



Certificate No.

IECRE.WE.TC.19.0027-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 3.6-137

wind turbine class (class, standard, year)

IIIB / S, IEC 61400-1 Ed. 3:2005-08 incl. Amendment 2010-10

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 17368486-TDB-IEC
Rev. 2, 2018-09-26

Design evaluation conformity statement
Dated

44 220 17028006-D-IEC
Rev. 3, 2019-01-17

Design evaluation conformity statement
Dated

44 220 18310793-D-IEC
Rev. 2, 2018-05-30

Type test conformity statement
Dated

44 220 18192223-T-IEC
Rev. 2, 2019-01-17

Manufacturing conformity statement
Dated

44 220 18192223-M-IEC
Rev. 3, 2019-01-17

Component certificate Rotor Blade LM67.2P
Dated

44 220 16895558-CC-IEC
Rev. 0, 2017-12-20, valid until 2022-12-19

Component certificate Rotor Blade LM67.2P3
Dated

44 220 18630105-CC-IEC
Rev. 1, 2018-03-29, valid until 2023-03-28

Final evaluation report
Dated

8115 192 223-20 E
2019-01-17

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:
2023-01-30

Approved for issue on behalf of the IECRE
Certification Body:

Dipl.-Ing., Dr. M. Broschart
Deputy of Specialist Manager Wind Energy
Essen, 2019-01-31



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:	3430 kW – 3630 kW
Rated wind speed V_r :	10.8 m/s
Rotor diameter:	137 m
Hub height(s):	110 m, 131.4 m
Hub height operating wind speed range $V_{in} - V_{out}$:	3 – 25 m/s
Design life time:	see table below
Software version:	V05.04.02
Controller feature:	mLRIC

Wind conditions for IEC IIIB:

Characteristic turbulence intensity I_{ref} at $V_{hub} = 15$ m/s:	0.14
Annual average wind speed at hub height V_{ave} :	7.5 m/s
Reference wind speed V_{ref} :	37.5 m/s
Mean flow inclination:	8 deg.
Hub height 50-year extreme wind speed V_{e50} :	52.5 m/s

Wind conditions for IEC S:

Characteristic turbulence intensity	see 8115 028 006-1 E I, Rev. 0
Annual average wind speed at hub height V_{ave} :	7.9 m/s
Reference wind speed V_{ref} :	31.3 m/s
Mean flow inclination:	4.3 deg.
Wind directional time distribution for tower	see 8115 028 006-1 E I, Rev. 0



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Electrical network conditions:

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

Other environmental conditions (where taken into account):

Design conditions in case of offshore WT :	N/A
Normal and extreme temperature ranges:	STW: Normal (operational): -15 °C – +40 °C (derated above 35°C) Extreme (survival): -20 °C – +50 °C CWE: Normal (operational): -30 °C – +40 °C (derated below -15 °C and above 35 °C) Extreme (survival): -40 °C – 50 °C
Relative humidity of the air:	Up to 95%
Air density:	STW: 1.225 kg/m ³ (annual average) CWE: 1.244 kg/m ³ (annual average) 1.367 kg/m ³ (max. in operation) 1.424 kg/m ³ (max. in operation, derated) 1000 W/m ²
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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TYPE CERTIFICATE**Wind Turbine****Configurations**

No.	HH [m]	Blade	Frequency [Hz]	Design Lifetime [years]	Class	Weather Conditions
1	110	LM67.2P or LM67.2P3	50	20	IIIB	STW
2	131	LM67.2P or LM67.2P3	50	20	IIIB	STW
3	131	LM67.2P3	50	27*	S	CWE

Notes: Configurations 1 and 2 are covered by DECS 44 220 18310793-D-IEC,
configuration 3 is covered by DECS 44 220 17028006-D-IEC

*machinery component design lifetime of 27 years has been evaluated only by means of load comparison

*electrical component design lifetime only for 20 years lifetime

Major components:

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

Blade LM67.2P (config. 1 and 2)

