# Certificate C10/11 revision June 4, 2012

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

| | | | |
|---|---|---|---|
| Type reference number | *Zeverlution 2000S*<br>*Zeverlution 1500S*<br>*Zeverlution 1000S* | | |
| 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.*<br>*R&D Department,Suzhou* | | |

| Type reference | Nominal AC power | Max.AC power |
|---|---|---|
| Zeverlution 2000S | *2.0kW* | *2.2kW* |
| Zeverlution 1500S | *1.5kW* | *1.65kW* |
| Zeverlution 1000S | *1.0kW* | *1.1kW* |

Jiangsu Zeversolar New Energy CO., LTD hereby declares that the inverter listed above meet the regulations of the Belgium on connection of photovoltaic installations to the low voltage network.

The inverters conforming to the regulations of the Belgium are characterized, along with the specification in the datasheet and the CE declaration, by the following features:
- There is a certificate of VDE 0126-1-1/A1:2012 issued by an accredited institute. The certificate 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/A1:2012 with the deviation of C10/11, as required in Annex 4 of C10/11..
- These parameters can't be changed by user, an installer or by any person other than Zeversolar (password protected).

The results of VDE 0126-1-1/A1:2012 and the deviation of C10/11 tests for 2000S are summarized in this certificate. Complete documentation on test details is available at Zeversolar on demand.
The model 1000S and 1500S is same as 2000S on hardware except that the output power and the size of the heat sink.

| | | | |
|---|---|---|---|
| Name of signatory and title | *Sandy Gong*<br>*Manager of Safety Dept* | Date and Place | *18.03.2016*<br>*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 | % of fund | Limit in Amps |
| 2 | 0.014 | 0.16 | 1.080 |
| 3 | 0.099 | 1.14 | 2.300 |
| 4 | 0.009 | 0.10 | 0.430 |
| 5 | 0.040 | 0.46 | 1.140 |
| 6 | 0.015 | 0.17 | 0.300 |
| 7 | 0.006 | 0.07 | 0.770 |
| 8 | 0.010 | 0.11 | 0.230 |
| 9 | 0.016 | 0.19 | 0.400 |
| 10 | 0.006 | 0.07 | 0.184 |
| 11 | 0.005 | 0.06 | 0.330 |
| 12 | 0.004 | 0.05 | 0.153 |
| 13 | 0.020 | 0.23 | 0.210 |
| 14 | 0.004 | 0.04 | 0.131 |
| 15 | 0.004 | 0.05 | 0.150 |
| 16 | 0.006 | 0.07 | 0.115 |
| 17 | 0.019 | 0.22 | 0.132 |
| 18 | 0.009 | 0.10 | 0.102 |
| 19 | 0.006 | 0.07 | 0.118 |
| 20 | 0.012 | 0.13 | 0.092 |
| 21 | 0.012 | 0.14 | 0.107 |
| 22 | 0.016 | 0.18 | 0.084 |
| 23 | 0.009 | 0.11 | 0.098 |
| 24 | 0.018 | 0.21 | 0.077 |
| 25 | 0.007 | 0.08 | 0.090 |
| 26 | 0.021 | 0.24 | 0.071 |
| 27 | 0.008 | 0.10 | 0.083 |
| 28 | 0.021 | 0.25 | 0.066 |
| 29 | 0.008 | 0.09 | 0.078 |
| 30 | 0.022 | 0.25 | 0.061 |
| 31 | 0.015 | 0.17 | 0.073 |
| 32 | 0.018 | 0.20 | 0.058 |
| 33 | 0.010 | 0.12 | 0.068 |
| 34 | 0.011 | 0.13 | 0.054 |
| 35 | 0.016 | 0.18 | 0.064 |
| 36 | 0.003 | 0.03 | 0.051 |
| 37 | 0.005 | 0.06 | 0.061 |
| 38 | 0.009 | 0.10 | 0.048 |
| 39 | 0.010 | 0.11 | 0.058 |
| 40 | 0.015 | 0.17 | 0.046 |
| THDI | NA | 1.57 | 5% |

| Voltage Fluctuations and Flicker as per EN 61000-3-3 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Starting | | | Stopping | | | Running | |
| | dmax | dc | d(t) | dmax | dc | d(t) | Pst | Plt 2 hours |
| Measured Values | 2.00% | 0.00% | 2.00% | 1.97% | 0.00% | 1.97% | 0.126 | 0.123 |
| Limits set under EN 61000-3-3 | 4% | 3.3% | 3.3% 500ms | 4% | 3.3% | 3.3% 500ms | 1.0 | 0.65 |
| | | | | | | | | |
| Test start date | 09/06/2015 | | | Test end date | | | 09/06/2015 | |
| Test location | Audix Technology (Wujiang) Co., Ltd. EMC Dept | | | | | | | |

| Power factor * | | | |
|---|---|---|---|
| Test Voltage level | 210 V | 230 V | 253 V |
| Measured value at 100%Pn | 0.995 | 0.998 | 0.998 |
| Limit | >0.95 | >0.95 | >0.95 |

* Measured at three voltage levels and at full output. The voltage maintained within ±1.5% of the stated level during the test.

