

CONFORMITY STATEMENT

Statement No.:
DE-DNVGL-SE-0074-02745-2

Issued:
2017-11-15

Issued for:

Design Evaluation

of

Vestas V136-3.45 MW / V136-3.60 MW

Specified in Annex 1 and Annex 2

Issued to:

Vestas Wind Systems A/S

Hedeager 42
8200 Aarhus N
Denmark

According to:

IEC 61400-22:2010-05 Wind turbines – Part 22: Conformity testing and certification

Based on the document:

ER-DE-DNVGL-SE-0074-02745-2 Evaluation Report, dated 2017-11-15

Changes of the system design are to be approved by DNV GL.

Hellerup, 2017-11-15

For DNV GL Renewables Certification



Christer Eriksson
Service Line Leader Type Certification



By DAkkS according DIN EN IEC/ISO 17065 accredited Certification Body for products. The accreditation is valid for the fields of certification listed in the certificate.

Hellerup, 2017-11-15

For DNV GL Renewables Certification



Ramakrishna Parasarampuram
Project Manager

The accredited certification body is Germanischer Lloyd Industrial Services GmbH, Brooktorkai 18, 20457 Hamburg.

DNV GL Renewables Certification is the trading name of DNV GL's certification business in the renewable energy industry.

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CONFORMITY STATEMENT - ANNEX 1

Statement No.: DE-DNVGL-SE-0074-02745-2

Page 2 of 7

Basic standard	IEC 61400-1 ed. 3 + A1
General	
Wind Turbine class	See Annex 2
Power regulation	pitch-controlled
Rotor orientation	upwind
Rotor tilt	6°
Cone angle	4°
Rated power	3450 kW / 3600 kW
Rated wind speed v_r	See Annex 2
Rotor diameter	136 m
Hub height(s)	See Annex 2
Hub height operating wind speed range $v_{in} - v_{out}$	See Annex 2
Design life time	20 years
Software version	VMP Global version/build 2017.01
Wind conditions	
Turbulence intensity I_{ref} at $v_{hub} = 15$ m/s	See Annex 2
Annual average wind speed at hub height v_{ave}	See Annex 2
Reference wind speed v_{ref}	See Annex 2
Mean flow inclination	8°
Electrical network conditions	
Normal supply voltage and range	3 x 650 V 10.5-36 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
Other environmental conditions	
Standard temperature ranges	Normal: -20°C to +45°C* Extreme: -30°C to +50°C (*de-rating strategy: refer Annex 2)
Low temperature range	Normal: -30°C to +45°C * Extreme: -40°C to +50°C (*de-rating strategy: refer Annex 2)
Relative humidity of the air	100% (max 40% of time) and 90% (rest of life time)
Air density	1.225 kg/m ³ (for normal operation) 1.325 kg/m ³ (for low temperature operation)
Solar radiation	1000 W/m ²
Description of lightning protection system	Designed acc. to IEC 61400-24, Protection Level 1 and IEC 61312-1

CONFORMITY STATEMENT - ANNEX 1

Statement No.: DE-DNVGL-SE-0074-02745-2

Page 3 of 7

Major components

Blade	Type	Infused structural airfoil shell
	Manufacturer	Vestas Wind Systems A/S
	Material	Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip (SMT).
	Blade length	66.65 m
	Number of blades	3
	Drawing / Data sheet / Part no.	V136 blade: 0055-0068 Rev. 2
		Aero add-ons: 0059-6671, Rev. 0 - V136 STE kit 0056-5767, Rev. 1 - V136 Vortex Generator Assembly
Blade bearing	Type	Double row four-point contact ball bearing
	Manufacturer	LGN/RLX/LBC/TMB
	Drawing / Data sheet / Part no.	29058368, Rev.0
Pitch system	Type	Hydraulic power unit
	Pitch Actuation Module	29059706, Rev. 3
	Hydraulic Cylinder (160/110X922)	29060554, Rev. 1
	Hydraulic Cylinder (160/110X922)	FCE002458, Rev. B
Main shaft	Type	Cast hollow shaft
	Material	EN GJS-500-14
	Drawing / Data sheet / Part no.	29085300, Rev. 1
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
	Manufacturer	ZF
	Gear ratio	125.163
	Drawing / Data sheet / Part no.	EH922A
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 type PG 1903
	Yaw brake type	Electrical disc brake in yaw motors
	Yaw speed	0.45 °/s for 50 Hz 0.55 °/s for 60 Hz

