



Certificate No.

**IECRE.WE.CC.19.0011-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

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

for the component

Vestas V117-4.0 MW / V117-4.2 MW Rotor Nacelle Assembly

wind turbine class (class, standard, year)

WT class S, IEC 61400-1: 2005+Amd1: 2010

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-0074-04881-0  
2019-05-08

Design evaluation conformity statement  
Dated

DE-DNVGL-SE-0074-04865-1  
2019-11-29

Manufacturing evaluation conformity statement  
Dated

ME-DNVGL-SE-0074-05529-0  
2019-11-29

Type test conformity statement  
Dated

TT-DNVGL-SE-0074-04866-1  
2019-11-29

Final evaluation report  
Dated

FER-CC-DNVGL-SE-0074-04864-1  
2019-11-29

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 component 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:  
2024-11-28

Approved for issue on behalf of the IECRE  
Certification Body:



  
  
Nils Kreidelmeyer / Bente Vestergaard  
Project Manager / Service Line Leader, Component  
Certification  
Hamburg/Hellerup 2019-11-29

Renewables Certification  
Brooktorkai 18  
20457 Hamburg, Germany



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

## **COMPONENT CERTIFICATE**

### **Wind Turbine**

#### **Machine parameters :**

Power regulation:	pitch-controlled
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	6.0°
Cone angle:	-4.0°
Rated power:	4000 kW / 4200 kW
Rated wind speed $V_r$ :	Annex 1
Rotor diameter:	117 m
Hub height(s):	84 m, 91.5 m
Hub height operating wind speed range $V_{in} - V_{out}$ :	3.0 – 32.0 m/s (HWO enabled)
Design life time:	20 years
Software version:	2017.09

#### **Wind conditions :**

Characteristic turbulence intensity $I_{ref}$ at $V_{hub} = 15$ m/s:	Annex 1
Annual average wind speed at hub height $V_{ave}$ :	Annex 1
Reference wind speed $V_{ref}$ :	Annex 1
Mean flow inclination:	0°

#### **Electrical network conditions :**

Normal supply voltage and range:	720 V 19.1-36 kV $\pm$ 10 %
Normal supply frequency and range:	50 or 60 Hz $\pm$ 6 % Hz
Voltage imbalance:	IEC 61000-3-6 TR max 2 %
Maximum duration of electrical power network outages:	Two 3 months periods
Number of electrical network outages	Max 52 per year



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

## **COMPONENT CERTIFICATE**

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#### **Other environmental conditions (where taken into account):**

Normal and extreme temperature ranges:

\*de-rating strategy above +30°C for V117-4.0 MW

\*de-rating strategy above +20°C for V117-4.2 MW

Normal: -20°C to +45°C\*

Extreme: -40°C to +50°C

Relative humidity of the air:

100% (max 40% of time) and  
90% (rest of life time)

Air density:

1.225 kg/m<sup>3</sup> (for normal  
operation)

1.273 kg/m<sup>3</sup> (for low  
temperature operation)

Solar radiation:

1000 W/m<sup>2</sup>

Lightning protection system (standard and protection  
class):

Designed acc. to IEC 61400-24,  
Protection Level 1 and IEC  
61312-1

#### **Interfaces:**

The certification covers RNA, including bolt connection to  
tower top.

Load calculations are valid for tower frequency range:

0.299 Hz ±5% (HH 84 m)

0.256 Hz ±5% (HH 91.5 m)



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

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### Wind Turbine

#### Major components:

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

#### Blade:

Type: Air foil shells bonded to supporting beam  
Material: Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip (SMT)  
Blade length: 57.15 m  
Number of blades: 3  
Manufacturer: Vestas  
Drawing / Data sheet / Part No.: 0037-6856, Rev. 6

#### Blade Aero Addons:

Type: Serrated Trailing Edge (STE), Root Vortex Generator (RVG), Gurney Flap Assembly  
Manufacturer: Vestas Wind Systems A/S  
Drawing / Data sheet / Part no.: STE: 0054-9342, Rev.1  
RVG: 0043-3896, Rev.2  
Gurney Flap Assembly: 0056-7084, Rev.1

#### Blade bearing:

Type: Double row four-point contact ball bearing  
Manufacturer: Laulagun/Rollix/Liebherr/TMB  
Drawing / Data sheet / Part No.: 29058368, Rev.1

#### Pitch System:

Type: Hydraulic power unit  
Manufacturer: LJM/Glual/Hine/Liebherr  
Hydraulic Cylinder (140/90x922): 29080628, Rev.1

Type: Pitch Actuation Module  
Manufacturer: Vestas Wind Systems A/S  
Drawing / Data sheet / Part no.: 29113716, Rev.1



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

## COMPONENT CERTIFICATE

### Wind Turbine

#### Main shaft:

Type: Cast iron  
Material: EN-GJS-500-14  
Drawing / Data sheet / Part no.: 29085300, Rev. 4

