



Certificate No.

**IECRE.WE.TC.18.0030-R0**

IECRE - IEC System for Certification  
to Standards Relating to Equipment  
for Use in Renewable Energy  
Applications

## TYPE CERTIFICATE

### Wind Turbine

This certificate is issued to

Suzlon Energy Ltd.  
One Earth Opp. Magarpatta City  
Pune, 411028  
India

for the wind turbine  
wind turbine class (class, standard, year)

Suzlon S111 DFIG 2.1 MW (50Hz)  
IIIA/S, IEC 61400-1:2005 incl. Amendment:2010-10

This certificate is transferred from IEC 61400-22 to IECRE (according to WE-OMC/316/DV and WE-OMC/321/RV) and attests compliance with IEC 61400 Series as specified in subsequent pages. It is based on the following reference documents:

Design basis evaluation conformity statement  
Dated

Integrated in design evaluation conformity statement

Design evaluation conformity statement  
Dated

44 220 14542181-D-IEC  
Rev. 10, 2018-08-14

Type test conformity statement  
Dated

44 220 15916286-T-IEC  
Rev. 4, 2017-10-27

Manufacturing conformity statement  
Dated

44 220 15916286-M-IEC  
Rev. 8, 2018-07-20

Component certificate Rotor Blade SB54  
Dated

44 220 15766740-CC-IEC  
Rev. 1, 2016-05-30, valid until 2020-07-14

Component certificate Rotor Blade SB54S2  
Dated

44 220 16263505-CC-IEC  
Rev. 0, 2016-03-18, valid until 2021-03-17

Component certificate Rotor Blade SB54HT  
Dated

44 220 16994393-CC-IEC  
Rev. 0, 2016-06-09, valid until 2021-06-08

Component certificate NGC Gearbox FD2262S  
Dated

44 220 16381810-CC-IEC  
Rev. 2, 2018-07-12, valid until 2021-11-21

Component certificate ZF Gearbox EH821A-001  
Dated

44 220 16942769-CC-IEC  
Rev. 2, 2017-08-07, valid until 2021-10-19

Component certificate Converter PT0100  
Dated

44 220 17257731-CC-IEC  
Rev. 0, 2017-09-25, valid until 2022-09-20

Final evaluation report  
Dated

8111 916 286-20 E I  
Rev. 9, 2018-08-14

The conformity evaluation was carried out in accordance with the rules and procedures of the IECRE System  
[www.iecre.org](http://www.iecre.org)

The wind turbine type specification begins on page 2 of this certificate.

Changes in the system design or the manufacturer's quality system are to be approved by the Certification Body. Without approval, the certificate loses its validity.

This certificate is valid until:  
2020-08-12

Approved for issue on behalf of the IECRE  
Certification Body:

Dipl.-Ing. C. Hering  
Specialist Manager Wind Energy  
Essen, 2018-12-21



TÜV NORD CERT GmbH  
Langemarckstraße 20  
45141 Essen



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#### Machine parameters:

Power regulation:	Independent electromechanical pitch system for each blade
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	5°
Cone angle:	3.5°
Rated power:	2100 kW
Rated wind speed $V_r$ :	9.5 m/s; Enhanced performance mode: 10 m/s
Rotor diameter:	111.8 m
Hub height(s):	90 m, 120 m, 140 m
Hub height operating wind speed range $V_{in} - V_{out}$ :	3.0 – 21 m/s;
Design life time:	20 years
Software version:	TURBCTRL: TC_S11x.m

#### Wind conditions:

Characteristic turbulence intensity $I_{ref}$ at $V_{hub} = 15$ m/s:	16 % (HH 90m) 15% (HH 90m, 120m, 140m HLT)
Annual average wind speed at hub height $V_{ave}$ :	7.5 m/s (HH 90m) 7.25 m/s (HH 90m, 120m, 140m HLT)
Reference wind speed $V_{ref}$ :	37.5 m/s (HH 90m, 120m) 36.5 m/s (HH 140m)
Mean flow inclination:	8°
Hub height 50-year extreme wind speed $V_{e50}$ :	52.5 m/s (HH 90m, 120m) 51.1 m/s (HH 140m)