## 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 | 47.5 | 0.1 | 47.5 | 0.06 | 47.50 | 0.098 |
| O/F Stage 1 | 51.5 | 0.1 | 51.5 | 0.06 | 51.51 | 0.095 |

## ACTIVE POWER FEED-IN AT OVER FREQUENCY

| PM =100% of Prated | | | | |
|---|---|---|---|---|
| Freq. (Hz) | Actual frequency (Hz) | Measured active output power Pnow(W) | ΔP as per measured data (=PM- Pnow) (W) | Actual gradient (%/Hz) |
| 50,00 | 50.001 | 1997.4 | - | - |
| 50,25 | 50.251 | 1943.9 | - | - |
| 50,70 | 50.700 | 1601.2 | 396.2 | 39.7 |
| 51,15 | 51.150 | 1249.4 | 748.0 | 39.4 |
| 50,70 | 50.700 | 1601.5 | 395.9 | 39.7 |
| 50,25 | 50.250 | 1950.6 | - | - |
| 50,00 | 50.001 | 2000.4 | - | - |
| The max. gradient over the whole power derating transient is 39,7$P_M$ % per Hz. | | | | |
| PM =50% of Prated | | | | |
| Freq. (Hz) | Actual frequency (Hz) | Measured active output power Pnow(W) | ΔP as per measured data (=PM- Pnow) (W) | Actual gradient (%/Hz) |
| 50,00 | 50.001 | 1005.8 | - | - |

| | | | | |
|---|---|---|---|---|
| 50,25 | 50.251 | 977.9 | - | - |
| 50,70 | 50.700 | 804.8 | 201.0 | 40.0% |
| 51,15 | 51.150 | 630.1 | .375.7 | 39.3% |
| 50,70 | 50.700 | 804.8 | 201.0 | 40.0% |
| 50,25 | 50.250 | 978.4 | - | - |
| 50,00 | 50.001 | 1025.5 | - | - |
| The max. gradient over the whole power derating transient is 40.0 $P_M$% per Hz. | | | | |

## 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 | 184.0 | 0.1 | 184.0 | 0.06 | 185.2 | 0.069 |
| O/V Stage 1* | 253.0 | 600 | 253.0 | 600 | 257.6 | 598 |
| O/V Stage 2 | 264.5 | 0.1 | 264.5 | 0.06 | 265.7 | 0.091 |

*Over voltage – stage 1: 10 min mean value corresponding to EN 50160. The voltage is set to 100%Un and held for 600s. After that, the voltage is set to 112%Un. It must be switched off within 600s.

## LOSS OF MAINS TEST

| Method used | Active frequency drift method | | |
|---|---|---|---|
| Output power level | 25% Prated | 50% Prated | 100% Prated |
| Limit according to VDE 0126-1-1 | 5s | 5s | 5s |
| Trip time (L:+5%) | 0.365s | 0.286s | 0.293s |
| Trip time (L:+4%) | 0.612s | 0.298s | 0.323s |
| Trip time (L:+3%) | 0.382s | 0.319s | 0.546s |
| Trip time (L:+2%) | 0.422s | 0.301s | 0.352s |
| Trip time (L:+1%) | 0.329s | 0.378s | 0.329s |
| Trip time (L:+0%) | 0.396s | 0.427s | 0.374s |
| Trip time (L:-1%) | 0.362s | 0.359s | 0.378s |
| Trip time (L:-2%) | 0.306s | 0.365s | 0.289s |
| Trip time (L:-3%) | 0.345s | 0.356s | 0.278s |
| Trip time (L:-4%) | 0.307s | 0.307s | 0.266s |
| Trip time (L:-5%) | 0.312s | 0.340s | 0.252s |

## RECONNECTION TIME MEASUREMENT

| Reconnection time | Under/over Voltage | | Under / over Frequency | | Loss of Mains | |
|---|---|---|---|---|---|---|
| | time | gradient | time | gradient | time | gradient |
| Limit | 60s | 10%Pn/min | 60s | 10%Pn/min | 60s | 10%Pn/min |
| Actual setting | 60s | 8% Pn/min | 60s | 8% Pn/min | 60s | 8% Pn/min |
| Recorded value | 68s | 8.7% Pn/min | 68s | 8.8% Pn/min | 67s | 8.8%Pn/min |

## 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. (the current limit is 1%In according to C10/11) | | | | |
|---|---|---|---|---|
| Function | Limit | | Trip test | |
| | DC current (A) | Time (ms) | DC current (A) | Time (ms) |
| Positive DC current | 0.1 | 200 | 0.09 | 160 |
| Negative DC current | 0.1 | 200 | 0.09 | 144 |

## RESIDUAL CURRENT MONITORING

| Test for correct triggering in event of steadily rising residual current | | | | |
|---|---|---|---|---|
| | Limit | | Trip test | |
| PV connection | Fault current (mA) | Time (ms) | Test Current (mA) | Time (ms) |
| PV+ | 300 | 300 | 89 | 136 |
| PV- | 300 | 300 | 97 | 116 |

| Test for correct triggering in event of steadily rising residual current | | | | |
|---|---|---|---|---|
| | Limit | | Trip test | |
| PV connection | Fault current (mA) | Time (ms) | Test Current (mA) | Time (ms) |
| PV+ | 30 | 300 | 29.7 | 143 |
| PV+ | 60 | 150 | 58.8 | 108 |
| PV+ | 150 | 40 | 150.0 | 35 |
| PV- | 30 | 300 | 30.1 | 145 |
| PV- | 60 | 150 | 59.8 | 115 |
| PV- | 150 | 40 | 149.0 | 29 |

## ARRAY INSULATION RESISTANCE DETECTION

| The value of the total resistance, including the intentional resistance for array functional grounding, the expected insulation resistance of the array to ground, and the resistance of any other networks connected to ground (for example measurement networks) must not be lower than $R = (V_{MAX\ PV}/30\ mA)$ ohms. (according to EN 62109-2) | | | |
|---|---|---|---|
| PV connector | Test resistance value | Activation(Yes/No) | Display |
| PV+ | 200kΩ | Yes | Isolation Fault |
| PV- | 200kΩ | Yes | Isolation Fault |