



Certificate No.

**IECRE.WE.TC.19.0008-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  
Holsterfeld 16  
48499 Salzbergen  
Germany

for the wind turbine

GE 2.5-116 (Variable Power Rating 2.5 MW to 2.0 MW)

wind turbine class (class, standard, year)

S (STW/CWE), 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

44220 17364312-TDB-IEC-b  
Rev.2, 2018-06-15

Design evaluation conformity statement  
Dated

44 220 17364312-D-IEC-b  
Rev. 4, 2018-06-04

Type test conformity statement  
Dated

44 220 18883741-T-IEC  
Rev. 1, 2018-12-21

Manufacturing conformity statement  
Dated

44 220 18883741-M-IEC  
Rev. 0, 2018-12-10

Component certificate Rotor Blade LM56.9P  
Dated

44 220 15382817-CC-IEC-b  
Rev. 2, 2017-11-03, valid until 2020-12-13

Final evaluation report  
Dated

8115 883 741-20 E  
Rev. 1, 2018-12-21

The conformity evaluation was carried out in accordance with the rules and procedures of the IECRE System  
[www.iecre.org](http://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. C. Hering  
Specialist Manager Wind Energy  
Essen, 2019-01-17



TÜV NORD CERT GmbH  
Langemarckstraße 20  
45141 Essen



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### Wind Turbine

#### Machine parameters:

Power regulation:	Independent electromechanical pitch system for each blade
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	5°
Cone angle:	4°
Rated power:	2530 kW, 2330 kW, 2030 kW (below -15°C down to 1830 kW at -30°C)
Rated wind speed $V_r$ :	10.5 m/s (STW) 9 m/s (CWE)
Rotor diameter:	116 m
Hub height(s):	80 m, 87 m, 90 m, 94 m
Hub height operating wind speed range $V_{in} - V_{out}$ :	3 m/s – 3.2 m/s
Design life time:	20 years
Software version:	V05.04.02
Controller features	E2MC Track 4 mLRIC

#### Wind conditions:

Characteristic turbulence intensity $I_{ref}$ at $V_{hub} = 15$ m/s:	12.9 %
Annual average wind speed at hub height $V_{ave}$ :	8 m/s
Reference wind speed $V_{ref}$ :	38 m/s
Mean flow inclination:	8°
Hub height 50-year extreme wind speed $V_{e50}$ :	53.2 m/s

#### Electrical network conditions:

Normal supply voltage and range:	690 V $\pm$ 10 %
Normal supply frequency and range:	60 Hz $\pm$ 5 Hz
Voltage imbalance:	4 %
Maximum duration of electrical power network outages:	No information
Number of electrical network outages	20 / 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 Climate Conditions: -15° C – 40° C (operational) -20° C – 50° C (survival) Cold Climate Conditions: -30° C – 40° C (operational) -40° C – 50° C (survival)
Relative humidity of the air:	Up to 95%
Air density:	1.18 kg/m <sup>3</sup> (annual average) 1.35 kg/m <sup>3</sup> (max. Operational) 1.41 kg/m <sup>3</sup> (max. Extreme)
Solar radiation:	1000 W/m <sup>2</sup>
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

#### Major components:

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

##### Blade LM56.9P

Type:	Vacuum infusion
Material:	glass fiber reinforced polyester
Blade length:	56.9 m
Number of blades:	3
Manufacturer:	LM Wind Power
Drawing / Data sheet / Part No.:	DR-07059 Rev.A4, dated 2017-04-05 GE kit part No.: 445W1543G001+G004+G005+G006 GE Blade part No.: 445W1468P001+P004+P005+P006 GE VG part No.: 444W5843G001



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**TYPE CERTIFICATE**  
**Wind Turbine(s)**

**Blade GE56.9**

Type: Vacuum infusion  
Material: glass fiber reinforced epoxy  
Blade length: 56.9 m  
Number of blades: 3  
Manufacturer: TPI, Jiangsu, China  
TPI, Newton, USA  
Aeris, Ceara, Brazil  
Drawing / Data sheet / Part No.: 444W6874G009  
GE Blade part No.: 445W0793G001  
GE VG part No.: 444W5843G001