Type: Vacuum infusion
Material: Fibre reinforced polyester
Blade length: 67.2 m
Number of blades: 3
Manufacturer: LM Wind Power A/S
(all manufacturing sites covered by the same global
manufacturing process and the ISO 9001 certificate)
Drawing / Data sheet / Part No.: Drawing No.: DR-07708, Rev. A1
GE Part No.: 444W8034P001-P010
Attachments: VG: 444W7445, Rev. A, LNTE: 444W8125, Rev.-

Blade LM67.2P3 (config. 1 and 2)

Type: Vacuum infusion
Material: Fibre reinforced polyester
Blade length: 67.2 m
Number of blades: 3
Manufacturer: LM Wind Power A/S, see LM67.2P
Drawing / Data sheet / Part No.: Drawing No.: DR-07708, Rev. A5
GE Part No.: 446W1194P001-P010



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Attachments: No Ice Mitigation System IMS (50Hz), LM VG – VG MKII,
GE VG – ED-05871, Rev. A1, (444W7445)
LNTE: ED-05872, Rev. A1, (444W8125)

Blade LM67.2P3 (with IMS, config. 3)

Type:	Vacuum infusion
Material:	Fibre reinforced polyester
Blade length:	67.2 m
Number of blades:	3
Manufacturer:	LM Wind Power A/S, see LM67.2P
Drawing / Data sheet / Part No.:	Drawing No.: DR-07708, Rev.A5 GE Part No.: 446W1194P011-P020 Attachments: Optional, Ice Mitigation System IMS (50Hz), LM VG – VG MKII, GE VG – ED-05871, Rev. A1, (444W7445) LNTE: ED-05872, Rev. A1, (444W8125)

Blade bearing:

Type:	Ball bearing slewing ring
Manufacturer:	TMB Tianma (Chengdu) Railway Bearing 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

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

Main shaft:

Type:	Forged part
Manufacturer:	GE Renewable Energy (Design) (1) Hyunjin 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.-



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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 CS1150PX1S30,
Alternative: CRD-18601 CS1150PX2V3S30
GE Part No.: 444W1051 P001
Drawing No.: 15-06675-B
Alternative: 16-10229, Rev,-

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
Drawing / Data sheet / Part No.: Designation: RNU17801CS385PX1S30
Alternative: RNU17801PX1V1S30
GE Part No.: 444W1052P001
Drawing No.: 15-06676-B
Alternative: 16-04756-A

Gearbox:

Type: Planetary helical gearbox
Gear Ratio: 150.20
Manufacturer: Nanjing High Speed Gear
Manufacturing Co., Ltd., Nanjing, China
Drawing / Data sheet / Part No.: Vendor Designation: NGC FDM5-00R1
GE Part No.: 444W9995P002
GE vendor Part No.: 444W9996P002 (HYDAC lubrication),
444W9996P004 (CRUN lubrication)
Drawing No.: FDM5-00R1, Rev.-



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alternative:

Type: Planetary helical gearbox
Gear Ratio: 150.094
Manufacturer: Flender GmbH (Winergy Siemens AG), Voerde, Germany
Drawing / Data sheet / Part No.: Vendor designation: PZAB 3521
GE Generic part No.: 444W9995P004 / 446W6997P004
GE VSPN: 444W9997P002 / 446W7030P002 (Hydra-Grene lubrication)
444W9997P004 / 446W7030P004 (Hydac lubrication)
Main drawing No.: A5E37846411A, Rev.008 (AG)

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 GmbH, Biberach, Germany
Drawing / Data sheet / Part No.: Vendor designation: DAT 450/2494 (90213700)
GE Part No.: 444W2139P001
Vendor Part No.: 444W0090P001
Drawing No.: 268 494 4000 99 0, Index 1.2

alternative:

Manufacturer: Bonfiglioli Transmittal (Design)
Bonfiglioli Riduttori S.p.A, Bologna, Italy
Drawing / Data sheet / Part No.: Vendor designation: 714T4W(MT714T040)
GE Vendor Part No.: 444W2140P001
Ge Part No.: 444W0090P001
Main Drawing No.: I7140T008200, Rev. H
Ball bearing slewing ring

