



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA

Rotor Nacelle Assembly

This certificate is issued to

Vestas Wind Systems A/S
Hedeager 42
8200 Aarhus N
Denmark

for the rotor nacelle assembly

V174-9.5MW with Power Mode up to 9.6MW

wind turbine class (class, standard, year)

Class IB IEC 61400-1:2019 adapted to offshore conditions as specified
on page 3 of this certificate
Class IB, T IEC 61400-1:2019 adapted to offshore conditions as
specified on page 3 of this certificate

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

DB-DNVGL-SE-0074-05542-3
2020-12-23

Design evaluation conformity statement
Dated

IECRE.WE.CS.20.0051-R2
2020-12-23

Type test conformity statement
Dated

TT-DNVGL-SE-0074-06453-2
2020-12-23

Manufacturing conformity statement
Dated

ME-DNVGL-SE-0074-06452-2
2020-12-23

Final evaluation report
Dated

FER-TC-DNVGL-SE-0074-06218-2
2020-12-23

The conformity evaluation was carried out in accordance with the rules and procedures of the IECRE System www.iecre.org

The rotor nacelle assembly 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 DNV GL. Without approval, the certificate loses its validity.

This certificate is valid until:
2025-07-30

Approved for issue on behalf of the IECRE Certification
Body:

Johan Olaison/Bente Vestergaard
Project Manager / Service Line Leader, Type Certification
Hellerup 2020-12-23



Renewables Certification
Brooktorkai 18
20457 Hamburg, Germany



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Machine parameters:

Power regulation:	Pitch-controlled
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	6°
Cone angle:	-6°
Rated power:	9.5 MW with power mode up to 9.6 MW
Rated wind speed V_r :	12.0 m/s
Rotor diameter:	174 m
Hub height(s):	Reference HH 107 m, please see interfaces below
Hub height operating wind speed range $V_{in} - V_{out}$:	3 –31 m/s
Max Storm (High Wind Operation) derating linearly to 4.3 MW at 31 m/s	25-31 m/s
Design life time:	25 years
Software version:	SW 2020.15

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
Weibull shape factor, K:	See adaption to offshore conditions
Reference wind speed V_{ref} :	50.0 m/s
Reference wind speed V_{refT} :	57.0 m/s
Mean flow inclination:	See adaption to offshore conditions

Electrical network conditions:

Normal supply voltage and range:	Up to 66 kV
Normal supply frequency and range:	50, 60 Hz
Voltage imbalance:	2 %
Maximum duration of electrical power network outages:	Not dimensioning
Number of electrical network outages	50



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Other environmental conditions (where taken into account):

Design conditions in case of offshore WT :	Site specific
Normal and extreme temperature ranges:	See adaption to offshore conditions
Air density:	1.225 kg/m ³
Solar radiation:	1000 W/m ²
Lightning protection system (standard and protection class):	Designed acc. to IEC 61400-24, Protection Level I

Adaption to offshore conditions

Normal and extreme temperature ranges: As per IEC 61400-3-1: 2019	-15°C to +35°C (normal) -20°C to +50°C (extreme)
Mean flow inclination: As per IEC 61400-3-1: 2019	0°
Wind shear profile: As per IEC 61400-3-1: 2019	0.14
Weibull shape factor, K: Adjusted for typical offshore conditions	2.24

Interfaces:

The certification covers RNA including yaw section (upper tower top) excluding bolt connection to tower top.

Load calculations are valid for system frequency range [0.191;0.264] Hz

The interface between the power control module and the tower is not included

Commissioning manuals have not been evaluated, as these are site specific



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Major components:

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

Blade:

Type: Structural shell
Material: Carbon fibre reinforced epoxy and glass fibre reinforced epoxy
Blade length: 85 m
Number of blades: 3
Manufacturer: Vestas Wind Systems A/S
Drawing / Data sheet / Part No.: 300041245 V02

Blade bearing:

Type: Three row slew roller bearing
Manufacturer: Liebherr
Drawing / Data sheet / Part No.: 300023040 V01

Type: Three row slew roller bearing
Manufacturer: Rollix
Drawing / Data sheet / Part No.: 300052307 V00

Pitch System:

Motor / Actuator Type: Two double acting hydraulic cylinders per blade
Pitch Controller Type: Hydraulic
Manufacturer: Lind Jensens Maskinfabrik A/S (LJM)
Drawing / Data sheet / Part No.: 300024225 rev. 0

Main shaft:

Type: Hollow shaft
Manufacturer: Vestas Wind Systems A/S
Material: Cast iron, EN-GJS-500-14
Drawing / Data sheet / Part No.: 300026486 V01



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Main bearing:

Type: Two pretensioned tapered roller bearings

Manufacturer: Schaeffler Technologies AG & Co. KG

Drawing / Data sheet / Part No.: F-615869.01.TR1-WPOS
F-615870.01.TR1-WPOS

Manufacturer: Timken

Drawing / Data sheet / Part No.: NP596934 – 90WA2 (E-55904, Rev. C)
NP746013 – 90WA2 (E-55905, Rev. C)