**Blade bearing:**

Type: ball bearing slewing ring  
Manufacturer: GE Renewable Energy (Design)  
(1) Shilla Corporation, Chungnam, South Korea  
(2) CS Bearing, Kyoungnam, South Korea  
(3) Tianma Precision Machinery Co. Ltd., Chengdu, China  
(4) Iljin USA SC Plant, Greer, USA  
(5) Kaydon Corporation, Guadalupe, Mexico  
(6) Liebherr Monterrey, Garcia, Mexico  
(7) Seohan-NTN Bearing Co., Gyeongbuk, South Korea  
(8) SKF do Brasil Ltda, Cajamar, Brazil  
Drawing / Data sheet / Part No.: GE BTP Part No.: 200W1709G001-003, G007-009,  
G013-015, G016-018  
Drawing No.: 200W1709, Rev. B

**Pitch System:**

Motor / Actuator Type: Electromechanical, individual blade, rotary drives, 3-  
stage planetary gearbox  
Pitch Controller Type: PLC Mark VIe  
Manufacturer: GE Renewable Energy

**Main shaft:**

Type: Forged part  
Manufacturer: GE Renewable Energy (Design)  
(1) Hyunjin Materials Co. Ltd., Busan, South Korea  
(2) Taewong Co. Ltd., Busan, South Korea  
(3) Tongyu Heavy Industry Co. Ltd., Shandong, China  
(4) Shandong Laiwu Jinlei Wind Power, Shandong, China  
(5) Villares Metals S.A., Sumare, Brazil



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### Wind Turbine(s)

Material:	34CrNiMo6 / 30CrNiMo8 (P3C-WE-0005)
Drawing / Data sheet / Part No.:	GE Part No.: 200W0789P001 & P002 GE drawing No.: 200W0789, Rev. -
<b>Main bearing:</b>	
Type:	Spherical roller bearing
Manufacturer:	NTN Bearing Corporation of America
Drawing / Data sheet / Part No.:	Designation: 240/750BL1PX1V4S30 GE Part No.: 200W2278P001 Drawing No.: 14-09009, Rev.-
<u>alternative:</u>	
Manufacturer:	Koyo/JTEKT
Drawing / Data sheet / Part No.:	Designation: 240/750RHAW33TS1CS FYPZ/00 B GE Part No.: 200W2278P001 Drawing No.: DSA306194, Rev. 4
<u>alternative:</u>	
Manufacturer:	SKF
Drawing / Data sheet / Part No.:	Designation: 240/750 ECA/W 33VQ725RE10 GE Part No.: 200W2278P001 Drawing No.: 240/750 ECA/W 33VQ725RE10, Rev. 1
<b>Gearbox:</b>	
Type:	Planetary helical gearbox
Gear Ratio:	111.986
Manufacturer:	GE Renewable Energy (Design) Nanjing High Speed Gear Manufacturing
Drawing / Data sheet / Part No.:	Designation: FDM2C-00R1 GE Part No.: 100W1505P003 GE Vendor Part No.: 444W6213P001, 444W6214P001 Drawing No.: FDM2C-00R1, sheet 2, Rev. 3
<u>alternative:</u>	
Type:	Planetary helical gearbox
Gear Ratio:	111.905
Manufacturer:	Siemens AG
Drawing / Data sheet / Part No.:	Designation: Winergy PZAB 3505,1 GE Part No.: 100W1505P003 GE Vendor Part No.: 444W6163P001, 444W6164P001 Drawing No.: A5E39116405A, Rev. 1
<u>alternative:</u>	
Type:	Planetary helical gearbox
Gear Ratio:	111.6
Manufacturer:	ZF Wind Power Antwerpen NV
Drawing / Data sheet / Part No.:	Designation: EH811A GE Part No.: 100W1505P003 GE Vendor Part No.: 444W6166P001, 444W6167P001 Drawing No.: A5E39116405A, Rev. 1



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### Wind Turbine(s)

#### Yaw System:

*Drive Type:*

Active, yaw bearing slewing ring with active yaw drives  
and hydraulic brakes  
4-stage planetary gearbox

*Manufacturer:*

Liebherr Components Biberach GmbH

*Drawing / Data sheet / Part No.:*

Vendor designation: DAT450/2440 (90211353)  
GE Generic Part No.: 103W3154P001, 111W1405P001  
GE VSPN: 109W5033P001, 111W1408P001  
Drawing No.: 268 440 4000 99 1, Index 0.0

*alternative:*

*Type:*

4-stage planetary gearbox

*Manufacturer:*

Bonfiglioli Trasmital

*Drawing / Data sheet / Part No.:*

Vendor designation: 714T4W (MT714T033)  
GE Generic Part No.: 111W1405P001  
GE VSPN: 111W1409P001  
Drawing No.: I7140T006700, Rev. A

*alternative:*

*Type:*

4-stage planetary gearbox

*Manufacturer:*

Nanjing High Speed Gear Co. Ltd.

