



Certificate No.

IECRE.WE.TC.19.0075-R0

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 V150-4.0 MW / V150-4.2 MW

wind turbine class (class, standard, year)

WT class 3B (V150-4.0 MW), IEC 61400-1: 2005+Amd1: 2010
WT class S (V150-4.2 MW), 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-0074-05341-0
2019-09-30

Design evaluation conformity statement
Dated

DE-DNVGL-SE-0074-04352-2
2019-09-30

Type test conformity statement
Dated

TT-B-DNVGL-SE-0074-05340-0
2019-09-30

Manufacturing Evaluation conformity statement
Dated

ME-B-DNVGL-SE-0074-05339-0
2019-09-30

Final evaluation report
Dated

FER-TC-B-DNVGL-SE-0074-05338-0
2019-09-30

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.

The outstanding issues are listed in Annex 1 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:
2020-09-29

Approved for issue on behalf of the IECRE
Certification Body:



Ramakrishna Parasarampuram / Bente Vestergaard
Project Manager / Service Line Leader, Type
Certification
Hamburg/Hellerup 2019-09-30

Renewables Certification
Brooktorkai 18
20457 Hamburg, Germany



Certificate. No.

IECRE.WE.TC.19.0075-R0

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

PROVISIONAL TYPE CERTIFICATE

Wind Turbine

Machine parameters:

Power regulation:	pitch-controlled
Rotor orientation:	Upwind
Number of rotor blades:	3
Rotor tilt:	6.0°
Cone angle:	-5.5°
Rated power:	4000 kW / 4200 kW
Rated wind speed V_r :	9.7 m/s (V150-4.0 MW) 9.9 m/s (V150-4.2 MW)
Rotor diameter:	150 m
Hub height(s):	105 m
Hub height operating wind speed range $V_{in} - V_{out}$:	3 m/s – 24.5 m/s (with the following HWO wind speeds: $V_{HWO1} = 17.5$ m/s $V_{HWO2} = 21.5$ m/s $V_{HWO3} = 24.5$ m/s)
Design life time:	20 years
Software version:	2017.09

Wind conditions:

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 (V150-4.0 MW) 7.0 m/s (V150-4.2 MW)
Reference wind speed V_{ref} :	37.5 m/s
Mean flow inclination:	8°

Electrical network conditions:

Normal supply voltage and range:	720 V
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.TC.19.0075-R0

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

PROVISIONAL TYPE CERTIFICATE

Wind Turbine

Other environmental conditions (where taken into account):

Normal and extreme temperature ranges:

*de-rating strategy above +30°C for V150-4.0 MW

*de-rating strategy above +20°C for V150-4.2 MW

Relative humidity of the air:

Air density:

Solar radiation:

Lightning protection system (standard and protection class):

Normal: -20°C to +45°C*

Extreme: -40°C to +45°C

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

1.225 kg/m³ (for normal
operation)

1.273 kg/m³ (for low
temperature operation)

1000 W/m²

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



Certificate. No.

IECRE.WE.TC.19.0075-R0

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

PROVISIONAL TYPE CERTIFICATE

Wind Turbine

Major components:

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

Blade:

Type:	Hybrid / Infused
Material:	Carbon fibre reinforced epoxy and glass fibre reinforced epoxy
Blade length:	73.65 m
Number of blades:	3
Manufacturer:	Vestas Wind Systems A/S
Drawing / Data sheet / Part No.:	0069-0345, Rev. 1

Blade Aero Addons:

Type	STE's and RVG's
Manufacturer	Vestas Wind Systems A/S
Drawing / Data sheet / Part no.	STE Kit: 0072-2639, Rev. 0 RVG: 0073-5893, Rev. 0

Blade bearing:

Type:	Triple row cylinder bearing
Drawing / Data sheet / Part no.:	29110524, Rev. 3
TPS no.:	0023-3088, Rev. 5

Pitch System:

Type:	Hydraulic power unit
Manufacturer:	LJM/HINE/Liebherr/Hengli
Hydraulic Cylinder (140/90x922):	29111326, Rev. 1

Type	Pitch Actuation Module
Manufacturer	Vestas Wind Systems A/S
Drawing / Data sheet / Part no.	29111583, Rev. 1



Certificate. No.

IECRE.WE.TC.19.0075-R0

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

PROVISIONAL TYPE 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: FAG
Drawing / Data sheet / Part no.: F-582562.PRL-WPO 000

Gearbox:

Type: 2 stage planetary and 1 helical stage gearbox
Manufacturer: ZF (EH1052A)
Gear ratio: 1:143.37
Drawing / Data sheet / Part no.: 096-EH1052A001, Rev. A

Gearbox:

Type: 2 stage planetary and 1 helical stage gearbox
Manufacturer: Winergy (PZAB 3580)
Gear ratio: 1:142.76
Drawing / Data sheet / Part no.: A5E45622888A, rev.2

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



Certificate. No.

IECRE.WE.TC.19.0075-R0

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

PROVISIONAL TYPE CERTIFICATE

Wind Turbine

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
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.TC.19.0075-R0

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

PROVISIONAL TYPE 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

Type:	Cast-Resin transformer DTTH1N 4000/30
Manufacturer:	SGB
Rated voltage:	33 / 0.72 V
Degree of protection:	IP00



Certificate. No.

IECRE.WE.TC.19.0075-R0

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

PROVISIONAL TYPE CERTIFICATE

Wind Turbine

Drawing / Data sheet / Part no.: 0073-7915, Rev. 0

Tower:

Type: Conical steel

Number of sections: 4

Length: 102.6 m (HH 105 m)

Drawing / Data sheet / Part no.: 0074-7302 Rev. 0

Manuals:

O&M manual: 0040-6996, Rev. 14

Transport manual: 0040-6996, Rev. 14

Installation / Commissioning manual: 0040-6996, Rev. 14



Certificate. No.

IECRE.WE.TC.19.0075-R0

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

PROVISIONAL TYPE CERTIFICATE

Wind Turbine

Annex 1

Outstanding issues:

The following outstanding issues should be resolved for Type Certification:

- Full scale fatigue test for the V150 blade (hybrid/infused) shall be completed to achieve the final Type Certificate
- The Power curve measurements for Vestas V150-4.0 MW / V150-4.2 MW wind turbine is pending for Type Certification.
- The load measurements for Vestas V150-4.0 MW / V150-4.2 MW wind turbine is pending for Type Certification.
- The robustness test, disassembly of the gearbox after robustness test and gear box field test for PZAB 3580 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 except for the following components:
 - V150 blade (Hybrid)
 - Tower
- Final set of manuals for Vestas V150-4.0 MW / V150-4.2 MW wind turbine shall be submitted by Vestas and approved by DNV GL for Type Certification.