



Certificate No.

IECRE.WE.TC.19.0029-R0

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

TYPE CERTIFICATE

Wind Turbine

This certificate is issued to

GE Wind Energy GmbH
Holsterfeld 16
48499 Salzbergen
Germany

for the wind turbine

GE 3.8-137

wind turbine class (class, standard, year)

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

Included in the Design evaluation conformity statement

Design evaluation conformity statement
Dated

44 220 18797135-D-IEC
Rev. 0, 2018-09-28

Type test conformity statement
Dated

44 220 18797135-T-IEC
Rev. 0, 2018-12-14

Manufacturing conformity statement
Dated

44 220 18797135-M-IEC
Rev. 0, 2018-12-14

Component certificate Rotor Blade LM67.2P3
Dated

44 220 18630105-CC-IEC
Rev. 0, 2018-03-29, valid until 2023-03-28

Final evaluation report
Dated

8115 797 135-20 E
Rev. 0, 2018-12-14

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

This certificate is valid until:
2023-12-13

Approved for issue on behalf of the IECRE
Certification Body:

Dipl.-Ing., Dr. M. Broschart
Deputy of Specialist Manager Wind Energy
Essen, 2019-01-22



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:	4°
Cone angle:	5°
Rated power:	3830 kW
Rated wind speed V_r :	11.25 m/s
Rotor diameter:	137 m
Hub height(s):	110 m
Hub height operating wind speed range $V_{in} - V_{out}$:	3 - 25 m/s
Design life time:	20 years
Software version:	V05.05.01.6C
Controller features	mLRIC

Wind conditions:

Characteristic turbulence intensity I_{ref} at $V_{hub} = 15$ m/s:	0.14
Annual average wind speed at hub height V_{ave} :	8.5 m/s
Reference wind speed V_{ref} :	42.5 m/s
Mean flow inclination:	8°
Hub height 50-year extreme wind speed V_{e50} :	59.5 m/s

Electrical network conditions:

Normal supply voltage and range:	10 kV or 33 kV (range 90-110 %)
Normal supply frequency and range:	50Hz (range 47-53 Hz)
Voltage imbalance:	4 %
Maximum duration of electrical power network outages:	6 hours
Number of electrical network outages	20 per year



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Other environmental conditions (where taken into account):

Design conditions in case of offshore WT :	N/A
Normal and extreme temperature ranges:	Normal: -15 °C - +35 °C (derated above 35 °C) Extreme: -20 °C - +50 °C
Relative humidity of the air:	Up to 95 %
Air density:	1.225 kg/m ³ (annual average) 1.341 kg/m ³ (maximum operation)
Solar radiation:	1000 W/m ²
Lightning protection system (standard and protection class):	IEC 61400-24, PL I
Earthquake model and parameters (standard and key parameters e.g. spectrum, model, seismic zone, soil class, etc.):	N/A
Other design conditions :	N/A



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Major components:

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

Blade LM 67.2P3

Type: Vacuum infusion
Material: Glass fibre reinforced polyester
Blade length: 67.3 m
Number of blades: 3
Manufacturer: LM Wind Power A/S
Drawing / Data sheet / Part No.:
GE Part No.: 446W1194P001-P010+P021+P022
Outline Drawing No.: DR-08951/A1, DR-08954/A1
Drawing No. (Vortex Generators): 444W7445, Rev. A
Drawing No. (TE Serrations): 444W8125
Specification: BS-00446/A2

Blade bearing:

Type: Ball bearing slewing ring
Manufacturer: TMB Tianma (Chengdu) Precision Machinery Co., Ltd.,
Chengdu, China
Drawing / Data sheet / Part No.:
GE Generic Part No.: 445W5233P001
Vendor Specific Part No.: 445W5246P001
Drawing No.: B033.82.2750K, Rev. A

alternative:

Manufacturer: GE Renewable Energy (Design)
CS Bearing Co. Ltd., Kyoungnam, Korea
Drawing / Data sheet / Part No.:
GE Part No.: 445W9236G001
Drawing No.: 445W9236

Pitch System:

Motor / Actuator Type: Electrical motors (DC) with battery backup and individual blade
pitch control
Pitch Controller Type: PLC Mark VIe UCSB
Manufacturer: GE Renewable Energy



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Main shaft:

