Certificate No.

IECRE.WE.TC.19.0019-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 V126-3.45 MW LTq Vestas V126-3.3 MW / V126-3.45 MW (BWC)
wind turbine class (class, standard, year)	IEC S (specified in Annex 1), IEC 61400-1 incl. Amd.1, 2010

This certificate is transferred from IEC 61400-22 to IECRE 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	DB-DNVGL-SE-0074-00772-4 2018-12-14
Design evaluation conformity statement Dated	DE-DNVGL-SE-0074-00774-5 2018-12-14
Type test conformity statement Dated	TT-DNVGL-SE-0074-00775-5 2018-12-14
Manufacturing conformity statement Dated	ME-DNVGL-SE-0074-00776-6 2018-12-14
Type characteristics conformity statement Dated	TCM-DNVGL-SE-0074-00777-5 2018-12-14
Final evaluation report Dated	FER-TC-DNVGL-SE-0074-00337-6 2018-12-14

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 the Certification Body. Without approval, the certificate loses its validity.

This certificate is valid until:
2022-01-12

Approved for issue on behalf of the IECRE Certification Body:

Ramakrishna Parasarampuram /
Christer Eriksson
Project Manager / Service Line Leader,
Type Certification
Hamburg 2019-01-31

DNV·GL

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°
Cone angle:	4°
Rated power:	See Annex 1
Rated wind speed V_r:	See Annex 1
Rotor diameter:	126 m
Hub height(s):	See Annex 1
Hub height operating wind speed range V_{in} – V_{out}:	See Annex 1
Design life time:	20 years
Software version:	See Annex 1

Wind conditions:

Characteristic turbulence intensity I_{ref} at V_{hub} = 15 m/s:	See Annex 1
Annual average wind speed at hub height V_{ave} :	See Annex 1
Reference wind speed V_{ref} :	See Annex 1
Mean flow inclination:	8°

Electrical network conditions:

Normal supply voltage and range:	3 x 650 V 10.5-36 kV ± 10 %
Normal supply frequency and range:	50 or 60 Hz ± 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

Other environmental conditions (where taken into account):

Standard temperature ranges	Normal: -20 °C to +45 °C* Extreme: -30 °C to +50 °C
Low temperature range	Normal: -30 °C to +45 °C* Extreme: -40 °C to +50 °C
*de-rating strategy	See Annex 1
Relative humidity of the air:	100% (max 40% of time) and 90% (rest of life time)
Air density:	1.225 / 1.325[i] kg/m3 [i]To account for low temperature operation, Vestas has applied higher air density for the following load cases: 1.2, 2.1, 3.1, 4.1 and 5.1
Solar radiation:	1000 W/m^2
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:	Infused structural air foil shell
Material:	Carbon fibres pultrusions, glass fibre fabrics, balsa and PET foam core
Blade length:	61.65 m
Number of blades:	3
Manufacturer:	Vestas, TPI Turkey, TPI China
Drawing / Data sheet / Part No.:	0028-7875, Rev. 10 – V126 Blade 0054-7820, Rev.2 – V126 STE kit 0055-5217, Rev. 1 – V126 Root Vortex Generator

Blade bearing:

Type:	Double row four-point contact ball bearing
Manufacturer:	LGN/RLX/LBC/TMB
Drawing / Data sheet / Part No.:	29049732, Rev. 3

Pitch System:

Motor / Actuator Type:	Hydraulic power unit
Drawing / Data sheet / Part No.:	29080628, Rev. 0
Pitch Controller Type:	Pitch Actuation Module
Drawing / Data sheet / Part No.:	29080632, Rev. 0

Main shaft:

Type:	Cast hollow shaft
Material:	EN GJS-500-14
Drawing / Data sheet / Part No.:	29085300, Rev. 1

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Type:	Cast hollow shaft
Material:	EN GJS-400-18U-LT
Drawing / Data sheet / Part No.:	29024367, Rev. 2

Main bearing:

Type:	Double-row 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 Planetary stages and one helical stage
Gear Ratio:	112.8
Manufacturer:	ZF
Drawing / Data sheet / Part No.:	EH921A

Type	2 Planetary stages and one helical stage
Gear Ratio:	112.6
Manufacturer:	Winergy
Drawing / Data sheet / Part No.:	PZAB 3530.1

Yaw System:

Drive Type:	Nacelle mounted electrical driven plain bearing with external toothing
Yaw Bearing Type:	Friction bearing, permanently pre-tensioned
Yaw Drive Type:	Comer PG1903 / Bonfiglioli 709T4R / Liebherr DAT350
Brake Type:	Electrical disc brake in yaw motors
Yaw Speed	0.45 °/s for 50 Hz 0.55 °/s for 60 Hz

Generator:

Type	VND SFIG V2 - DASG 560/6M (Three phase induction generator with squirrel cage rotor)
Rated Power:	3450 kW, 3650 kW, 3800 kW
Rated Speed:	1520 rpm
Rated Voltage:	750 V
Insulation Class:	H
Degree of Protection:	IP54
Rated power factor (VFD) – Cos phi	0.87

Converter:

Type:	Full-scale converter - cube power
Manufacturer:	Vestas
Line side voltage level	650 Vac
Machine side voltage level	750 Vac
Nominal apparent power	4.4 MVA
Line side AC Frequency	50 / 60 Hz
DC-Link voltage	1150 Vdc

Transformer:

Type:	Dry-type transformer (ECO)
Manufacturer:	SGB
Nominal power	4000 kVA
Nominal voltages (HV)	33 kV
Nominal voltage (LV)	650 V
Frequency	50 Hz
Vector group	Dyn5
Environmental Tests	E2
Climatic Tests	C2
Fire class	F1

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Type	Dry-type transformer 3-Phase GEAFOL – Transformer (ECO)
Manufacturer	Siemens
Nominal power	4000 kVA
Nominal voltages (HV)	33 kV / 34.5 kV
Nominal voltage (LV)	650 V
Frequency	50 Hz / 60 Hz
Vector group	Dyn5
Environmental Tests	E2
Climatic Tests	C2
Fire class	F1

Tower:

Type:	Tubular steel tower
Hub height	See Annex 1
Drawing / Data sheet / Part no.	See Annex 1

Manuals:

Operation & maintenance manual:	See list of manuals 0006-6955, Rev. 25
Transport manual:	See list of manuals 0040-6996, Rev. 10
Installation & commissioning. manual:	See list of manuals 0040-6996, Rev. 10

Crane (optional)

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

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Annex 1 – Configurations covered by this Type Certificate

Variants	IEC WT class**	Power*	Rated wind speed V_r	Operating Wind Speed (v_{in} - v_{out})	Mean wind speed V_{ave}	Reference wind speed V_{ref}
V126-3.3 MW/ V126-3.45 MW (BWC)	S (III A)	3.3 MW /3.45 MW	10.70 m/s	3 m/s-20 m/s (87m) 3 m/s-22.5 m/s (137m) 3 m/s-22.5 m/s (147m)	7.5 m/s / 6.9 m/s	37.5 m/s
V126-3.3 MW/ V126-3.45 MW (BWC)	S (III B)	3.3 MW /3.45 MW	10.70 m/s	3 m/s-22.5 m/s (117m)	7.5 m/s / 6.9 m/s	37.5 m/s
V126-3.45 MW LTq	S (II B)	3.45 MW	10.40 m/s	3 m/s-30 m/s (87m) 3 m/s-30 m/s (117m)	8.5 m/s	42.5 m/s

Notes:
Power* - see De-rating temperature defined in the table below.
IEC WT class** - Wind class S except for the temperature ranges

Variants	Hub Height (HH)	Tower (drawing no)	Turbulence Intensity Iref	De-rating temperature	Software version
V126-3.3 MW/ V126-3.45 MW (BWC)	87 m 137 m 147 m	HH 87 m (0050-2668.V00) HH 137 m (0041-4092.V04) HH 147 m (0052-6454.V01)	0.16	*de-rating strategy above +30^{0}C for V126-3.3MW *de-rating strategy above +30^{0}C for V126-3.45MW	VMP Global, Build: 2016.07 (BWC)
V126-3.3 MW/ V126-3.45 MW (BWC)	117 m	HH 117 m (0038-9831.V01)	0.14	*de-rating strategy above +30^{0}C for V126-3.3MW *de-rating strategy above +30^{0}C for V126-3.45MW	VMP Global, Build: 2016.07 (BWC)
V126-3.45 MW LTq	87 m 117 m	HH 87 m - T3III420 (0055-1568, Rev. 0) HH 87 m - T3III422 (0059-2967, Rev. 1) HH 117 m - T3III450 (0057-6926, Rev. 0) HH 117 m - T3III453 (0062-0744, Rev. 0)	0.14	*de-rating strategy above +30^{0}C for V126-3.45 MW LTq	VMP Global, Build: 2016.07