



Certificate No.

**IECRE.WE.TC.19.0050-R1**

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

## PROVISIONAL TYPE CERTIFICATE

### Wind Turbine

This certificate is issued to

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

for the wind turbine

Vestas V117-4.0 MW / V117-4.2 MW

wind turbine class (class, standard, year)

WT class S, IEC 61400-1: 2005+Amd1: 2010 (HH 84 m)  
WT class II A, IEC 61400-1: 2005+Amd1: 2010 (HH 91.5 m)

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-0074-04861-0  
03.05.19

Design evaluation conformity statement  
Dated

DE-DNVGL-SE-0074-04461-1  
03.05.19

Type test conformity statement  
Dated

TT-B-DNVGL-SE-0074-04863-0  
03.05.19

Final evaluation report  
Dated

FER-TC-B-DNVGL-SE-0074-04860-0  
03.05.19

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.

The outstanding issues are listed in Annex 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:  
02.05.20

Approved for issue on behalf of the IECRE  
Certification Body:



Ramakrishna Parasarampuram / Bente Vestergaard  
Project Manager / Service Line Leader, Type  
Certification  
Hamburg/Hellerup 18.07.19

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:	6.0°
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



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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 +40°C\*

Extreme: -20°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)

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

Solar radiation:

Lightning protection system (standard and protection  
class):

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



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#### **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.0 – V117 Blade  
0054-9342, Rev.1 – V117 STE kit  
0043-3896, Rev.2 – V117 Root Vortex Generator  
0056-7084, Rev.1 – V117 Gurney Flap Assembly

#### **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



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#### **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  
Drawing / Data sheet / Part no.: SKF - 240/950 CA/C3LW 33VQ113  
FAG - F-582562.PRL-WPO

#### **Gearbox:**

Type: 2 stage planetary and 1 helical stage  
gearbox  
Manufacturer: Winergy  
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

Drive type: 8 x 3.2 kW, 400 V, 60 Hz asynchronous  
motors  
Drive manufacturer: ABB



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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



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#### **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

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



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#### **Tower:**

Type: Conical steel  
Number of sections: 4  
Length: 81.4 m (HH 84 m)  
Drawing / Data sheet / Part no.: 0078-1303 Rev. 0

Type: Conical steel  
Number of sections: 4  
Length: 89.3 m (HH 91.5 m)  
Drawing / Data sheet / Part no.: 0075-2831, Rev. 0

#### **Manuals:**

O&M manual: 0040-6996, Rev. 14  
Transport manual: 0040-6996, Rev. 14  
Installation / Commissioning manual: 0040-6996, Rev. 14





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#### Annex 1

#### Configurations covered by this Provisional Type Certificate

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>
V117-4.0 MW	84	S	0.14	11.7 m/s	10.0 m/s	57.0 m/s
V117-4.2 MW	84	S	0.14	12.0 m/s	9.5 m/s	57.0 m/s
V117-4.0 MW	84	S	0.16	11.7 m/s	8.5 m/s	57.0 m/s
V117-4.2 MW	84	S	0.16	12.0 m/s	8.5 m/s	57.0 m/s
V117-4.0 MW	91.5	2A	0.16	11.7 m/s	8.5 m/s	42.5 m/s
V117-4.2 MW	91.5	2A	0.16	12.0 m/s	8.5 m/s	42.5 m/s



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## **Annex 2**

### **Outstanding issues:**

The following outstanding issues should be resolved for Type Certification:

- Initial documentation for the V117 blade static and fatigue tests has been submitted by Vestas and reviewed by DNV GL. For Type Certification, the comments raised for the initial documentation shall be closed by Vestas.
- The Power curve measurements for Vestas V117-4.0 MW / V117-4.2 MW wind turbine are pending for Type Certification.
- The load measurements for Vestas V117-4.0 MW / V117-4.2 MW wind turbine are pending for Type Certification.
- The robustness test, disassembly of the gearbox after robustness test and gear box field test for PZAB 3530,3 gear box are pending for the Type Certification.
- The Manufacturing Evaluation for the components listed in section 7.5.3 of IECRE OD-501, Ed.2 is pending for Type Certification
- Final set of manuals for Vestas V117-4.0 MW / V117-4.2 MW wind turbine shall be submitted by Vestas and approved by DNV GL for Type Certification.