Certificate NEN EN 50438:2013

Manufacturer declaration and Type testing of compliance with the regulations of the Netherlands on connection of photovoltaic installations to the low voltage network.

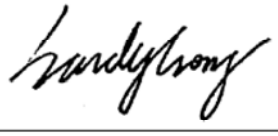
Type reference number	*Eversol TLC15K* *Eversol TLC17K* *Eversol TLC20K*		
Type	*Photovoltaic Inverter*		
Manufacturer:	*Jiangsu Zeversolar New Energy CO., LTD.*		
Address	*No. 198 Xiangyang Road, Suzhou, 215011 China*		
Tel	*+86 512 6937 0998*	Fax	*+86 512 6937 0630*
E:mail	*service.china@zeversolar.com*	Web site	*www.zeversolar.com*

Test house details:	*Jiangsu Zeversolar New Energy CO., LTD.* *R&D Department,Suzhou*

Type reference	Nominal AC power	Max.AC power
Eversol TLC15K	*15.0kW*	*15.0kW*
Eversol TLC17K	*17.0kW*	*17.0kW*
Eversol TLC20K	*20.0kW*	*20.0kW*

Jiangsu Zeversolar New Energy CO., LTD hereby declares that the inverter listed above meet the regulations of the Netherlands on connection of photovoltaic installations to the low voltage network.
The inverters conforming to the regulations of the Netherlands are characterized, along with the specification in the datasheet and the CE declaration, by the following features:
- There are two certificate of VDE 0126-1-1/A1:2012 and VDE 0126-1-1:2013 issued by an accredited institute. Those certificates can be downloaded from the website http://www.zeversolar.com/.
- The automatic disconnection devices integrated within the inverters meet the requirements of DIN VDE 0126-1-1:2006 with the deviation of NEN EN50438:2013
- These parameters can't be changed by user, an installer or by any person other than Zeversolar (password protected).
- The inverter can be capable of operating in an adjustable displacement factor between 0.85ind and 0.85cap. There are three reactive power control models (a displacement factor/active Power characteristic cosφ(P), a fixed displacement factor cosφ, a reactive power/voltage characteristic Q(U)). But the displacement factor is set to one as default.

The models TLC15K, TLC17K are similar to TLC20K on hardware except that the output power was decreased. The function was achieved by software..

Name of signatory and title	*Sandy Gong* *Manager of Safety Dept*	Date and Place	*1/4/2016* *Suzhou*
Signed		On behalf of	*Jiangsu Zeversolar New Energy CO., LTD.*

