



Certificate No.

**IECRE.WE.TC.18.0007-R1**

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

## PROVISIONAL 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 S120 DFIG 2.1MW (50 Hz)

wind turbine class (class, standard, year)

S, IEC 61400-1 Ed.3:2005-08 incl. Amendment 1: 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

44 220 18245100-TDB-IEC  
Rev. 0, 2018-10-15

Prov. Design evaluation conformity statement,  
Dated

44 220 18245100-PD-IEC  
Rev. 3, 2019-01-31

Prov. Type test conformity statement  
Dated

44 220 18245100-PT-IEC  
Rev. 2, 2019-01-31

Manufacturing conformity statement  
Dated

44 220 18245100-M-IEC  
Rev. 1, 2018-12-20

Component certificate Converter PT0100  
Dated

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

Component certificate Rotor Blade SB59S2

44 220 19482776-CC-IEC  
Rev. 0, 2019-01-23, valid until 2024-01-22

Final evaluation report  
Dated

8115 245 100-20 E  
Rev. 2, 2019-01-31

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 TÜV NORD CERT GmbH.  
Without approval, the certificate loses its validity.

This certificate is valid until:  
2019-10-29

Approved for issue on behalf of the IECRE  
Certification Body:

Dipl.-Ing./M.Sc. M. Lange  
Specialist Manager Wind Energy  
Essen, 2019-02-06



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
Rotor diameter:	120 m
Hub heights:	105 m, 120 m, 140 m
Hub height operating wind speed range $V_{in} - V_{out}$ :	3 – 18 m/s
Design life time:	20 years
Software version:	18.20.4.2

#### Wind conditions:

Characteristic turbulence intensity $I_{ref}$ at $V_{hub} = 15$ m/s:	14%
Annual average wind speed at hub height $V_{ave}$ :	7.25 m/s
Reference wind speed $V_{ref}$ :	36.5 m/s
Mean flow inclination:	8°
Hub height 50-year extreme wind speed $V_{e50}$ :	51.1 m/s

#### Electrical network conditions:

Normal supply voltage and range:	690 V -15% / +10%
Normal supply frequency and range:	50 Hz -6% / +5%
Number of electrical network outages	365/year



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#### Other environmental conditions (where taken into account):

Normal and extreme temperature ranges:	HTV Light 0°C - +45°C (operational) 0°C - +50°C (survival)
Relative humidity of the air:	Up to 95%
Air density:	1.16 kg/m <sup>3</sup>
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: 0kN/m <sup>2</sup> Max. altitude above sea level for electrical components: 1000 m

#### Configurations:

Conf. No	Hub Height	Tower Type
1	105 m (TT)	Tubular Steel (TT)
2	140 m (HLT)	Hybrid lattice (HLT)
3	120m (STT)	Smart tubular (STT)
4	140 m (HCT)	Hybrid concrete (HCT)



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#### Major components:

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

#### Blade SB59S1 (Conf. 1):

Type: Vacuum infusion  
Material: glass fibre reinforced epoxy  
Blade length: 59 m  
Number of blades: 3  
Manufacturer: Suzlon Energy Ltd.  
Drawing / Data sheet / Part No.: Designation: SB59S2  
Drawing No.: SB59XX-D-01-00001, Rev. 0  
Specification: SB59S1-S-01-00001, Rev.02

#### Blade SB59S2 (Conf. 1-4):

Type: Vacuum infusion  
Material: glass fibre reinforced epoxy  
Blade length: 59 m  
Number of blades: 3  
Manufacturer: Suzlon Energy Ltd.  
Drawing / Data sheet / Part No.: Designation: SB59S2  
Drawing No.: SB59XX-D-01-00001, Rev.  
0  
Specification: SB59S2-S-01-00001,  
Rev.00

#### Blade bearing:

Type: Double-row ball bearing slewing ring  
Manufacturer: IMO GmbH & Co. KG  
Drawing / Data sheet / Part No.: Designation: 11900  
Drawing No.: 42-552424/4-11900, Rev. -

#### alternative:

Type: Double-row ball bearing slewing ring  
Manufacturer: Laulagun Bearings, S.L.  
Drawing / Data sheet / Part No.: Designation: F2634M16DTTI125FAB  
Drawing No.: F2634M16DTTI125FAB, Rev. 0



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### Wind Turbine

#### **Pitch System:**

Motor / Actuator Type:	E-Motor
Motor / Actuator Manufacturer:	Bonfiglioli Transmissions (PVT) Ltd.
Motor / Actuator Designation:	BN 132MA 4 230/400-50 IP55 CLF B5 FD100 270SD
Pitch Controller Type:	PLC
Manufacturer:	Bachmann
Gear Type:	3-stage planetary gearbox
Manufacturer:	Bonfiglioli Transmissions (PVT) Ltd.
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) Zhongyuan Special Steel Co. Ltd., Jiyuan City, China Tongyu Heavy Industry Co., Ltd., Shandong, China Shandong Laiwu Jinlei Wind Power Tech. Co. Ltd., Shandong, China
Material:	42CrMoS4/42CrMo4
Drawing / Data sheet / Part No.:	Drawing No.: M334.000985-04, Rev. 4

