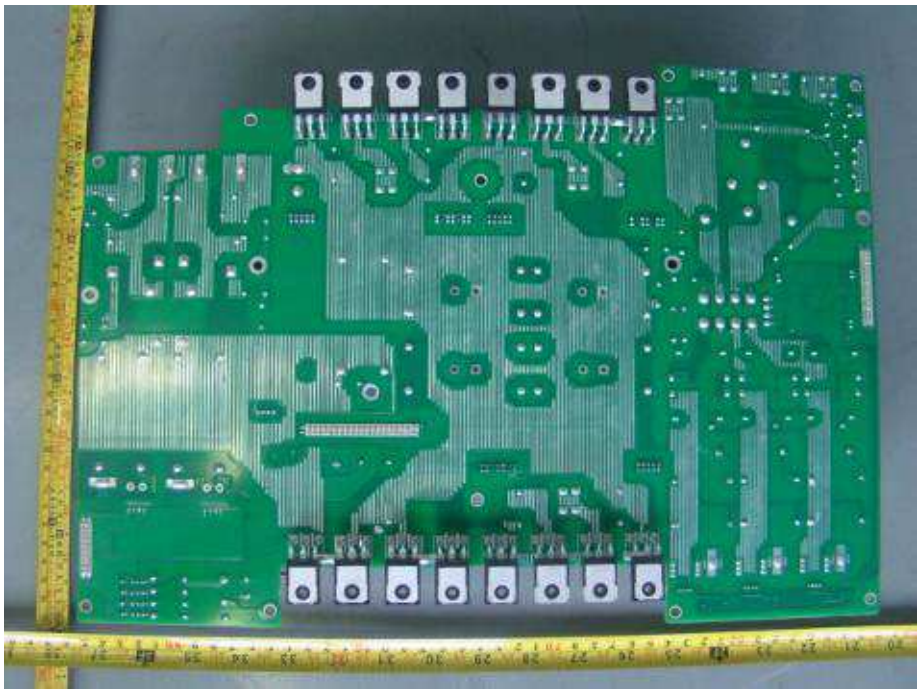


Main board view



Main board view （reverse）

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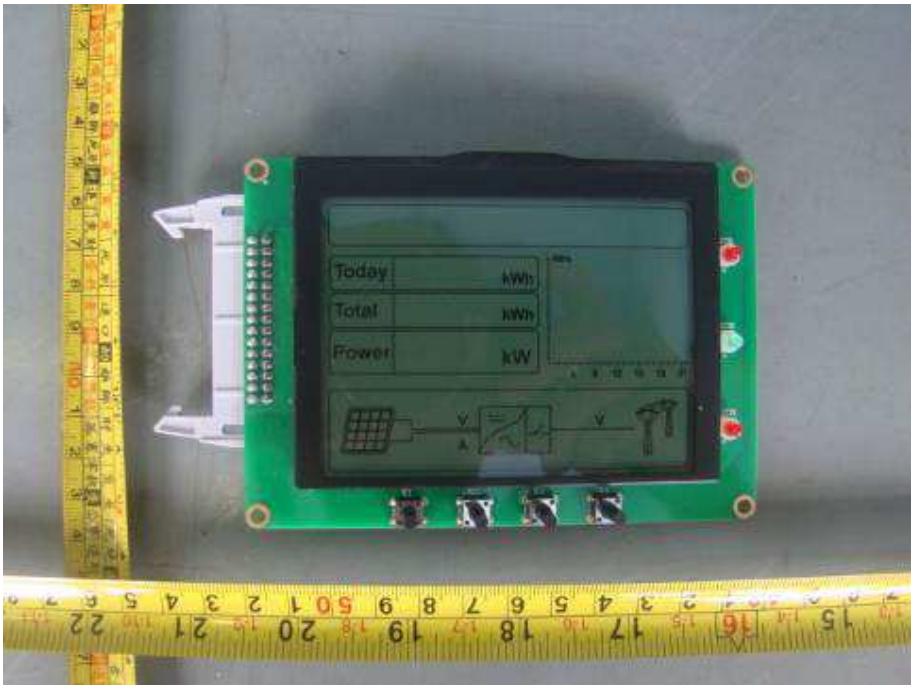