*Drawing / Data sheet / Part No.:*

Vendor designation: FDX207G-03-00R1  
GE Generic Part No.: 111W1405P001  
GE VSPN: 111W1406P001  
Drawing No.: FDX207G-03-00R1, Rev.-

*alternative:*

*Type:*

3-stage cycloid/planetary gearbox Nabtesco  
Corporation

*Manufacturer:*

Vendor designation: RGS100B

*Drawing / Data sheet / Part No.:*

GE Generic Part No.: 111W1405P001  
GE VSPN: 111W1407P001  
Drawing No.: 152T0000-00-A, Rev. 1

*alternative (for HH 80m, 90m, 94m):*

*Type:*

4-stage planetary gearbox

*Manufacturer:*

Nanjing High Speed Gear Co. Ltd

*Drawing / Data sheet / Part No.:*

Vendor designation: FDX207G-01-00R1  
GE Generic Part No.: 103W3154P001  
GE VSPN: 108W4725P001  
Drawing No.: FDX207G-01-00R1, Rev. I

*alternative:*

*Type:*

4-stage planetary gearbox

*Manufacturer:*

Nanjing High Speed & Accurate Gear (Group) Co., Ltd.

*Drawing / Data sheet / Part No.:*

Vendor designation: FDX207G-03-00R26  
GE Generic Part No.: 111W1405P001  
GE VSPN: 111W1570P001  
Drawing No.: FDX207G-03-00R26, Rev.-

*Bearing Type:*

Ball bearing slewing ring



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### Wind Turbine(s)

Manufacturer:	GE Renewable Energy
Drawing / Data sheet / Part No.:	GE Part No.: 109W7629G001 / G002 GE drawing No.: 109W7629, Rev. A
<i>Brake Type:</i>	Mechanical with spring washer
Manufacturer:	GE Renewable Energy
Drawing / Data sheet / Part No.:	GE BTP Part No.: 444W2461G001/G002 Drawing No.: 444W2461, Rev. –
<i>alternative:</i>	
Manufacturer:	JHS / Jungblut wind elements GmbH Co. KG., Germany
Drawing / Data sheet / Part No.:	GE BTP Part No.: 444W2462G001/G002 Drawing No.: 444W2462, Rev. –
<i>alternative:</i>	
Manufacturer:	CSIC Haisheng Technology Co. Ltd.
Drawing / Data sheet / Part No.:	GE BTP Part No.: 444W2463G001/G002 Drawing No.: 444W2463, Rev. -
<b>Generator:</b>	
Type	double-fed induction
Manufacturer:	INDAR
Drawing / Data sheet / Part No.:	Designation: NAR560G6PB60N / 300564 GE Designation: 444W6931P001
Rated Power:	2601 kW
Rated Frequency:	60 Hz
Rated Speed:	1497 rpm
Rated Voltage:	690 V
Rated Current:	1748 A (Stator) 726 A (Rotor)
Insulation Class:	F
Degree of Protection:	IP 34 (Generator) IP 23 (Slip ring)
<i>alternative:</i>	
Manufacturer:	Winergy
Drawing / Data sheet / Part No.:	Designation: JFSB-560SR-06A / A5E53000294 GE Designation: 444W6932P001
Rated Power:	2601 kW
Rated Frequency:	60Hz
Rated Speed:	1497 rpm
Rated Voltage:	690 V
Rated Current:	1897 A (Stator) 782 A (Rotor)



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### Wind Turbine(s)

Insulation Class: F  
Degree of Protection: IP 34 (Generator)  
IP 23 (Slip ring)

alternative:

Manufacturer: GE Vietnam (GEHP)  
Drawing / Data sheet / Part No.: Designation: NAR560G6PB60NGEHP  
GE Designation: 444W6930P001/ 444W7522P001  
Rated Power: 2601 kW  
Rated Frequency: 60Hz  
Rated Speed: 1497 rpm  
Rated Voltage: 690 V  
Rated Current: 1900 A (Stator)  
788 A (Rotor)  
Insulation Class: F  
Degree of Protection: IP 34 (Generator)

#### Converter:

Type: 2.x DTA DFIG  
Manufacturer: GE Energy  
Drawing / Data sheet / Part No.: Designation: 151X1237KA01SA05  
Rated Voltage (grid side): 690 V  
Rated Current (grid side): 2450 A rms @ 45° C  
Degree of Protection: IP 54 (Control and bridge cabinet)  
IP 21 (Filter and power distr. Cabinet)

#### Transformer:

Out of scope (outside tower)

#### Tower:

Type: Tubular steel tower (NAMTS)  
Manufacturer: GE Power & Water  
Sections: 3  
Length: 77.3 m  
Drawing / Data sheet / Part No.: Drawing No.: 444W0614, Rev. -  
Foundation Specification:  
Foundation\_Load\_Drawing\_2.5-116\_60Hz\_80mHH\_EN-  
r02, Rev. 2





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### Wind Turbine(s)

alternative:

Type: Tubular steel tower (NAMTS)  
Manufacturer: GE Power & Water  
Sections: 3  
Length: 77.3 m  
Drawing / Data sheet / Part No.: Drawing No.: 444W7176, Rev. -  
Foundation Specification:  
Foundation\_Load\_Drawing\_2.5-116\_60Hz\_80mHH\_EN-r02, Rev. 2

alternative:

Type: Tubular steel tower  
Manufacturer: GE Power & Water  
Sections: 3  
Length: 84.405 m  
Drawing / Data sheet / Part No.: Drawing No.: 444W6886, Rev. -  
Foundation Specification:  
Foundation\_Load\_Drawing\_2.5-116\_50-60Hz\_87mHH\_EN-r04, Rev. 4

alternative:

Type: Tubular steel tower  
Manufacturer: GE Power & Water  
Sections: 3  
Length: 87.405 m  
Drawing / Data sheet / Part No.: Drawing No.: 445W7602, Rev. -  
Foundation Specification:  
Foundation\_Load\_Drawing\_2.5-116\_50-60Hz\_90mHH\_EN-r03, Rev. 3

alternative:

Type: Tubular steel tower  
Manufacturer: GE Power & Water  
Sections: 3  
Length: 87.405 m  
Drawing / Data sheet / Part No.: Drawing No.: 445W2050, Rev. A  
Foundation Specification:  
Foundation\_Load\_Drawing\_2.5-116\_50-60Hz\_90mHH\_EN-r03, Rev. 3

alternative:

Type: Tubular steel tower  
Manufacturer: GE Power & Water  
Sections: 4  
Length: 91.15 m  
Drawing / Data sheet / Part No.: Drawing No.: 444W1779, Rev. -  
Foundation Specification:  
Foundation\_Load\_Drawing\_2.5-116\_xxHz\_94mHH\_EN-r02, Rev. 2



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**Wind Turbine(s)**

**Manuals:**

Operation & maintenance manual:

Operating\_Manual\_2.0-  
2.4MW\_xxHz\_Operating\_EN\_r02  
Maintenance\_Manual\_Generic-  
xxHz\_Introduction\_EN\_r01  
Maintenance\_Manual\_Generic-  
xxHz\_Foundation\_Tower\_EN\_r01  
Maintenance\_Manual\_1-2MW-xxHz\_ESS\_EN\_r01  
Maintenance\_Manual\_Generic-  
xxHz\_MachineHead\_EN\_r01  
Maintenance\_Manual\_Generic-xxHz\_Hub\_EN\_r01

Transport manual:

Site\_Roads\_Crane\_Spec\_2.0-2.5-60Hz\_1-2MW\_Road  
Crane\_EN\_r02

Installation & commissioning. manual:

Installation\_Manual\_2.0-2.5-xxHz\_1-2MW\_EN\_r03  
Commissioning\_Checklist\_2.0-2.5-xxHz\_1-  
2MW\_downtower\_EN\_r01\_d  
Commissioning\_Checklist\_2.0-2.5-xxHz\_1-  
2MW\_uptower\_EN\_r01\_d