#### Main bearing:

Type: Spherical Roller Bearing  
Manufacturer: SKF/FAG/JTKET-Koyo  
Drawing / Data sheet / Part no.: SKF - 240/950 CA/C3LW 33VQ113  
FAG - F-582562.PRL-WPO 000  
JTKET-Koyo - 240/950 RHAW33TS1CS

#### Gearbox:

Type: 2 stage planetary and 1 helical stage  
gearbox  
Manufacturer: Winergy (PZAB 3530.3)  
Gear ratio: 1:112.630  
Drawing / Data sheet / Part no.: A5E43498362A, Rev. 001-AA

#### Yaw System:

Drive type: 8 x 2.7 kW, 400 V, 50 Hz asynchronous  
motors  
Drive manufacturer: Lafert  
Drawing / Data sheet / Part no.: MZ10/A4A-55337

Drive type: 8 x 3.2 kW, 400 V, 60 Hz asynchronous  
motors  
Drive manufacturer: Lafert  
Drawing / Data sheet / Part no.: MZ10/A4A-55338

Drive type: 8 x 2.7 kW, 400 V, 50 Hz asynchronous  
motors  
Drive manufacturer: ABB  
Drawing / Data sheet / Part no.: 3GZF500810-23 A 14 AA 100 A



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

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Drive type:	8 x 3.2 kW, 400 V, 60 Hz asynchronous motors
Drive manufacturer:	ABB
Drawing / Data sheet / Part no.:	3GZF500810-23 A 14 AA 100 A
Drive type:	8 x 2.7 kW, 400 V, 50 Hz asynchronous motors
Drive manufacturer:	Bonfiglioli
Drawing / Data sheet / Part no.:	CD00006614-02
Drive type:	8 x 3.2 kW, 400 V, 60 Hz asynchronous motors
Drive manufacturer:	Bonfiglioli
Drawing / Data sheet / Part no.:	CD00007013-01
Gear type:	Bevel stage and three planetary stages, $i = 952.3$
Gear manufacturer:	Bonfiglioli
Drawing / Data sheet / Part no.:	I7090T010300
Gear type:	Bevel stage and three planetary stages, $i = 935$
Gear manufacturer:	Comer
Drawing / Data sheet / Part no.:	N07297_01
Bearing type:	Preloaded sliding bearing, PETP pads
Bearing manufacturer:	Vestas Wind Systems A/S
Drawing / Data sheet / Part no.:	29104726, Rev. 0



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

## COMPONENT CERTIFICATE

### Wind Turbine

#### Generator:

Type:	DASG 560/6M, Induction generator
Manufacturer:	Vestas Nacelles Deutschland (VND)
Rated power:	4450 kW
Rated frequency:	74 Hz
Rated speed:	1485 rpm
Rated voltage:	800 V
Rated current:	3650 A
Insulation class:	H
Degree of protection:	IP54

#### Converter:

Type:	Full quadrant IGBT
Manufacturer:	Vestas Wind Systems A/S
Rated voltage machine/grid:	720 Vrms / 800 Vrms
Rated current:	3200 A
Degree of protection:	IP54
Drawing / Data sheet / Part no.:	0069-2805, Rev. 0

#### Transformer:

Type:	Cast-Resin transformer 4GY6781-1EY
Manufacturer:	Siemens
Rated voltage:	33 / 0.72 V
Degree of protection:	IP00
Drawing / Data sheet / Part no.:	0073-7914, Rev. 0



Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

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Type:	Cast-Resin transformer DTTH1N 4000/30
Manufacturer:	SGB
Rated voltage:	33 / 0.72 V
Degree of protection:	IP00
Drawing / Data sheet / Part no.:	0073-7915, Rev. 0

#### **Manuals:**

Operating manual:	0079-9811, Rev. 1
Transportation and handling manual:	0079-9801, Rev. 2
Installation manual:	0079-9663, Rev. 2
Commissioning manual:	0079-9665, Rev. 0





Certificate. No.

**IECRE.WE.CC.19.0011-R1**

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

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#### Annex 1

#### Configurations covered by this Component Certificate

ID*	Variants	Hub Height	IEC WT class	Turbulence Intensity I <sub>ref</sub>	Rated wind speed V <sub>r</sub>	Mean wind speed V <sub>ave</sub>	Reference wind speed V <sub>ref</sub>
1.1	V117-4.0 MW	84	S	0.16	11.7 m/s	8.5 m/s	57.0 m/s
1.2	V117-4.2 MW	84	S	0.16	12.0 m/s	8.5 m/s	57.0 m/s
2.1	V117-4.0 MW	91.5	S	0.14	11.7 m/s	10.0 m/s	55.0 m/s
2.2	V117-4.2 MW	91.5	S	0.14	12.0 m/s	9.5 m/s	55.0 m/s

\* The ID follows the hub height with its first digit, the second digit is only consecutive to identify the different configurations within one hub height