#### **Main bearing:**

Type:	Spherical roller bearing
Manufacturer:	Schaeffler Technologies AG & Co. KG (FAG) (Design) Schaeffler Romania S.R.L., Brasov, Romania
Drawing / Data sheet / Part No.:	Designation: 240/710B.MB.R250.370.M15BK.M47 Drawing No.: 240/710B.MB.R250.370.M15BK.M47

#### alternative:

Type:	Spherical roller bearing
Manufacturer:	Schaeffler Technologies AG & Co. KG (FAG) (Design) Schaeffler Romania S.R.L., Brasov, Romania



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### Wind Turbine

Drawing / Data sheet / Part No.:

Designation: F-623425.PRL-M15BK-C2H  
Drawing No.: EDD F-623425.PRL 000

alternative:

Type:

Spherical roller bearing

Manufacturer:

SKF Group (Design)  
SKF Technologies India Pvt. Ltd.,  
Ahmedabad, Gujarat, India

Drawing / Data sheet / Part No.:

Designation: 240/710 BC/C2H  
Drawing No.: 240/710 BC/C2H, Rev.1

alternative:

Type:

Spherical roller bearing

Manufacturer:

SKF Group (Design)  
SKF Technologies India Pvt. Ltd.,  
Ahmedabad, Gujarat, India

Drawing / Data sheet / Part No.:

Designation: 240/710 ECA/C2HW  
33RE10  
Drawing No.: 240/710 ECA/C2HW  
33RE10, Rev.2

#### **Gearbox:**

Type:

Planetary helical gearbox

Gear Ratio:

89.79

Manufacturer:

ZF Wind Power Coimbatore Pvt. Ltd.

Drawing / Data sheet / Part No.:

Designation: EH0828A-001  
Drawing No.: 097-EH0828A001, Rev. B

alternative:

Type:

Planetary helical gearbox

Gear Ratio:

89.775

Manufacturer:

Siemens AG - Germany / Siemens Ltd. –  
India (Design)  
309/2, "A" Block 100, Chettipattu Village,  
Thandalam Post. Sriperumbudur Taluk,  
Kancheepuram Dist., 602105 India

Drawing / Data sheet / Part No.:

Designation: Winergy PEAB 4450  
Drawing No.: A5E35769398A, Rev. AK  
(011)



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#### Yaw System:

Type: Active, friction bearing with gear rim, 6 active yaw drives and motor brake

Drive Type: E-motor with motor brake

Manufacturer: Bonfiglioli Transmissions (PVT) Ltd.

Drawing / Data sheet / Part No.: Designation motor: BN100LB4 400/690-50

*Bearing Type:* Slide block system with friction pads

Manufacturer: Suzlon Energy Ltd.

Drawing / Data sheet / Part No.: Drawing No.: M310.000107-00, Rev. 0

*Gear Type:* 5-stage planetary gearbox

Manufacturer: Bonfiglioli Trasmital

Drawing / Data sheet / Part No.: Designation: 712T5F (MT712T086 / MT712T092)  
Drawing no. (MT712T086): I7120T014000, Rev. D  
Drawing no. (MT712T092): I7120T016500, Rev. A

*Brake Type:* See drive and bearing

#### Generator:

Type: Doubly-fed induction generator (DFIG)

Manufacturer: Suzlon Energy Ltd. (Design ELIN)

Drawing / Data sheet / Part No.: Designation: MRL-063Z06

Rated Power: 2170 kW

Rated Frequency: 50 Hz

Rated Speed: 1166 rpm

Rated Voltage: 690 V

Rated Current: 1580 A (Stator)

540 A (Rotor)

Insulation Class: H

Degree of Protection: IP 54

#### Converter:

Type:

Manufacturer: Ingeteam (Design)



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Drawing / Data sheet / Part No:	Suzlon Energy Ltd., Combatore, India
Rated Voltage (grid side):	Designation: PT0100
Rated Current (grid side):	690 V
Degree of Protection:	600 A
	IP 54

alternative:

Manufacturer:	Vertiv Tech Co. Ltd. (Design) Emerson Network Power Co. Ltd. (VERTIV), Mianyang, China
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 (Conf. 1):**

Type:	Tubular Steel Tower, HH 105m
Manufacturer:	Suzlon Energy Ltd. (Design) Suzlon Energy Ltd., Chopadava, Kutch, India Tool fab Engineering Industries (P) Ltd., Trichy, Tamilnadu, India Barakath Engineering Industries Pvt. Ltd., Trichy, Tamilnadu, India Jay Engineering Industries, Trichy, Tamilnadu, India Altec Fabricators, Trichy, Tamilnadu, India Cu-Built Engineers Pvt. Ltd., Khandala, India Metal Engineers, Trichy, Tamilnadu, India Likhita Energy Systems Pvt. Ltd., Ongole, Prakasham, India