#### Electrical network conditions:

Normal supply voltage and range:	690 V -15% / +10%
Normal supply frequency and range:	50 Hz -6% / +5%



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**TYPE CERTIFICATE****Wind Turbine****Other environmental conditions (where taken into account):**

Normal and extreme temperature ranges:	Operational temperature range: -10°C - +40°C (STV); 0°C - +50°C (HTV); 0°C - +45°C (HTV light) Survival temperature range: -20°C - +50°C (STV); -10°C - +50°C (HTV); 0°C - +50°C (HTV light) Up to 95%
Relative humidity of the air:	Up to 95%
Air density:	See below table "Turbine Variants"
Solar radiation:	1000 W/m <sup>2</sup>
Lightning protection system (standard and protection class):	IEC 61400-24, LPL 1
Other design conditions :	Max. snow load on nacelle: 1.75 kN/m <sup>2</sup> (STV/HTV); 0 kN/m <sup>2</sup> (HTV light) Max altitude for electrical components: 2000 m (STV); 1000 m (HTV); 1400 m (HTV light)

**Turbine Variants:**

Variant No	Rotor Blade	Hub Height	IEC wind class	Climate conditions	Annual average air density	Power Curve <sup>1</sup>	Optional Operation Modes <sup>2</sup>
1	SB54/SB54 S2/SB54 HT	90 m	IEC IIIA	STV	1.225 kg/m <sup>3</sup>	A	PRM, NRM, VPT
2	SB54/SB54 S2/SB54 HT	90 m	IEC IIIA	HTV	1.225 kg/m <sup>3</sup>	A	PRM, NRM, VPT
3	SB54 HT	90 m 140 m (HLT)	IEC S	HTV (light)	1.16 kg/m <sup>3</sup>	A	n/a
4	SB54 HT	90 m 120 m (HLT)	IEC S	HTV (light)	1.16 kg/m <sup>3</sup>	A/B	n/a
5	SB54 HT	140 m (HLT) 120 m (HLT) 90m	IEC S (cut out 21 m/s)	HTV (light)	1.16 kg/m <sup>3</sup>	A/B	ADCWI

**Major components:**

<sup>1</sup> Power Curve A as measured and documented in Report No.: DEWI-GER-PV14-03787-02.01, dated 2015-07-10 and considered in load evaluation reports 8114 258 660-1 E I, Rev.0, dated 2017-06-23 and 8113 115 838-1 E I, Rev.2, dated 2016-03-11  
Power Curve B for enhanced performance mode as measured and documented in Report No.: DEWI-GER-PPT17-11876307-01.03, dated 2017-10-26 and considered in load evaluation reports 8114 968 597 -1 EI, Rev.0, dated 2017-10-06 and 8114 968 597 -1 EII, Rev.0, dated 2017-10-06

<sup>2</sup> Power Reduced Mode (PRM); Noise Reduced Mode (NRM); Variable Pitch Table based on air density (VPT); Air Density Corrected Wind Input for minimum pitch angle (ADCWI)



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\*\*If not otherwise stated, the certificate holder  
is the manufacturer.