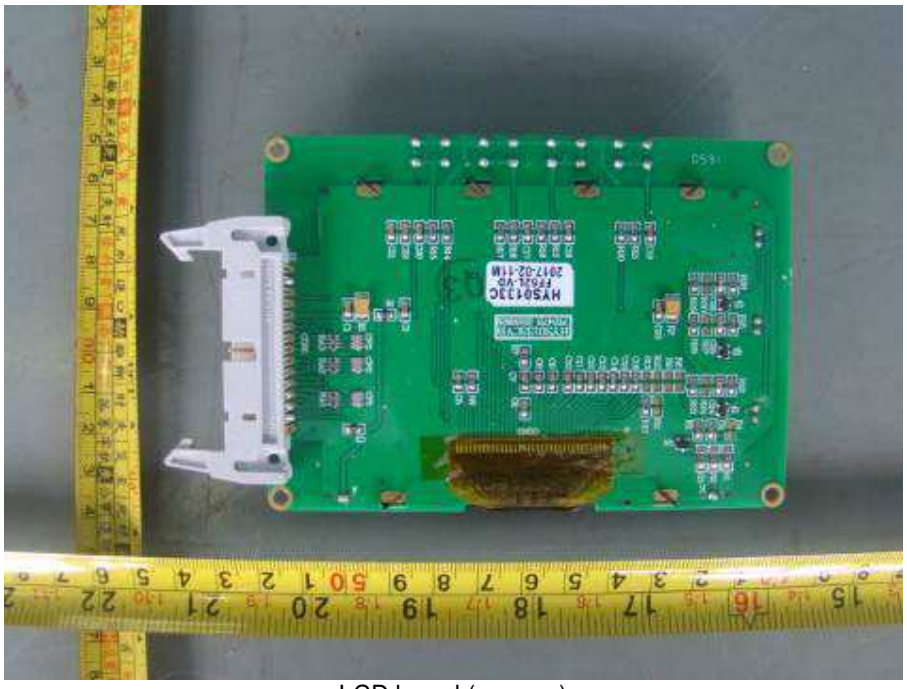


LCD board



LCD board (reverse)

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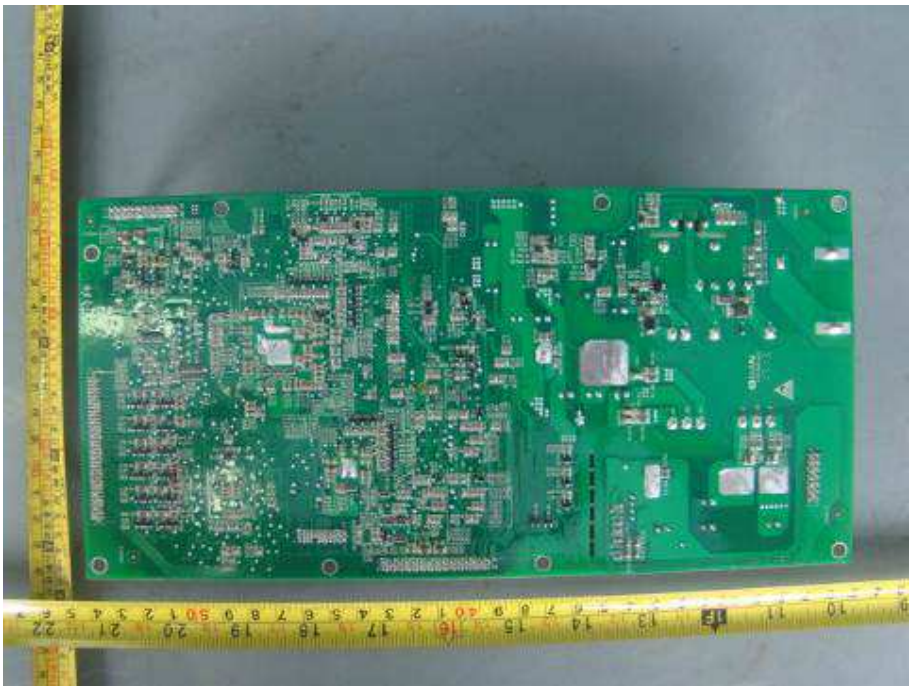
Control board