Gearbox:

Type: 2 stage planetary gearbox

Gear Ratio: 1:40.8

Manufacturer: Winergy

Drawing / Data sheet / Part No.: PZFB 2780.1

Yaw System:

Drive Type: 10 electrical yaw motors incl. gearbox
and motor brake

Manufacturer: Lafert

Drawing / Data sheet / Part No.: 300009451 (motor), Rev. 0

Bearing Type: Slide bearing

Manufacturer: Vestas Wind Systems A/S

Drawing / Data sheet / Part No.: 300010675 (support beam machined),
Rev. 1

Gear Type: Internal ring gear

Manufacturer: Comer Industries

Drawing / Data sheet / Part No.: M_29031014 (yaw gear), Rev. 2



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Brake Type: Braking capacity is based on bearing friction and electrically activated friction brake on motors
Manufacturer: Vestas Wind Systems A/S
Lafert
Drawing / Data sheet / Part No.: 300009494 (brake), Rev. 0

Generator:

Type: Medium-speed low voltage 3-phase synchronous permanent magnet generator
Manufacturer: The Switch
Drawing / Data sheet / Part No.: PMM1500B10
Rated Power: 10.4 MW
Rated Speed: 400 rpm
Rated Voltage: 730 V
Insulation Class: H
Degree of Protection: IP54

Type: Medium-speed low voltage 3-phase synchronous permanent magnet generator
Manufacturer: The Switch
Drawing / Data sheet / Part No.: PMM1500D00
Rated Power: 10.4 MW
Rated Speed: 425 rpm
Rated Voltage: 730 V
Insulation Class: H
Degree of Protection: IP54

Converter:

Type: Full scale converter
Manufacturer: Vestas Wind Systems A/S
Rated Voltage (grid side): 710 VAC machine-side
640 VAC line-side
Rated Current (grid side): 2 x 5000 A
Rated grid frequency: 50 / 60 Hz



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Transformer:

Type: Three-winding three-phase liquid-immersed HV transformer
Manufacturer: Siemens Energy Austria AG
Drawing / Data sheet / Part No.: TDU-104K03W6A-99
Rated Voltage: 33 or 34 kV (HV)
640 V (LV)
Rated grid frequency: 50 Hz
Degree of Protection: IP54
Location (e.g. tower bottom): PCM module, bottom half of tower

Type: Three-winding three-phase liquid-immersed HV transformer
Manufacturer: ABB Oy Transformers
Drawing / Data sheet / Part No.: KTAU/M 42 FA 11111
Rated Voltage: 34 kV (HV)
640 V (LV)
Rated grid frequency: 50 Hz
Degree of Protection: IP54
Location (e.g. tower bottom): PCM module, bottom half of tower

Type: Three-winding three-phase liquid-immersed HV transformer
Manufacturer: ABB Oy Transformers
Drawing / Data sheet / Part No.: KTAU/M 72 FA 11120
Rated Voltage: 66 kV (HV)
640 V (LV)
Rated grid frequency: 50/60 Hz
Degree of Protection: IP54
Location (e.g. tower bottom): PCM module, bottom half of tower



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Type:	Three-winding three-phase liquid-immersed HV transformer
Manufacturer:	Siemens Energy Austria AG
Drawing / Data sheet / Part No.:	TDU-114K07W6K-TU
Rated Voltage:	66 kV (HV) 640 V (LV)
Rated grid frequency:	50 Hz
Degree of Protection:	IP54
Location (e.g. tower bottom):	PCM module, bottom half of tower

Switchgear:

Manufacturer	ABB
Type	SafePlus 36
Part no protection relay	ABB REF 615
Rated grid voltage	Up to 36 kV
Rated grid frequency	50 / 60 Hz

Manufacturer	Siemens AG
Type	8DN8
Part no protection relay	SIPROTEC 4 7SJ85
Rated grid voltage	Up to 72.5 kV
Rated grid frequency	50 / 60 Hz

Manufacturer	Mitsubishi Electric
Type	HG-VG-A
Part no protection relay	ABB REF 620
Rated grid voltage	Up to 72.5 kV
Rated grid frequency	50 / 60 Hz



Certificate No.

IECRE.WE.TC.20.0087-R2

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

TYPE CERTIFICATE RNA
Rotor Nacelle Assembly

Manufacturer	Schneider Electric Sachsenwerk GmbH
Type	WIA 6/72.5-2/628
Part no protection relay	MiCOM P14x
Rated grid voltage	Up to 72.5 kV
Rated grid frequency	50 / 60 Hz

Manuals:

Operating manual	DOC-000026053 V03
Service manual	DOC-000026052 V04 Section 2.2
Installation manual	DOC-000026052 V04 Section 2.1 and 2.6
Commissioning Manual	Site specific