POWER QUALITY

Harmonic current emissions as per EN 61000-3-2							
Harmonic	Test Value in Amps Phase 1	% of fund Phase 1	Test Value in Amps Phase 2	% of fund Phase 2	Test Value in Amps Phase 3	% of fund Phase 3	Limit value in Amps
2	0.131	0.458	0.118	0.409	0.055	0.193	1.080
3	0.046	0.161	0.018	0.061	0.041	0.145	2.300
4	0.090	0.315	0.062	0.215	0.086	0.302	0.430
5	0.141	0.491	0.168	0.584	0.137	0.482	1.140
6	0.030	0.105	0.009	0.031	0.030	0.104	0.300
7	0.101	0.352	0.111	0.387	0.085	0.299	0.770
8	0.042	0.145	0.027	0.094	0.051	0.178	0.230
9	0.027	0.093	0.008	0.028	0.019	0.068	0.400
10	0.063	0.218	0.047	0.164	0.061	0.212	0.184
11	0.099	0.345	0.080	0.277	0.101	0.356	0.330
12	0.015	0.051	0.007	0.023	0.017	0.058	0.153
13	0.084	0.294	0.077	0.269	0.082	0.289	0.210
14	0.011	0.040	0.010	0.034	0.007	0.024	0.131
15	0.006	0.021	0.005	0.017	0.009	0.031	0.150
16	0.019	0.067	0.012	0.042	0.016	0.058	0.115
17	0.052	0.181	0.059	0.207	0.058	0.202	0.132
18	0.010	0.035	0.004	0.015	0.010	0.036	0.102
19	0.057	0.199	0.063	0.218	0.049	0.173	0.118
20	0.009	0.032	0.007	0.026	0.006	0.023	0.092
21	0.013	0.045	0.006	0.021	0.009	0.031	0.107
22	0.008	0.026	0.003	0.011	0.008	0.028	0.084
23	0.056	0.195	0.049	0.169	0.058	0.205	0.098
24	0.007	0.025	0.004	0.013	0.008	0.029	0.077
25	0.049	0.171	0.047	0.164	0.046	0.160	0.090
26	0.007	0.024	0.003	0.011	0.006	0.021	0.071
27	0.003	0.012	0.004	0.013	0.004	0.012	0.083
28	0.007	0.025	0.005	0.018	0.005	0.017	0.066
29	0.030	0.105	0.033	0.115	0.034	0.119	0.078
30	0.006	0.021	0.003	0.011	0.007	0.024	0.061
31	0.039	0.136	0.045	0.155	0.036	0.126	0.073
32	0.006	0.021	0.003	0.010	0.006	0.023	0.058
33	0.008	0.029	0.005	0.018	0.006	0.020	0.068
34	0.007	0.024	0.004	0.014	0.008	0.028	0.054
35	0.036	0.126	0.032	0.112	0.039	0.137	0.064
36	0.004	0.013	0.003	0.011	0.005	0.017	0.051
37	0.027	0.094	0.028	0.099	0.025	0.089	0.061
38	0.003	0.010	0.004	0.015	0.003	0.012	0.048
39	0.003	0.009	0.004	0.013	0.004	0.013	0.058
40	0.006	0.019	0.005	0.019	0.007	0.024	0.046

Voltage Fluctuations and Flicker as per EN 61000-3-11					
	Pst	Plt	d(t) – 500ms	d_c	d_{max}
limit	1.0	0.65	3.3%	3.3%	4.0%
Measured Values at test impedance	0.111	0.088	0.00%	0.20%	0.72%

Test Impedance	R	0.15	Ω	XI	0.15	Ω
Maximum Impedance	R	0.557	Ω	XI	0.557	Ω

Test start date	2012-8-11	Test end date	2012-8-11
Test location	Audix Technology (WuJiang)Co.,Ltd. EMC Dept.		

DC injection				
Test level	20%	50%	75%	100%
Measured value (mA)	38.0	42.0	31.1	52.3
as % of rated AC current	0.13%	0.14%	0.10%	0.17%
Limit	0.5%	0.5%	0.5%	0.5%

UNDER / OVER FREQUENCY PROTECTION

Function	Limit		Actual setting		Trip test	
	Frequency(Hz)	Time(s)	Frequency(Hz)	Time(s)	Frequency(Hz)	Time(s)
U/F Stage 1	48.0	2.0	48.0	1.9	48.00	1.86
O/F Stage 1	51.0	2.0	51.0	1.9	51.01	1.88

UNDER / OVER VOLTAGE PROTECTION

Function	Limit		Actual setting		Trip test	
	Voltage (V)	Time (s)	Voltage (V)	Time (s)	Voltage (V)	Time (s)
U/V Stage 1 L1	184.0	2.0	184.0	1.9	184.1	1.910
U/V Stage 1 L2	184.0	2.0	184.0	1.9	184.9	1.902
U/V Stage 1 L3	184.0	2.0	184.0	1.9	184.7	1.904
O/V Stage 1 L1	253.0	2.0	253.0	1.9	254.3	1.900
O/V Stage 1 L2	253.0	2.0	253.0	1.9	252.8	1.920
O/V Stage 1 L3	253.0	2.0	253.0	1.9	253.9	1.910