Control board (reverse)

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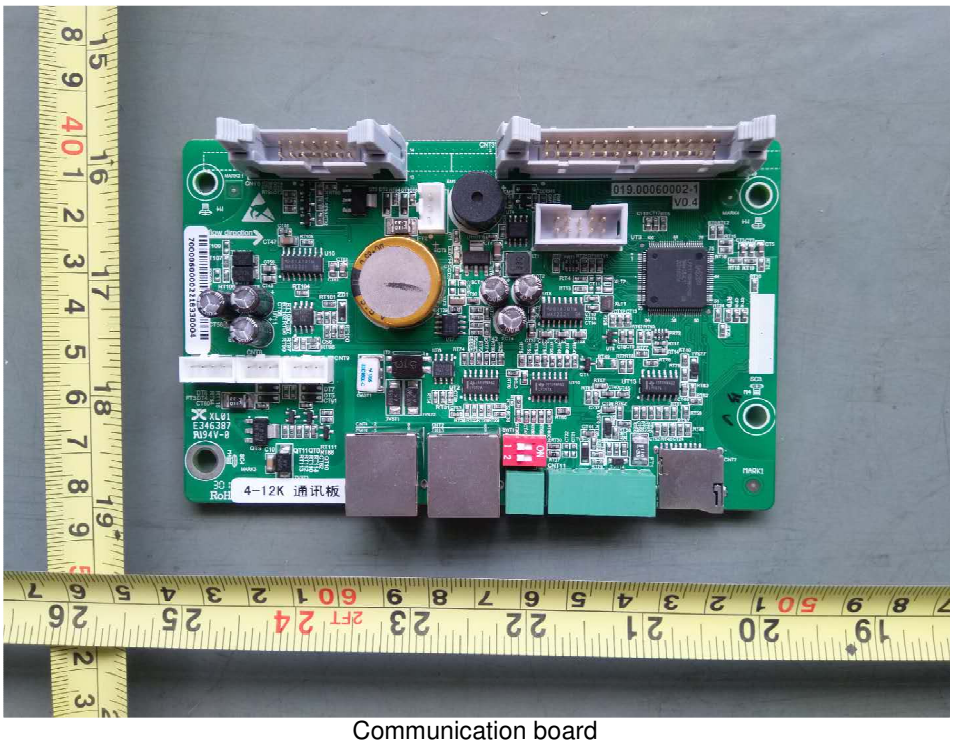
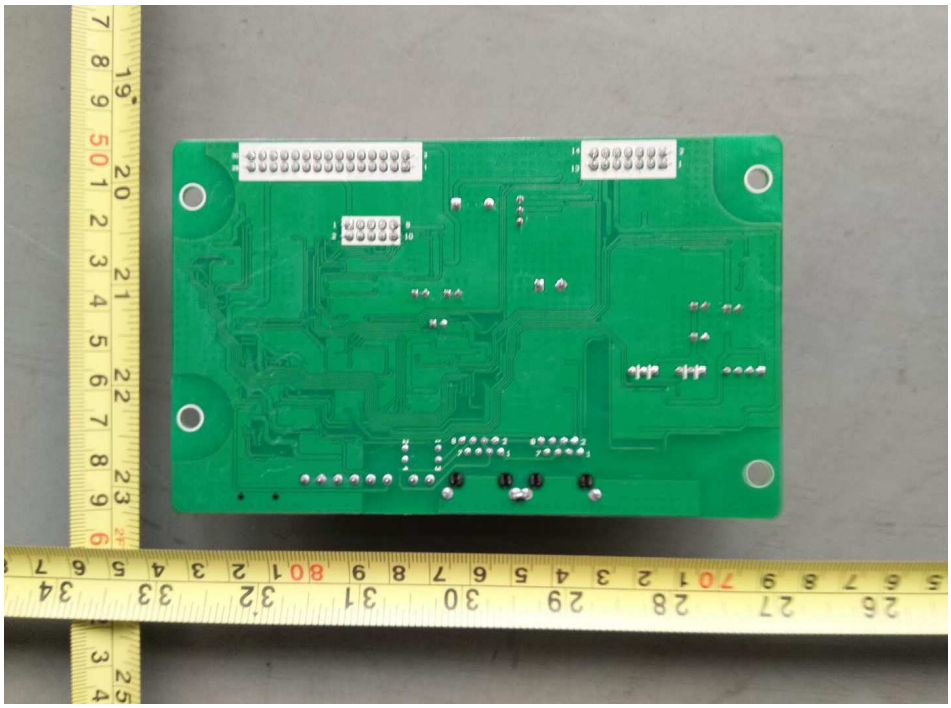


