Certificate No.

IECRE.WE.TC.18.0031-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	Suzlon S111 DFIG 2.1MW (60Hz)
wind turbine class (class, standard, year)	IIIA, IEC 61400-1 Ed. 3:2005-08 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, 2018-10-27
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 Converter PT0100 Dated	44 220 17257731-CC-IEC Rev. 0, 2017-09-25, valid until 2022-09-20
Final evaluation report Dated	8111916286-20 E II Rev. 7, 2018-12-20

The conformity evaluation was carried out in accordance with the rules and procedures of the IECRE System 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 TÜV NORD CERT GmbH. 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

Certificate. No.

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TYPE CERTIFICATE

Wind Turbine

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 (8.5 m/s below -10°C)
Rotor diameter:	111.8m
Hub height(s):	90 m
Hub height operating wind speed range V_{in} – V_{out}:	3.0 m/s – 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 %
Annual average wind speed at hub height V_{ave} :	7.5 m/s
Reference wind speed V_{ref} :	37.5 m/s
Mean flow inclination:	8°
Hub height 50-year extreme wind speed V_{e50}:	52.5 m/s

Electrical network conditions:

Normal supply voltage and range:	690 V	-10% / +10%
Normal supply frequency and range:	60 Hz	-6% / +5%

Other environmental conditions (where taken into account):

Normal and extreme temperature ranges:	STV: -10°C - +40°C (operational) -20°C - +50°C (survival) LTV: -30°C - +40°C (operational), -40°C - +50°C (survival)
Relative humidity of the air:	Up to 95%
Air density:	1.225 kg/m^3
Solar radiation:	1000 W/m^2
Lightning protection system (standard and protection class):	IEC 61400-24, LPL 1
Other design conditions :	Max. snow load on nacelle and nose cone: 1.75 kN/m^2

Major components:

**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.:	Drawing No.: SB54-D-01-00013, Rev. 2 Specification: SB54HT-S-01-00001, Rev. 1

alternative: Blade SB54

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.:	Drawing No.: SB54-D-01-00013, Rev. 2 Specification: SB54-S-01-00005, Rev. 4

alternative: Blade SB54S2

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.:	Drawing 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.: F2644M16DTTI125FA, Rev. 08
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

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
Drawing / Data sheet / Part No.:	Drawing No.: M334.000985-04, Rev. 4,

Main bearing:

Type:	Sperical 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.:	Designation: 240/710B.MB.R250.370.M15BK.M47 Drawing No.: 40/710B.MB.R250.370.M15BK.M47

Gearbox:

Type:	Planetary helical gearbox
Gear Ratio:	107.9167
Manufacturer:	Moventas Gears Oy
Drawing / Data sheet / Part No.:	Designation: PLH-1800S11x Main Drawing No.: GDR0006914, Rev. -, dated 2013-09-24 *alternative:* Main Drawing No.: GDRM101150, Rev. A *alternative:* Main Drawing No.: GDRM101757, Rev. A

alternative:

Type:	Planetary helical gearbox
Gear Ratio:	107.963
Manufacturer:	Siemens AG / Siemens Ltd – India (Design) Winergy Drive Systems India (P) Ltd.

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Drawing / Data sheet / Part No.:	Designation: Winergy PEAB 4450 Main Drawing No.: A5E35769398A, Rev. 005
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
Manufacturer:	SUZLON Energy Ltd.
Drawing / Data sheet / Part No.:	Drawing no.: M310.000072-05, Rev. 5 *alternative:* Drawing no.: M310.300014-01, Rev. 1 *alternative:* Drawing no.: M310.330449-00, Rev. 0
Drawing Yaw Gear Rim:	M314.0071-08, Rev. 8, *alternative:* 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 *alternative:* Drawing no.: I7120T016500, Rev. 1
Brake Type:	See drive and bearing
Manufacturer:	n/a
Drawing / Data sheet / Part No.:	n/a
Generator:	
Type:	Doubly-fed induction generator (DFIG)
Manufacturer:	ELIN (Design) M/s. Suzlon Generators Ltd.
Drawing / Data sheet / Part No.:	Designation: MRL-063Z06

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Wind Turbine

Rated Power:	2170 kW
Rated Frequency:	50 Hz / 60 Hz
Rated Speed:	1083 rpm below -10°C 1197 rpm for enhanced performance mode
Rated Voltage:	690 V
Max. Current:	1810 A (Stator), 650 A (Rotor)
Insulation Class:	H
Degree of Protection:	IP54

Converter:

Type:	IGBT, water cooling
Manufacturer:	Woodward SEG
Drawing / Data sheet / Part No:	Designation: CW1211LD-C04
Rated Voltage (grid side):	690 V
Rated Current (grid side):	600 A
Degree of Protection:	IP54

alternative:

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:

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:

Out of scope (outside tower)

Tower (90m):

Type:	Tubular Steel tower
Manufacturer:	Suzlon Energy Ltd. Tool Fab Engineering Industries (P) Ltd. Barakath Engineering Industries Pvt. Ltd. Jay Engineering Industries Altec Fabricators Likhita Energy Systems Pvt. Ltd. Cu-Built Engineers Pvt. Ltd. Metal Engineers
Sections:	4
Length:	90 m
Drawing / Data sheet / Part No.:	Drawing No.: M200.000208-00, Rev.0 Foundation specification: PDG-NP-R-PLP-02513, Rev. 7

Tower (90m):

Type:	Tubular Steel tower
Manufacturer:	Suzlon Energy Ltd. Tool Fab Engineering Industries (P) Ltd. Barakath Engineering Industries Pvt. Ltd. Jay Engineering Industries Altec Fabricators Likhita Energy Systems Pvt. Ltd. Cu-Built Engineers Pvt. Ltd. Metal Engineers
Sections:	4
Length:	90m
Drawing / Data sheet / Part No.:	Drawing No.: M200.000217-05, Rev. 5 Foundation specification: PDG-NP-R-PLP-02513, Rev. 7

Manuals:

Operation & maintenance manual:	TDC0027, Rev. 07-00
Transport, installation & commissioning manual:	TDC0026, Rev. 07-00