LOSS OF MAINS TEST

No.	P_{EUT}[1] (% of EUT rating)	Reactive load (% of Q_L in 6.1.d)1)	P_{AC}[2] (% of nominal)	Q_{AC}[3] (% of nominal)	Disconnection time [s]	Remarks[4]
1	100	100	0	0	113.4	Test A at BL
2	66	66	0	0	131.8	Test B at BL
3	33	33	0	0	117.6	Test C at BL
4	100	100	–5	–5	71.8	Test A at IB
5	100	100	–5	0	72.0	Test A at IB
6	100	100	–5	5	73.2	Test A at IB
7	100	100	0	–5	98.2	Test A at IB
8	100	100	0	5	99.4	Test A at IB
9	100	100	5	–5	98.8	Test A at IB
10	100	100	5	0	64.4	Test A at IB
11	100	100	5	5	46.2	Test A at IB
12	66	66	0	–5	72.0	Test B at IB
13	66	66	0	–4	93.2	Test B at IB
14	66	66	0	–3	116.0	Test B at IB
15	66	66	0	–2	120.4	Test B at IB
16	66	66	0	–1	130.6	Test B at IB
17	66	66	0	1	122.8	Test B at IB
18	66	66	0	2	115.2	Test B at IB
19	66	66	0	3	112.8	Test B at IB
20	66	66	0	4	91.4	Test B at IB
21	66	66	0	5	88.6	Test B at IB
22	33	33	0	–5	72.2	Test C at IB
23	33	33	0	–4	82.6	Test C at IB
24	33	33	0	–3	109.6	Test C at IB
25	33	33	0	–2	112.4	Test C at IB
26	33	33	0	–1	117.0	Test C at IB
27	33	33	0	1	116.0	Test C at IB
28	33	33	0	2	108.2	Test C at IB
29	33	33	0	3	89.2	Test C at IB
30	33	33	0	4	72.4	Test C at IB
31	33	33	0	5	71.6	Test C at IB

[1] P_{EUT}: EUT output power

[2] P_{AC}: Real power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

[3] Q_{AC}: Reactive power flow at S1 in Figure 1. Positive means power from EUT to utility. Nominal is the 0 % test condition value.

[4] BL: Balance condition, IB: Imbalance condition.

Note: Test on active LoM detection methods according to EN 62116.

RECONNECTION TIME MEASUREMENT

Reconnection time	Under/over Voltage	Under / over Frequency	Loss of Mains
Minimum value	60s	60s	60s
Actual setting	60s	60s	60s
Recorded value	60s	60s	60s

DC CURRENT MONITORING

A direct current feed to the low voltage grid due to a defective generator operation must lead to a disconnection within 0.2 s. (according to VDE 0126-1-1)				
Function	Limit		Trip test	
	DC current [A]	Time [ms]	DC current [A]	Time [ms]
Positive DC current	1.0	200	0.97	89
Negative DC current	1.0	200	0.95	91

OPERATING RANGE

Test sequence	Voltage [V]	Frequency[Hz]	Output power[W]	Primary power source[W]
Test 1	195.1	47.50	17564,3	25000
Test 2	253.1	51.50	20058.4	25000

Note: Operation at reduced power is allowed during test 1, equal to the maximum power that can be supplied on reaching the maximum output current limit.

During the sequence of test 2, automatic adjustment to reduce power in the case of over frequency shall be disabled.

During the test, the frequency protection should be disabled.

ACTIVE POWER AT UNDER-FREQUENCY

Test sequence	Output power [W]	Frequency [Hz]	Primary power source [W]
Test a)	19943	50.00	25000
Test b)	19950	49.50	25000
Test C)	19954	48.50	25000

Note: the power reduction in point c) is less or equal to 20%Pn according to EN50438:2013.