Type: Forged part
Manufacturer: GE Renewables Energy (Design)
(1) Hyunjing Materials Co. Ltd., Busan, South-Korea
(2) Shandong Laiwu Jinlei Wind Power Technology Co. Ltd., Laiwu City, Shandong, China
(3) Taewoong Co.Ltd., Busan, South-Korea
(4) Tongyu Heavy Industry Co. Ltd., Yucheng City, Shandong, China
Material: 34CrNiMo6 + HH, WTG-113, 30CrNiMo8+HH
Drawing / Data sheet / Part No.: Drawing No.: 444W7167, Rev.-

Main bearing (Rotor Side):

Type: Double row tapered roller bearing
Manufacturer: NTN Bearing Corporation of America (Design)
(1) NTN Houdatsushimizu Corporation, Ishikawa, Japan
(2) NTN Corporation (Kuwana Works), Kuwana-shu, Mie-ken, Japan
Drawing / Data sheet / Part No.: Designation: CRD-18601 CS1150PX1 S30, alternative: CRD-18601 CS1150PX2V3S30
GE Part No.: 444W1051 P001
Drawing No.: 15-06675-B, alternative: 16-10229

Main bearing (Generator Side):

Type: Cylindrical roller bearing
Manufacturer: NTN Bearing Corporation of America (Design)
(1) NTN Houdatsushimizu Corporation, Ishikawa, Japan
(2) NTN Corporation (Kuwana Works), Kuwana-shu, Mie-ken, Japan
Designation: RNU17801CS385PX1S30, alternative: RNU17801PX1V1S30
Drawing / Data sheet / Part No.: GE Part No.: 444W1052P001
Drawing No.: 15-06676-B, alternative: 16-04756-A

Gearbox:

Type: Planetary helical gearbox
Gear Ratio: 150.094
Manufacturer: Flender GmbH / Winergy, Voerde, Germany
Drawing / Data sheet / Part No.: Designation: PZAB 3521
GE Part No.: 44W9995P004 / 446W6997P004
Vendor Part No.: 444W9997P002 / 446W7030P002,
444W9997P004 / 446W7030P004
Drawing No.: A5E37846411A, Rev.008 (AG)



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Yaw System:

Drive Type: Active, yaw bearing slewing ring with 4 active yaw drives and 5 hydraulic brakes,
4 stage planetary gearbox
Manufacturer: Liebherr Components Biberach GmbH, Biberach, Germany
Drawing / Data sheet / Part No.: Vendor designation: DAT 450/2494
GE Part No.: 444W2139P001
Vendor Part No.: 444W0090P001
Drawing No.: 268 494 4000 99 0, Index 1.2

alternative:

Type: 4 stage planetary gearbox
Manufacturer: Bonfiglioli Trasmital (Design)
Bonfiglioli Riduttori, Bologna, Italy
Drawing / Data sheet / Part No.: Designation: 714T4W(MT714T040)
GE Vendor Part No.: 444W2140P001
GE Part No.: 444W0090P001
Drawing No.: I7140T008200, Rev. H

Bearing Type:

Manufacturer: Ball bearing slewing ring
GE Renewable Energy (Design)
(1) Tianma (Chengdu) Precision Machinery Co. Ltd.,
Chengdu, China
(2) CS Bearing Co. Ltd., Kyounghnam, South-Korea
(3) Seohan-NTN Bearing Co. Ltd., Gyeongbuk, South-
Korea
(4) Seohan-NTN Bearing Co. Ltd., Gyeongbuk, South-
Korea
Drawing / Data sheet / Part No.: GE Part No.: 444W0622G001
Drawing No.: 444W0622

Brake Type:

Manufacturer: Hydraulic active brakes
Svendborg Brakes A/S, Melle, Germany
Drawing / Data sheet / Part No.: Designation: BSAB 120-S-550
GE Part No.: 444W4359P001
Drawing No.: 490-6132-801



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Generator:

Type: Doubly-fed induction
Manufacturer: GE Power Conversion (Design)
GE Power Conversion Group, Nancy, France
Drawing / Data sheet / Part No.: Designation: DF1NXS120-95/4GH/5
Vendor Specific Part No.: 444W7266P001 / 444W7266P002
GE Generic Part No.: 444W7178P001 / 444W7178P004
Rated Power: 3988 kW
Rated Frequency: 50 Hz
Rated Speed: 1741 rpm
Rated Voltage: 6000 V (stator)
825 V (rotor)
Rated Current: 391 A (stator)
1532 A (rotor)
Insulation Class: F
Degree of Protection: IP 34 (generator)
IP 23 (slip ring)

