



Certificate No.

IECRE.WE.TC.20.0083-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

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

for the wind turbine

Vestas V150-4.2MW MK3E(BR)

wind turbine class (class, standard, year)

IEC 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-0074-05341-2
2019-12-20

Design evaluation conformity statement
Dated

DE-DNVGL-SE-0074-05562-0
2020-04-22

Type test conformity statement
Dated

TT-DNVGL-SE-0074-05340-2
2019-12-20

Manufacturing evaluation conformity statement
Dated

ME-DNVGL-SE-0074-06043-0
2020-04-22

Final evaluation report
Dated

FER-TC-DNVGL-SE-0074-06044-0
2020-04-22

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 DNV GL. Without approval, the certificate loses its validity.

This certificate is valid until:
2025-04-21

Approved for issue on behalf of the IECRE
Certification Body:



Nils Kreidelmeyer / Bente Vestergaard
Senior Project Manager / Service Line Leader, Type
Certification
Hamburg/Hellerup 2020-04-22



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:	-5.5°
Rated power:	4200 kW
Rated wind speed V_r :	10.10 m/s
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:	2019.06 (including enhanced power curve features)

Wind conditions:

Characteristic turbulence intensity I_{ref} at $V_{hub} = 15$ m/s:	0.12
Annual average wind speed at hub height V_{ave} :	9.0 m/s
Reference wind speed V_{ref} :	27.0 m/s
Mean flow inclination:	8°

Electrical network conditions:

Normal supply voltage and range:	720 V
Normal supply frequency and range:	60 Hz ± 6 % (continuously) (-7 % for 30 s / +7 % for 10 s)
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 +20°C

Normal: +5°C to +45°C*
Extreme: -5°C to +50°C

Relative humidity of the air:

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

Air density:

1.070 kg/m³
1.170 kg/m³ (for DLC8.1 only)

Solar radiation:

1000 W/m²

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: 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. 3

Type: Infused
Material: Carbon fibre reinforced epoxy and glass fibre reinforced epoxy
Blade length: 73.65 m
Number of blades: 3
Manufacturer: Aeris Energy
Drawing / Data sheet / Part No.: 0069-0345, Rev. 3

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



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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

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

Main bearing:

Type: Spherical Roller Bearing
Manufacturer: SKF
Drawing / Data sheet / Part no.: 240/950 CA / C3LW33VQ113

Main bearing:

Type: Spherical Roller Bearing
Manufacturer: JTKET / KOYO
Drawing / Data sheet / Part no.: 240/950 RHAW33TS1CS



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

Drive type: 7 x 3.2 kW, 400 V, 60 Hz asynchronous motors
Drive manufacturer: Lafert
Drawing / Data sheet / Part no.: MZ10/A4A-55338

Drive type: 7 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: 7 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



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Drive type: 7 x 2.7 kW, 400 V, 50 Hz asynchronous motors
Drive manufacturer: Bonfiglioli
Drawing / Data sheet / Part no.: CD00006614-02

Drive type: 7 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

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



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Type:	Water-cooled induction generator MGW560A
Manufacturer:	WEG Equipamentos Elétricos S/A – Energia (WEG)
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 (machine side / grid side):	3600 A ($\leq 30^{\circ}\text{C}$); 3650 ($\leq 20^{\circ}\text{C}$) / 4100 A ($\leq 30^{\circ}\text{C}$); 4150 ($\leq 20^{\circ}\text{C}$)
Degree of protection:	IP54
Drawing / Data sheet / Part no.:	0069-2805, Rev. 0
Transformer:	
Type:	Cast-Resin transformer 4GY6781-1EY (1000 m)
Manufacturer:	Siemens
Rated voltage:	34.5 / 0.72 V
Degree of protection:	IP00
Drawing / Data sheet / Part no.:	29100322, Rev. 0 (dated 2019-10-10)
Type:	Cast-Resin transformer 4GY6781-1EY (2000 m)
Manufacturer:	Siemens
Rated voltage:	34.5 / 0.72 V
Degree of protection:	IP00
Drawing / Data sheet / Part no.:	29100323, Rev. 0 (dated 2019-11-25)



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Tower:

Type: Conical steel
Number of sections: 4
Length: 102.6 m (HH 105 m)
Drawing / Data sheet / Part no.: 0074-7302 Rev.0 (T966901)

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

Service lift:

Manufacturer: Avanti
Type: Avanti Shark / Avanti Dolphin / Avanti
Beluga

Manufacturer: Power climber
Type: Sherpa-SD4

Crane:

Manufacturer: Star 071/95 Liftket
Maximum lifting capacity: max 800 kg