CONFORMITY STATEMENT - ANNEX 1

Statement No.: DE-DNVGL-SE-0074-02745-2

Page 4 of 7

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 voltage	750 V
	Rated power factor (VFD) - Cos phi	0.87
	Insulation class stator	H
	Protection class (acc. to IEC 529)	IP54
	Rated speed	1470 rpm
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
	Type	Dry-type transformer 3-Phase GEAFFOL - Transformer (ECO)
	Manufacturer	Siemens
	Nominal power	4000 kVA
	Nominal voltages (HV)	34.5 kV
Nominal voltage (LV)	650 V	
Frequency	60 Hz	
Vector group	Dyn5	
Environmental Tests	E2	
Climatic Tests	C2	
Fire class	F1	
Tower	Type	Tubular Steel Tower
	Hub height (HH)	See Annex 2
	Drawing / Data sheet / Part no.	See Annex 2

CONFORMITY STATEMENT - ANNEX 1

Statement No.: DE-DNVGL-SE-0074-02745-2

Page 5 of 7

Manuals	O&M manual	See list of manuals 0040-6996, Rev. 14
	Transport manual	See list of manuals 0040-6996, Rev. 14
	Installation / Commissioning manual	See list of manuals 0040-6996, Rev. 14
Service lift	Manufacturer Type	Avanti Avanti Shark or Power Lift Sherpa-SD
Crane	Manufacturer Type	Star 071/95 Liftket max 800 kg

CONFORMITY STATEMENT - ANNEX 2

Statement No.: DE-DNVGL-SE-0074-02745-2

Page 6 of 7

Configurations covered by this Type Certificate

Variants	HH (m)	IEC WT class	Rated wind speed V_r	Operating Wind Speed ($V_{in} - V_{out}$)	Mean wind speed V_{ave}	Iref	Reference wind speed V_{ref}	Tower drawing
V136-3.45 MW ¹	82	S (III A) ³	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0060-8092, V00
V136-3.45 MW ¹	82	S ⁴	10.0 m/s	3 m/s-27.5 m/s	8.6 m/s	14%	44 m/s	0060-8092, V00
V136-3.45 MW ¹	82	S (III A) ³	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0065-7850, V01
V136-3.60 MW ²	82	S (III A) ³	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0065-7850, V01
V136-3.45 MW ¹	82	S (II B) ⁵	10.0 m/s	3 m/s-30 m/s	8.5 m/s	14%	42.5 m/s	0065-7850, V01
V136-3.60 MW ²	82	S ⁶	10.2 m/s	3 m/s-30 m/s	8.0 m/s	14%	42.5 m/s	0065-7850, V01
V136-3.45 MW ¹	105	S (III A) ³	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0060-6080, V00
V136-3.60 MW ²	105	S (III A) ³	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0060-6080, V00
V136-3.45 MW ¹	105	S (IEC III B) ⁷	10.0 m/s	3 m/s-30 m/s	7.5 m/s	14%	37.5 m/s	0067-3835, V00
V136-3.60 MW ²	105	S (IEC III B) ⁷	10.2 m/s	3 m/s-30 m/s	7.5 m/s	14%	37.5 m/s	0067-3835, V00
V136-3.45 MW ¹	112	S (III A) ³	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-9758, V00
V136-3.60 MW ²	112	S (III A) ³	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-9758, V00
V136-3.45 MW ¹	142	S (III A) ³	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0056-3963, V00
V136-3.60 MW ²	142	S (III A) ³	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0056-3963, V00
V136-3.45 MW ¹	132	S (III A) ³	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-8000, V00
V136-3.60 MW ²	132	S (III A) ³	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-8000, V00
V136-3.45 MW ¹	132	S (II B) ⁵	10.0 m/s	3 m/s-30 m/s	8.5 m/s	14%	42.5 m/s	0064-8000, V00
V136-3.60 MW ²	132	S ⁶	10.2 m/s	3 m/s-30 m/s	8.0 m/s	14%	42.5 m/s	0064-8000, V00

CONFORMITY STATEMENT - ANNEX 2

Statement No.: DE-DNVGL-SE-0074-02745-2

Page 7 of 7

Notes:

- 1 De-rating strategy above +30°C for V136-3.45MW
- 2 De-rating strategy above +20°C for V136-3.60MW
- 3 Wind turbine class IEC III A except for the temperature ranges
- 4 The following are the deviations from standard Wind turbine class IEC IIB:
 - Deviation in the standard and operating temperature ranges as compared to the IEC II B wind turbine class.
 - Air density (1.11 kg/m³) has been used except for following DLCs - 12LT, 12Ic, 21RPY, 21PSBB, 21GRF, 31PR, 41RP, 41RC, 51RE (1.325 kg/m³).
 - Mean wind speed V_{ave} – 8.6 m/s
 - Reference wind speed V_{ref} – 44 m/s
- 5 Wind turbine class IEC II B except for the temperature ranges
- 6 Wind turbine class IEC II B except for the temperature ranges and with reduced mean wind speed (8 m/s).
- 7 Wind turbine class IEC III B except for the temperature ranges