Communication board



Communication board (reverse)

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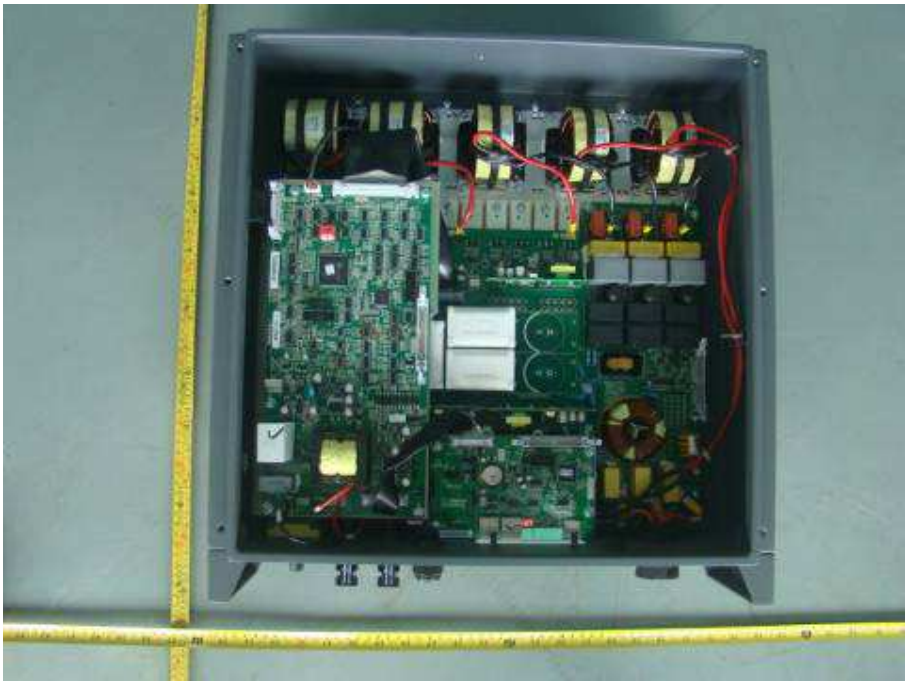
Appendix Photos: Report No.: 191012014GZU-004

Internal view for Hiverter Si-8.8K, Hiverter Si-11K, Hiverter Si-12K



Internal view for Hiverter Si-4.4K, Hiverter Si-5.5K, Hiverter Si-6.6K

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Input/output terminal view

--- End of test report---

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