#### **Blade SB54HT**

Type: Vacuum infusion  
Material: glass fibre reinforced epoxy  
Blade length: 54.8 m  
Number of blades: 3  
Manufacturer: Suzlon Energy Ltd.  
Drawing / Data sheet / Part No.: SB54-D-01-00013, Rev. 2  
Specification:  
SB54HT-S-01-00001, Rev. 1

#### **Blade SB54 (conf. 1-2)**

Type: Vacuum infusion  
Material: glass fibre reinforced epoxy  
Blade length: 54.8 m  
Number of blades: 3  
Manufacturer: Suzlon Energy Ltd.  
Drawing / Data sheet / Part No.: SB54-D-01-00013, Rev. 2  
Specification:  
SB54-S-01-00005, Rev. 4

#### **Blade SB54S2 (conf. 1-2, without VPT)**

Type: Vacuum infusion  
Material: glass fibre reinforced epoxy  
Blade length: 54.8 m  
Number of blades: 3  
Manufacturer: Suzlon Energy Ltd.  
Drawing / Data sheet / Part No.: SB54-D-01-00013, Rev. 2  
Specification:  
SB54S2-S-01-00001, Rev. 0

#### **Blade bearing:**

Type: Double row ball bearing slewing ring  
Manufacturer: IMO Energy  
Drawing / Data sheet / Part No.: Designation: 42-552422/4-10905  
Drawing No.: 42-552422/4-10905, Rev. C



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### Wind Turbine

alternative:

Manufacturer: Laulagun Bearings  
Drawing / Data sheet / Part No.: Designation: F2644M16DTTI125FA  
Drawing No.: F2644M16DTTI125FA, Rev. 08

alternative:

Manufacturer: ThyssenKrupp Rothe Erde  
Drawing / Data sheet / Part No.: Designation: 092.55.2422.000.48.1420  
Drawing No.: 092.55.2422.000.48.1420, Rev. F

alternative:

Manufacturer: Shanghai Ouji Kete  
Drawing / Data sheet / Part No.: Designation: SZ033.55.2420  
Drawing No.: SZ033.55.2420\_V0.8, Rev. 08

alternative conf. 5 (without HH90m):

Manufacturer: Shanghai Ouji Kete  
Drawing / Data sheet / Part No.: Designation: SZ033.50.2420  
Drawing No.: SZ033.50.2420\_V0.0, Rev. –

alternative conf. 5 (without HH90m):

Manufacturer: ThyssenKrupp Rothe Erde  
Drawing / Data sheet / Part No.: Designation: 83703420  
Drawing No.: 092.50.2418.000.44.140D, Rev. A

#### Pitch System:

Motor / Actuator Type: E-Motor  
Motor / Actuator Manufacturer: Bonfiglioli Trasmital  
Motor / Actuator Designation: BN 132MA 4 230/400-50 FD100  
Pitch Controller Type: PLC  
Manufacturer: Bachmann  
Gear Type: 3-stage planetary gearbox  
Manufacturer: Bonfiglioli Trasmital  
Drawing / Data sheet / Part No.: Main drawing no: 56120990, Rev. F  
Designation: 707T3F (Pitch drive MT707T033)

#### Main shaft:

Type: Forged  
Manufacturer: SUZLON Energy Ltd. (Design)  
Shandong Laiwu Jinlei Wind Power Tech. Co. Ltd.  
Material: 42CrMo4



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Drawing / Data sheet / Part No.:

config. 1-4: M334.000985-04, Rev. 4  
*alternative conf. 5: M334.003675-01, Rev. 1*

#### **Main bearing:**

Type:

Spherical roller bearing

Manufacturer:

NTN Wälzlager

Drawing / Data sheet / Part No.:

Designation: 240/710BL1CS310S30  
Drawing No.: 10-07057, Rev. a

*alternative:*

Manufacturer:

SKF GmbH

Drawing / Data sheet / Part No.:

Designation: 240/710 ECA/C2HW 33RE10  
Drawing No.: 240/710 ECA/C2HW 33RE10 Ed.1

*alternative:*

Manufacturer:

Schaeffler Technologies GmbH & Co. KG

Drawing / Data sheet / Part No.:

240/710B.MB.R250.370.M15BK.M47

*alternative conf. 5 (without HH90m):*

Manufacturer:

Schaeffler Technologies GmbH & Co. KG

Drawing / Data sheet / Part No.:

Designation: F-630645.PRL-H50V-R300-400  
Drawing No.: EDD F-630645.PRL 000, Vers. 0

#### **Gearbox 50 Hz (conf. 1-4)**

Type:

Planetary helical gearbox

Gear Ratio:

90.1875

Manufacturer:

Moventas Gears Oy

Drawing / Data sheet / Part No.:

Designation: PLH-1800S11x  
Main drawing no.: GDR0006914, Rev.—  
*alternative:*  
Main drawing no.: GDRM101150, Rev. A  
*alternative:*  
Main drawing no.: GDRM101757, Rev. A

#### **Gearbox 50 Hz (conf. 1-4)**

Type:

Planetary helical gearbox

Gear Ratio:

89.775

Manufacturer:

Flender GmbH, Voerde, Germany / Siemens Ltd.,  
Chennai, India

Drawing / Data sheet / Part No.:

Designation:  
Winergy PEAB 4450  
Main drawing no.:  
A5E35769398A, Rev. 005



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#### **Gearbox 50 Hz (conf. 1-4)**

Type: 3 stage Planetary helical gearbox  
Gear Ratio: 90.125  
Manufacturer: Nanjing High Speed Gear Manufacturer  
Drawing / Data sheet / Part No.: Designation:  
FD2262S-01-00R1  
Main drawing no.:  
FD2262S-01-00R1, Rev. 5

#### **Gearbox 50 Hz (conf. 2-5)**

Type: Planetary helical gearbox  
Gear Ratio: 89.79  
Manufacturer: ZF Wind Power Coimbatore Pvt. Ltd  
Drawing / Data sheet / Part No.: Designation:  
EH821A-001  
Main drawing no.:  
97EH821AQ21-001, Rev. B

#### **Gearbox 50 Hz (conf. 5)**

Type: 3 stage Planetary helical gearbox  
Gear Ratio: 90.125  
Manufacturer: Nanjing High Speed Gear Manufacturer  
Drawing / Data sheet / Part No.: Designation:  
FD2262S-01-00R1G  
Main drawing no.:  
FD2262S-01-00R1G

#### **Gearbox 50 Hz (conf. 5)**

Type: Planetary helical gearbox  
Gear Ratio: 89.775  
Manufacturer: Flender GmbH, Voerde, Germany/  
Siemens Ltd., Chennai, India  
Drawing / Data sheet / Part No.: Designation:  
Winergy PEAB 4450  
Main drawing no.:  
A5E35769398A, Rev. AK (11)

#### **Yaw System:**

*Drive Type:* E-motor with motor brake  
Manufacturer: Bonfiglioli  
Drawing / Data sheet / Part No.: BN100LB4 400/690-50 FD 30

*Bearing Type:* slide block system with friction pads



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Manufacturer:	SUZLON Energy Ltd.
Drawing / Data sheet / Part No.:	Drawing no.: M310.000072-05, Rev. 5  <i>alternative:</i> Drawing no.: M310.300014-01, Rev. 1  <i>alternative:</i> Drawing no.: M310.330449-00, Rev. 0
Drawing Yaw Gear Rim:	M314.0071-08, Rev. 8,  <i>alternative:</i> Drawing no.: M314.0071-07, Rev. 7,
Gear Type:	5-stage planetary gearbox
Manufacturer:	Bonfiglioli Trasmital
Drawing / Data sheet / Part No.:	Designation: 712T5F (MT712T086 / MT712T092) Drawing no.: I7120T014000, Rev. 9  <i>alternative:</i> Drawing no.: I7120T016500, Rev. 1
Brake Type:	See drive and bearing
<b>Generator:</b>	
Type	Doubly-fed induction generator (DFIG)
Manufacturer:	ELIN
Drawing / Data sheet / Part No.:	Designation: MRL-063Z06
Rated Power:	2200 kW
Rated Frequency:	50 Hz
Rated Speed:	1083 rpm below -10°C 1197 rpm for enhanced performance mode
Max. speed:	1300rpm
Rated Voltage:	690 V
Max. Current:	1810 A (Stator), 650 A (Rotor)
Insulation Class:	H
Degree of Protection:	IP54