Sections:	5
Length:	101.895 m

Drawing / Data sheet / Part No.:	Drawing No.: M200.000272-02, Rev. B Foundation specification: TGDE-RE- 003172, Rev.03
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### Wind Turbine

#### Tower (Conf. 2)

Type:

Hybrid Lattice Tower, HH 140m

Manufacturer:

Suzlon Energy Ltd. (Design)

Steel part:

Suzlon Energy Ltd., Chopadava, Kutch,  
India

Tool fab Engineering Industries (P) Ltd.,  
Trichy, Tamilnadu, India

Barakath Engineering Industries Pvt. Ltd.,  
Trichy, Tamilnadu, India

Jay Engineering Industries, Trichy,  
Tamilnadu, India

Altec Fabricators, Trichy, Tamilnadu,  
India

Cu-Built Engineers Pvt. Ltd., Khandala,  
India

Metal Engineers, Trichy, Tamilnadu, India  
Likhita Energy Systems Pvt. Ltd., Ongole,  
Prakasham, India

Lattice part:

Valmont Structures Pvt. Ltd., Survey No.  
189 to 193, Village: Chandrapur – 389  
350, Taluka: Halol, District: Panchmahal,  
Gujarat, India

Associated Power Structure Pvt. Ltd.,  
Block No. 35, Near Mordern Petrofiles,  
N.H. 8, Village: Bamangam Tal.: Karjan  
Dist.: Vadodara – 391240, Gujarat, India  
Sanvijay Infrastructures Pvt. Ltd., A-1-1  
A-1/P/1/A/2, MIDC Butibori Area, Khairy  
Khurd-440108, Tal.-Hingna, Dist-Nagpur,  
Maharashtra, India

Sections:

Length:

138.015 m

Drawing / Data sheet / Part No.:

Drawing No.: M200.000276-01, Rev. 01  
Tubular part: M201.000672-01, Rev. 01  
Lattice part: M801.000030-01, Rev. 01  
Foundation specification: M111.300006-  
00, Rev. 01

#### Tower (Conf. 3)

Type:

Smart Tubular Tower, HH 120m

Manufacturer:

Suzlon Energy Ltd. (Design)  
Suzlon Energy Ltd., Chopadava, Kutch,  
India



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### Wind Turbine

Tool fab Engineering Industries (P) Ltd.,  
Trichy, Tamilnadu, India  
Barakath Engineering Industries Pvt. Ltd.,  
Trichy, Tamilnadu, India  
Jay Engineering Industries, Trichy,  
Tamilnadu, India  
Altec Fabricators, Trichy, Tamilnadu,  
India  
Cu-Built Engineers Pvt. Ltd., Khandala,  
India  
Metal Engineers, Trichy, Tamilnadu, India  
Likhita Energy Systems Pvt. Ltd., Ongole,  
Prakasham, India  
5

Sections:

Length:

Drawing / Data sheet / Part No.:

117.696 m

Drawing No.: M200.000274-03, Rev. 3  
Foundation specification: TGD1-RE-  
007894, Rev.02

#### **Tower (Conf. 4)**

Type:

Manufacturer:

Hybrid Concrete Tower, HH 140m

Suzlon Energy Ltd. (Design steel part)  
BYO Towers, SL (Design concrete part)

Steel part:  
Suzlon Energy Ltd., Chopadava, Kutch,  
India  
Tool fab Engineering Industries (P) Ltd.,  
Trichy, Tamilnadu, India  
Barakath Engineering Industries Pvt. Ltd.,  
Trichy, Tamilnadu, India  
Jay Engineering Industries, Trichy,  
Tamilnadu, India  
Altec Fabricators, Trichy, Tamilnadu,  
India  
Cu-Built Engineers Pvt. Ltd., Khandala,  
India  
Metal Engineers, Trichy, Tamilnadu, India  
Likhita Energy Systems Pvt. Ltd., Ongole,  
Prakasham, India

Sections:

Length:

Drawing / Data sheet / Part No.:

137.7 m

Drawing No. steel part: M201.000670-01,  
Rev. 01  
Drawing No. concrete part: T-ME-067-  
0025-PL-C0001-R01, Rev. 01



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Foundation specification: T-ME-067-  
0023-IC-0004-R01, Rev. 01

#### **Manuals:**

Operation & maintenance manual:  
Transport manual, Installation &  
commissioning. manual:

TGPM-MA-006850-S120-OMS, Rev. 04

TGPM-MA-006850-S120-A, Rev. 04

#### **Outstanding issues:**

1. For the rotor blade SB59S1 design evaluation of the blade fatigue test specification, post fatigue test specification and manuals.
2. For the smart tubular tower with HH 120m (STT) the assessment of the tower internals has to be finished.
3. For the smart tubular tower with HH 120m (STT) and the hybrid concrete tower with HH 140m (HCT) the loads assessment has to be done with regards to the optimized power curve.
4. The eigenfrequencies and the corresponding damping values of HH 120 m (STT) conf. 3 and HH 140 m (HCT) conf. 4 need to be validated by measurements.
5. The controller side-side tower damper of HH 120 m (STT) conf. 3 shall be examined via additional measurements.