Converter:

Type: MMW DFIG Converter
Manufacturer: GE Power & Water, Haiphong City, Vietnam
Drawing / Data sheet / Part No.: Designation: 151X1249KA01SA04
GE Part No.: 109W3000P005
Rated Voltage (grid side): 690 V
Rated Current (grid side): 700 A
Degree of Protection: IP 53 (control and bridge cabinet)
IP 22 (filter and inductor cabinet)
IP 32 (AC entry cabinet)
IP 21 (heat exchanger cabinet)

Transformer:

Type: Dry type
Manufacturer: Hainin Jinpan Electric (JST), Haikou, China
Drawing / Data sheet / Part No.: Designation: 3161152301
Vendor Specific Part No.: 445W2509P012
GE Generic Part No.: 445W2508P012
Rated Voltage: 33 kV (high)
6 kV (medium)
690 V (low)
Rated Power: 4300 kVA
Degree of Protection: IP00 (not defined)
Location (e.g. tower bottom): Tower bottom



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alternative:

Manufacturer:
Drawing / Data sheet / Part No.:

Hainan Jinpan Electric Co. Ltd. (JST), Haikou, China
Designation: 3161001301
Vendor Specific Part No.: 444W5865P001
GE Generic Part No.: 444W5864P001

Rated Voltage:

10 kV (high)
6 kV (medium)
690 V (low)

Rated Power:
Degree of Protection:

4779 kVA
IP00 (not defined)

alternative:

Manufacturer:
Drawing / Data sheet / Part No.:

Hainan Jinpan Electric Co. Ltd. (JST), Haikou, China
Designation: 3161176301
Vendor Specific Part No.: 444W8961P014
GE Generic Part No.: 444W8962P014

Rated Voltage:

35 kV (high)
6 kV (medium)
690 V (low)

Rated Power:
Degree of Protection:

4779 kVA
IP00 (not defined)

Tower (110m):

Type:
Manufacturer:

Tubular steel
GE Renewable Energy (Design)
(1) Chengxi Shipyard Co., Jiangsu Province, China
(2) CS Wind Corporation, Tau Province, Vietnam
(3) Ates Celik Insaat Taahhtüt, Bergama/Izmir, Turkey
(4) Ambau GmbH, Graefenhainichen, Germany

Sections:

4

Length:

105.86 m

Drawing / Data sheet / Part No.:

Drawing No.: 444W9561
Foundation_Load_Drawing_3.8-137_50Hz_110mHH_EN_r02,
Rev.02

Foundation Adaptor (110m):

Type:
Manufacturer:

Tower base ring
GE Renewable Energy (Design)
(1) Chengxi Shipyard Co., Jiangsu Province, China
(2) CS Wind Corporation, Tau Province, Vietnam
(3) Ates Celik Insaat Taahhtüt, Bergama/Izmir, Turkey
(4) Ambau GmbH, Graefenhainichen, Germany

Drawing / Data sheet / Part No.:

Drawing No.: 444W4509



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Manuals:

Operation & maintenance manual:

Operating_Manual_3MW_xxHz_Safety_EN_r04
Operating_Manual_3MW-xxHz_Operating_EN_r05
Maintenance_Manual_Generic-xxHz_Foundation_Tower_EN_r01
Maintenance_Manual_3MW-xxHz_DFIG_EN_r02
Maintenance_Manual_Generic-xxHz_MachineHead_EN_r02
Maintenance_Manual_Generic-xxHz_Hub_EN_r01
Maintenance_Manual_Generic-xxHz_MVSG_EN_r01

Transport manual:

Transport_Documents_3.2-3.8-
xxHz_3MW_DTA_SCADA_TM1_EN_r01
Transport_Documents_3.2-3.8-
xxHz_3MW_TBR_Tower_TM2_EN_r01
Transport_Documents_3.2-3.8-
xxHz_3MW_Nacelle_Hub_TM3_EN_r01

Installation & commissioning. manual:

Installation_Manual_3MW-DFIG-xxHz_EN_r02
Commissioning_Checklist_3MW-DFIG-xxHz_uptower_EN_r03
Commissioning_Checklist_3MW-DFIG-
xxHz_downtower_EN_r03