



Certificate No.

**IECRE.WE.TC.20.0069-R0**

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

## PROVISIONAL TYPE CERTIFICATE RNA

### Rotor Nacelle Assembly

This certificate is issued to

Siemens Gamesa Renewable Energy A/S  
Borupvej 16  
7330 Brande  
Denmark

for the wind turbine RNA

SG DD-193 (50 Hz)

wind turbine class (class, standard, year)

Class S (based on IB), IEC 61400-1, ed.3

This certificate 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 20320808-TDB-IEC Rev.0  
2020-12-11

Design evaluation conformity statement  
Dated

IECRE.WE.CS.20.0059-R0  
2020-12-16

Type test conformity statement  
Dated

44 220 20320808-PT-IEC Rev.0  
2020-12-16

Manufacturing conformity statement  
Dated

44 220 20320808-PM-IEC Rev.0  
2020-12-16

Final evaluation report  
Dated

8116 320 808-20 E Rev.0  
2020-12-16

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:  
2021-12-15

Approved for issue on behalf of the IECRE  
Certification Body:

Dipl.-Ing., Dr. M. Broschart  
Deputy Specialist Manager Wind Energy  
Essen, 2020-12-16



TÜV NORD CERT GmbH  
Langemarckstraße 20  
45141 Essen



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#### Machine parameters:

Power regulation:	Independent hydraulic pitch system
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	0.5°
Cone angle:	6°
Rated power:	11 MW (with variable power rating from 10 to 11 MW; PowerBoost: 11.55 MW)
Rated wind speed $V_r$ :	12 – 15 m/s
Rotor diameter:	193 m
Hub height(s):	n/a (HH 140 m considered in loads evaluation)
Hub height operating wind speed range $V_{in} - V_{out}$ :	4 – 28 m/s (with HWO active from 25 – 28 m/s)
Design life time:	25 years
Software version:	STC-1 version 145.x.x.x

#### Wind conditions:

Characteristic turbulence intensity $I_{ref}$ at $V_{hub} = 15$ m/s:	0.14
Annual average wind speed at hub height $V_{ave}$ :	10 m/s
Reference wind speed $V_{ref}$ :	50 m/s ( $V_{ref,typhoon}$ 57 m/s acc. to IEC 61400-1 ed.4)
Mean flow inclination:	8°
Hub height 50-year extreme wind speed $V_{e50}$ :	70 m/s ( $V_{e50,typhoon}$ 79.8 m/s acc. to IEC 61400-1 ed.4)

#### Electrical network conditions:

Normal supply voltage and range:	66 kV $\pm$ 10% (690 V $\pm$ 15%)
Normal supply frequency and range:	50 Hz (-3 Hz / + 2 Hz)
Voltage imbalance:	Min. 2% acc. to IEC 60146
Maximum duration of electrical power network outages:	No limitations if requirements in manuals are followed.
Number of electrical network outages:	24 per year



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

Design conditions in case of offshore WT:	As defined in the turbine design basis documentation
Normal and extreme temperature ranges:	Normal: -10 to +15 °C (with HTRT up to +35°C) Extreme: -20 to +45 °C
Relative humidity of the air:	100% (outside)
Air density:	1.225 kg/m <sup>3</sup>
Solar radiation:	1000 W/m <sup>2</sup>
Lightning protection system (standard and protection class):	IEC 61400-24, protection level I
Earthquake model and parameters (standard and key parameters e.g. spectrum, model, seismic zone, soil class, etc.):	n/a
Other design conditions:	Max. installation altitude of the generator and the converter 1000 m.

#### **Interfaces:**

The design evaluation covers the rotor nacelle assembly (RNA) including the tower top adapter (with its bolt connection to the yaw ring) and the tower top flange which is connected beneath the tower top adapter. TTF drawing no: D1835822, Rev.003, ECN no. C01054893

The load calculation is valid for tower (coupled) frequency range of 0.189 Hz +/-5% (fore-aft) with a 3° geometric tolerance in tower verticality (tubular steel tower).

General internals for tubular steel towers are included in the design evaluation; their suitability (geometries, detail categories, etc.) shall be checked within the individual tower design evaluations and with respect to site-specific particularities.



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### **Rotor Nacelle Assembly**

#### **Major components:**

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

#### **Blade:**

Type: B94 (NB12)  
Material: Glass- and carbon fibre reinforced epoxy  
and balsa  
Blade length: 93.8 m  
Number of blades: 3  
Manufacturer: Siemens Gamesa Renewable Energy A/S  
Drawing / Data sheet / Part No.: D1904061, Rev.001, ECN no.  
C01064835 (see ref. Provisional Design  
Evaluation Conformity Statement for the  
applied  $\gamma_M$ )

#### **Blade bearing:**

Type: Double-row ball bearing slewing ring  
Manufacturer: Thyssenkrupp Rothe Erde GmbH  
Drawing / Data sheet / Part No.: 090.70.4450.000.49.140D, Rev. G

#### **Pitch system:**

Motor / Actuator Type: Hydraulic cylinders per blade  
Pitch Controller Type: Hydraulic  
Manufacturer: Hine Renovables S.L.