POWER RESPONSE TO OVER-FREQUENCY

Test sequence at power level >80%	Output Power [W]	Frequency [Hz]	Primary Power source[W]	Power gradient
Step a)	20008	50,00	25000	-
Step b)	19697	50,25	25000	-
Step c)	16085	50,70	25000	39.2%
Step d)	19697	50,25	25000	-
Step e)	20007	50,00	25000	-

Test sequence at power	Output Power	Frequency	Primary Power source[W]	Power gradient

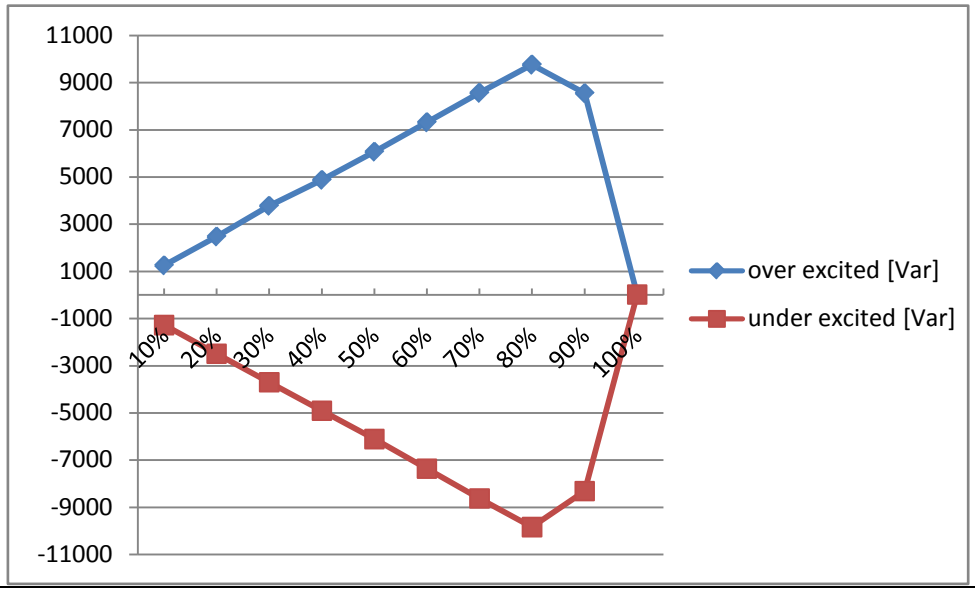
level 40% - 60%				
Step a)	10023	50.00	10200	-
Step b)	9853	50.25	10200	-
Step c)	8042	50.70	25000	39.5%
Step d)	9852	50.25	25000	-
Step e)	20005	50.00	25000	8.8%*

* This power gradient is active power rise once the frequency drops below the threshold frequency f1.

REACTIVE POWER RANGE

Set point P [P/Pn]	P(W) Measured	+ Q (Var) Measured	PF Measured	P(W) Measured	- Q (Var) Measured	PF Measured
10%	2051.6	1253.1	0.853	2058.4	-1280.6	0.849
20%	4052.2	2471.2	0.854	4047	-2490.9	0.852
30%	6029.8	3775.2	0.848	6024.4	-3705	0.852
40%	7999.5	4876.1	0.854	7992.9	-4910.8	0.852
50%	9954.7	6065.4	0.854	9949	-6111.5	0.852
60%	12019.6	7310.9	0.854	11992.5	-7366.5	0.852
70%	14067.5	8560.1	0.854	14051.8	-8630.7	0.852
80%	16015.3	9754.7	0.854	15998.6	-9839.6	0.852
90%*	17987.7	8553.6	0.903	17962.4	-8313.6	0.908
100%*	19963.6	15.4	0.999	19963.6	15.4	0.999

Plot of P over Q of all measured points



Note:

The letter "-" is short for "inductive" and indicates inductive power factor. In case of capacitive power factor the letter "+" is used instead.

* The maximum apparent power of the inverter is limited to 20KVA. If setting cosφ≠1, the maximum active power is reduced accordingly. The active power 90% and 100% P/Pn is therefore only achieve when the cosφ≥0.9 and cosφ=1 respectively.