Bearing Type:

Manufacturer: GE Renewable Energy (Design)
(1) Tianman (Chengdu) Railway Bearing, Chegdu, China
(2) Samhyun Engineering Co., Ltd. (Sumitomo Corporation), Chilseo-myeon, Haman-gun, South-Korea
(3) Seohan-NTN Bearing Co., Ltd, Gyeongbuk, South-Korea
(4) Shilla Corporation, Cheonan-si, Chungnam, South-Korea
Drawing / Data sheet / Part No.: GE Part No.: 444W0622G001
Drawing No.: 444W0622, Rev. -, dated 2015-09-16

Brake Type:

Manufacturer: Svendborg Brakes A/S, Melle, Germany
Drawing / Data sheet / Part No.: Designation: BSAB 120-S-550
GE Part No.: 444W4359P001 (490-6126-802)
Drawing No.: 490-6132-801, Rev.-



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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
Only for configurations 1 and 2:
Vendor Specific Part No.: 444W7266P001; 444W7266P002
GE Generic Part No.: 444W7178P00; 444W7178P004

alternative (all configurations):

Designation: DF1NXS120-95/4GH/5 (E95S16A055F)
GE Part No.: 444W7178P008
Vendor Specific Part No.: 444W7266P004

alternative (all configurations):

Designation: DF1NXS120-95/4GH/5 (E95S16A055I)
GE Part No.: 444W7178P005
Vendor Specific Part No.: 444W7266P006

Rated Power: 3988 kW
Rated Frequency: 50 Hz
Rated Speed: 1717 rpm
Rated Voltage: 6000 V (stator)
690 V (rotor)
Rated Current: @ 40°C: 391 A (stator) / 1486 A (rotor)
@ 50°C: 376 A (stator) / 1415 A (rotor)
Insulation Class: F
Degree of Protection: IP 34 (generator)
IP 23 (slip ring)

Converter:

Type: MMW DFIG Converter
Manufacturer: GE Power and 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)



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Transformer:

Type: Dry Type
Manufacturer: Hainan Jinpan Electric Co., Ltd (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: IP 00 (not defined)
Location (e.g. tower bottom): Tower bottom

alternative:

Drawing / Data sheet / Part No.: 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: 4779 kVA
Degree of Protection: IP 00 (not defined)

alternative:

Drawing / Data sheet / Part No.: Designation: 3161011301
Vendor Specific Part No.: 444W5865P011
GE Generic Part No.: 444W5864P011
Rated Voltage: 33 kV (high), 6 kV (medium), 690 V (low)
Rated Power: 4779 kVA
Degree of Protection: IP 00 (not defined)

Tower:

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



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HH 110m (config. 1):

Sections: 5
Length: 105.86 m
Drawing / Data sheet / Part No.: Drawing No.: 444W9561, Rev. -
Foundation specification: Foundation_Load_Drawing_3.6-137_50-60Hz_110mHH_EN_r01

HH 131.4m (config. 2):

Sections: 7
Length: 128.79 m
Drawing / Data sheet / Part No.: Drawing No.: 444W6114, Rev. -
Foundation specification: Foundation_Load_Drawing_3.6-137_50Hz_131mHH_Tubular_IEC_EN_r03

HH 131.4m (config. 3):

Sections: 7
Length: 128.79 m
Drawing / Data sheet / Part No.: Drawing No.: 445W9746, Rev. -
Foundation specification: Foundation_Load_Drawing_1041639_Markbygden_3.6-137_131mHH_r03

Manuals:

Operation & maintenance manual: 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
Transport_Documents_3.2-3.8-xxHz_3MW_Rotor_Blades_TM4_EN_r01

Installation & commissioning manual: Installation_Manual_3MW-DFIG-xxHz_EN_r04
Commissioning_Checklist_3MW-DFIG-xxHz_uptower_EN_r05
Commissioning_Checklist_3MW-DFIG-xxHz_downtower_EN_r05