



Certificate No.

IECRE.WE.CC.20.0038-R1

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

COMPONENT CERTIFICATE

Wind Turbine

This certificate is issued to

General Electric Renovables España, S.L.
C/ Roc Boronat, 78
08005 Barcelona
Spain

for the component

HALIADE X

wind turbine class (class, standard, year)

Class IB, adapted to offshore wind conditions; IEC 61400-1:2019-02

This certificate attests compliance with the operational documents of the IECRE system and applicable technical standards such as the 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-0074-03480-0
2018-06-29

Design evaluation conformity statement
Dated

IECRE.WE.CS.20.0049-R1
2020-07-15

Type test conformity statement
Dated

TT-DNVGL-SE-0074-03483-2
2020-10-29

Manufacturing conformity statement
Dated

ME-DNVGL-SE-0074-03482-0
2019-08-30

Final evaluation report
Dated

FER-TCO-DNVGL-SE-0074-03484-2
2020-10-29

Provisional component certificate
Dated

IECRE.WE.CC.20.0018-R1 issued by TÜV NORD CERT GmbH
2020-10-26
(DNV GL takes no responsibility for the work covered by this certificate)

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

The component specification begins on page 2 of this component 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:
2025-06-09

Approved for issue on behalf of the IECRE
Certification Body:



Gema Parro / Bente Vestergaard
Project Manager / Service Line Leader, Type
Certification
Hellerup 2020-10-29

Renewables Certification
Brooktorkai 18
20457 Hamburg, Germany



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Machine parameters:

Power regulation:	Pitch controlled
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	6°
Cone angle:	-4°
Rated power:	12000 kW
Rated wind speed V_r :	10.5 m/s
Rotor diameter:	220 m
Hub height(s):	138 m
Hub height operating wind speed range $V_{in} - V_{out}$:	3.5-28 m/s
Design life time:	25 years
Wind turbine control system, software release:	GEWindOffshore_V01.01.04
Wind turbine safety PLC, software version:	V01.03.03
Pitch Safety PLC, software version:	HaliadeX_Proto_v00_00 (145a Hex CRC)

Wind conditions:

Characteristic turbulence intensity at V_{hub} :	0.14
Annual average wind speed at hub height V_{ave} :	10.0 m/s
Weibull shape factor k:	2.0
Mean flow inclination:	0°
50 Year mean wind speed (10min avg.), V_{50} :	50.0 m/s
1 Year mean wind speed (10min avg.), V_1 :	40.0 m/s



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Electrical network conditions:

Normal supply voltage and range:	66 kV \pm 10%
Normal supply frequency and range:	50/60 Hz -6% / +4%
Voltage imbalance:	2.5% V
Maximum duration of electrical power network outages:	As per IEC 61400-1 Ed.4 requirements, section 6.5
Number of electrical network outages	As per IEC 61400-1 Ed.4 requirements, section 6.5



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Other environmental conditions (where taken into account):

Design conditions in case of offshore WT (water depth, wave conditions, salinity, etc.):	Marine environment for atmospheric zone, ref. IEC 61400-3 ed.1 Hydrodynamic loading not included
	Corrosion class acc. ISO-12944-2 External surfaces: C5 Internal surfaces: C4
Normal and extreme temperature ranges: Extreme temperature range: Maximum operation temperature without derating:	-10 °C to +40 °C (operating) -20 °C to +50 °C (survival) +25 °C
Relative humidity of the air:	10% to 100%
Air density:	1.24 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
Earthquake model and parameters (standard and key parameters e.g. spectrum, model, seismic zone, soil class, etc.):	Not applicable
Other design conditions :	Not applicable

Interfaces:

Tower, tower top flange to upper section bolted connection, tower internals, diesel generator and 60Hz high-voltage switchgear are not covered	
Load calculations are valid for tower frequency range:	0.18 Hz to 0.26 Hz
Interface to other components or systems and design loads	See Final Evaluation Report: FER-TCO-DNVGL-SE-0074- 03484-2 dated 2020-10-29



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Major components:

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

Blade:

Type: LM107P
Material: Glass fibre reinforced polyester material along with carbon and hybrid fibre, balsa and foam
Blade length: 107 m
Number of blades: 3
Manufacturer: LM Wind Power
Drawing / Data sheet / Part No.: DR-08898/A2, Rev. A2

Blade bearing:

Type: Double row four contact ball slewing bearing
Manufacturer: Rollix
Drawing / Data sheet / Part No.: 12-5580-00, Rev. B

Pitch System:

Type: Three stages planetary gearbox with pinion shaft
Manufacturer: Liebherr Components Biberach GmbH
Drawing / Data sheet / Part No.: 368 451 4000 99 0, Rev. 00.13

Main shaft:

Type: Cast Component
Material: EN-GJS-400-18-LT
Drawing / Data sheet / Part No.: 449W4176, Rev. A

Main bearing:

Type: Two taper roller bearings
Manufacturer: Timken Company
Drawing / Data sheet / Part No.: E-57384, Rev. F (front bearing)
E-57383, Rev. F (rear bearing)



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Yaw System:

Gear/Drive Type: Four stages planetary gearbox with pinion shaft and electric motor with electrobrakes
Manufacturer: Liebherr Components Biberach GmbH
Drawing / Data sheet / Part No.: 368 452 5000 99 0, rev. 01.5

Bearing Type: Friction bearing with 24 upper pads, four front calipers and eight rear calipers
Manufacturer: GE Renewable Energy
Drawing / Data sheet / Part No.: 447W6166, rev. -

Generator:

Type: Permanent magnet synchronous generator (PMSG)
DD12-3MV-120P-9600-1150
Manufacturer: GE Renewable Energy
Drawing / Data sheet / Part No.: WE-47700, Rev. A
Rated Power: 12798 kW
Rated Frequency: 7.81 Hz
Rated Speed: 7.81 rpm
Rated Voltage: 3220 V
Rated Current: 2 x 1455 A
Insulation Class: F
Degree of Protection: IP54

Converter:

Type: PCS6000 Wind
Manufacturer: ABB Switzerland Ltd.
Drawing / Data sheet / Part No.: 3BHE054727_E01, Rev. B
Rated Voltage (machine side/grid side): 3.3 kV / 3.1 kV
Rated Current (machine side/grid side): 2 x 1600 A / 2 x 1600 A
Rated grid frequency: 50/60 Hz
Degree of Protection: IP54



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Transformer:

Type: KTAU/M 72 NM 15250 – Ester-immersed
Manufacturer: ABB
Drawing / Data sheet / Part No.: YKLZE 2168, dated 17.09.2018
Rated Voltage: 66 kV
Rated grid frequency: 50 Hz
Degree of protection: n/s
Location (e.g. tower bottom): Nacelle

Type: POWER 14+0.5 MVA / 66/3.1-3.1/0.41 kV
– Ester-immersed
Manufacturer: GE Grid Solutions
Drawing / Data sheet / Part No.: 35337PA292-08-00, dated 13.04.2020
Rated Voltage: 66 kV
Rated grid frequency: 60 Hz
Degree of protection: n/s
Location (e.g. tower bottom): Nacelle

Manuals:

Operation & maintenance manual: 17_054 Gxxx_BDC101.R5
17_054 Gxxx_BDC200.R6

Installation & commissioning. manual: WOS-TI_IDI-025_HALX.R03
WOS-T&I_IDI-024_HALX.R03
PHX-GE-ROT-COM-MAN-06025.R00_
Haliade X Commissioning Technical
Manual