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#### Converter:

Type:

Manufacturer: Woodward SEG

Drawing / Data sheet / Part No: Designation:  
CW1211LD-C04 (IGBT, water cooling)

Rated Voltage (grid side): 690 V

Rated Current (grid side): 600 A

Degree of Protection: IP54

#### alternative:

Type:

Manufacturer: Ingeteam (Design)

Suzlon Energy Ltd.

Drawing / Data sheet / Part No: Designation: PT0100

Rated Voltage (grid side): 690 V

Rated Current (grid side): 600 A

Degree of Protection: IP54

#### alternative (conf. 1,3,4):

Type:

Manufacturer: Vertiv Tech Co., Ltd. (Design)

Emerson Network Power Co., Ltd.

Drawing / Data sheet / Part No: Designation: WF1000-06L0210-CPN-A

Rated Voltage (grid side): 690 V

Rated Current (grid side): 600 A

Degree of Protection: IP54

#### Transformer:

Type: Dry Type

Manufacturer: Imefy

Drawing / Data sheet / Part No.: Designation:  
IM-OT10193.16-1 | IM-OT10193.16-2

Rated Voltage: Primary: 20kV/30 kV

Rated Power: Secondary: 690 V

2150 kVA

Degree of Protection:

Location (e.g. tower bottom): for PiT Power inside tower

(tower drawing: M200.000260-02, Rev. 2)



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### Wind Turbine

#### **Tower 90m:**

Type: Tubular Steel tower  
Manufacturer: SUZLON Energy Ltd.  
Sections: 4  
Length: 87.27 m  
Drawing / Data sheet / Part No.:  
conf. 1, 2, 4, 5:  
Main drawing no.:  
M200.000217-06, Rev. 6  
Foundation specification:  
PDG-NP-R-PLP-02513, Rev. 8  
  
conf. 1, 2, 4, 5:  
Main drawing no.:  
M200.000254-04, Rev. 4  
Foundation specification:  
PDG-NP-R-PLP-02513, Rev. 8  
  
conf. 1, 2:  
Main drawing no.:  
M200.000208-02, Rev. 2  
Foundation specification:  
PDG-NP-R-PLP-02513, Rev. 8  
  
conf. 1, 2:  
Main drawing no.:  
M200.000260-02, Rev. 2  
Foundation specification:  
PDG-NP-R-PLP-02513, Rev. 8

#### **Tower 90m (conf. 3):**

Type: Tubular Steel tower  
Manufacturer: SUZLON Energy Ltd.  
Sections: 4  
Length: 87.27 m  
Drawing / Data sheet / Part No.:  
Main drawing no.:  
M200.300087-01, Rev.1  
Foundation specification:  
TGDI-RE-006252, Rev. 01

#### **Tower 120m (conf. 4, 5):**

Type: Hybrid lattice tower  
Manufacturer: SUZLON Energy Ltd.



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#### Sections:

Length: 116.15 m  
Drawing / Data sheet / Part No.:  
Main drawing no.:  
M200.000257-08, Rev.8  
Foundation specification:  
TGDI-RE-004348, Rev. 4

#### **Tower 140m (conf. 3, 5):**

Type: Hybrid lattice tower  
Manufacturer: SUZLON Energy Ltd.

#### Sections:

Length: 140 m  
Drawing / Data sheet / Part No.:  
Main drawing no.:  
M200.000265-04, Rev. 4  
Foundation specification:  
TGDI-RE-005673, Rev. 1

#### **Manuals:**

Operation & maintenance manual: TDC0027, Rev. 08-00  
Transport manual: TDC0026, Rev. 08-01  
Installation & commissioning. manual: TDC0026, Rev. 08-01