



Certificate No.

IECRE.WE.TC.20.0070-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-200 (50 Hz)

wind turbine class (class, standard, year)

Class S (definition see below), 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 20921768-TDB-IEC Rev.0
2020-12-11

Design evaluation conformity statement
Dated

IECRE.WE.CS.20.0060-R0
2020-12-16

Type test conformity statement
Dated

44 220 20921768-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

8117 921 768-20 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

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 – 14 m/s
Rotor diameter:	200 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 (till 15 m/s) and 0.12 (from 15 m/s)
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 ³
Solar radiation:	1000 W/m ²
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 0.188 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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Major components:

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

Blade:

Type: B97 (NB17)
Material: Glass- and carbon fibre reinforced epoxy
and balsa
Blade length: 97.3 m
Number of blades: 3
Manufacturer: Siemens Gamesa Renewable Energy A/S
Drawing / Data sheet / Part No.: D2374570, Rev.003, ECN no.
C01105286 (see ref. Provisional Design
Evaluation Conformity Statement for the
applied γ_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.