#### **Main shaft:**

Type: Steel part (fixed shaft)  
Manufacturer: Jiangsu Bright Steel Fine Machinery Co.,  
Ltd.  
Material: EN-GJS-400-18C-LT-Z  
Drawing / Data sheet / Part No.: D1722291, Rev.009

#### **Main bearing:**

Type: Tapered roller bearing  
Manufacturer: Thyssenkrupp Rothe Erde GmbH  
Drawing / Data sheet / Part No.: 140.99.4267.000.62.130D, Rev. G



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#### **Gearbox:**

Type: n/a  
Gear Ratio: n/a  
Manufacturer: n/a  
Drawing / Data sheet / Part No.: n/a

#### **Yaw system:**

*Drive Type:* Active yaw motors mounted on gears  
Manufacturer: ABB  
Drawing / Data sheet / Part No.: 3GAR133310-BDESG01

#### *Bearing Type:*

Yaw bearing ring (slide solution) with  
mounted friction pads (yaw clamps)  
Manufacturer: Reducel S.L.  
Drawing / Data sheet / Part No.: Yaw ring: D1702818, Rev.010, ECN no.  
C01088150  
Friction pads: D1702910, Rev.003

#### *Gear Type:*

4-stage planetary gearbox  
Manufacturer: Bonfiglioli Trasmital  
Drawing / Data sheet / Part No.: I7140T013600, Rev. B

#### *Brake Type:*

Integrated motor brakes of the yaw  
motors  
Manufacturer: ABB  
Drawing / Data sheet / Part No.: See yaw motor

#### **Generator:**

Type Permanent magnet synchronous direct  
drive generator  
Manufacturer: Siemens D.O.O. (structural elements);  
KK Wind Solutions Polska Sp. z.o.o.  
(electrical parts); (designed by Siemens  
Gamesa Renewable Energy A/S)  
Drawing / Data sheet / Part No.: DD9-1  
Rated Power: 12 MW (max.)  
Rated Frequency: 14 – 15 Hz



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Rated Speed:	8.6 – 9.1 rpm
Max. speed:	9.1 rpm
Rated Voltage:	820 V (max.)
Rated Current:	2x(4.9 – 5.0) kA
Insulation Class:	H
Degree of Protection:	IP44

#### Converter:

Type:	Liquid cooled, full power converter (2 symmetrical single systems)
Manufacturer:	KK Wind Solutions Polska Sp. z.o.o. (designed by Siemens Gamesa Renewable Energy A/S)
Drawing / Data sheet / Part No.:	AA1-1 – S2100AA1003 (master) AA1-2 – S2100AA1004 (slave)
Rated Voltage (grid side):	690 V
Rated Current (grid side):	6000 A
Degree of Protection:	IP54

#### Transformer:

Type:	Ester-immersed
Manufacturer:	Siemens AG (Austria)
Drawing / Data sheet / Part No.:	TDN-164A07W1N-99
Rated Voltage:	66 kV (HV-side), 690 V (LV-side)
Rated Power:	15060 kVA
Degree of Protection:	IP00
Location (e.g. tower bottom):	Inside nacelle

#### Tower:

Type:	Out of scope
Manufacturer:	n/a
Sections:	n/a
Length:	n/a
Drawing / Data sheet / Part No.:	n/a



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#### **Foundation:**

Type: Out of scope  
Manufacturer: n/a  
Drawing / Data sheet / Part No.: n/a

#### **Manuals:**

Operation & maintenance manual: See Provisional Design Evaluation Conformity Statement (P-DECS)  
Transport manual: See P-DECS  
Installation & commissioning manual: See P-DECS

#### **Outstanding issues:**

Design Evaluation: Safety system and manuals:  
Final performance level calculation document; final parameter and alarm lists; final manuals.  
Machinery components:  
Validation of performance of the cooling and dehumidification systems; evaluation of the cooling tower on top of the canopy; final evaluation of the helicopter hoist platform fences.  
Electrical equipment:  
Test reports for generator and converter tests, finalized documentation of slip ring and transformer.

Type Testing Evaluation: Load measurements  
Safety and function tests (only non-safety related tests outstanding)  
Power performance measurements  
Rotor blade edgewise fatigue tests  
Turbine type inspection

Manufacturing Evaluation: Component qualification for some suppliers required and/or existing qualifications to be updated/renewed.