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PROVISIONAL TYPE CERTIFICATE

Certificate No.:	Issued:	Valid until:
TC-B-DNVGL-SE-0074-03607-6	2019-04-05	2019-12-14

Issued for:

Vestas V120 2.0/2.1/2.2MW 50 Hz VCS Mk11

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 documents:

DB-DNVGL-SE-0074-03608-4	Design Basis Conformity Statement, dated 2018-12-06
DE-B-DNVGL-SE-0074-03610-6	Design Evaluation Conformity Statement, dated 2019-04-05
TT-B-DNVGL-SE-0074-03611-6	Type Test Conformity Statement, dated 2019-04-05
ME-DNVGL-SE-0074-03612-4	Manufacturing Conformity Statement, dated 2018-12-06
FER-TC-B-DNVGL-SE-0074-03607-6	Final Evaluation Report, dated 2019-04-05

Changes of the system design, the production and erection or the manufacturer's quality system are to be approved by DNV GL.

Outstanding issues are listed in Annex 3.

Vestas Wind Technology India Private Limited Chennai 600 119

Hellerup, 2019-04-05

For DNV GL Renewables Certification

Bente Vestergaard
Service Line Leader for Type Certification

DAkkS Deutsche Akkreditierungsstelle D-ZE-11053-01-00

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, 2019-04-05

For DNV GL Renewables Certification

Anil Kumar Singh
Project Manager

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PROVISIONAL TYPE CERTIFICATE - ANNEX 1

Certificate No.: TC-B-DNVGL-SE-0074-03607-6

General	
Wind turbine class	S
Power regulation	pitch-controlled
Rotor orientation	upwind
Rotor tilt	6°
Cone angle	3°
Rated power	see Annex 2
Rated wind speed v_r	see Annex 2
Rotor diameter	120 m
Hub height(s)	118 m
Hub height operating wind speed range v_{in} - v_{out}	3–18 m/s
Design life time	20 years
Software version	VMP Global 2018.02
Wind conditions	
Turbulence intensity I_{ref} at v_{hub} = 15 m/s	0.14
Annual average wind speed at hub height v_{ave}	see Annex 2
Reference wind speed v_{ref}	see Annex 2
Mean flow inclination	8°
Hub height extreme wind speed v_{e50}	see Annex 2
Electrical network conditions	
Normal supply voltage and range	10.5 kV – 35 kV
Normal supply frequency and range	50 Hz
Voltage imbalance	< 3 %
Number of electrical network outages	max. 20 times per year
Other environmental conditions	
Standard temperature turbine	
Operating temperature	-20°C to +45°C
Extreme temperature, stand still	-30°C to +50°C
Low temperature turbine (LT, additional heating elements and fans are installed for low temperature usage)	
Operating temperature	-30°C to +45°C
Extreme temperature, stand still	-40°C to +50°C
Relative humidity of the air	100 % (max 10% of lifetime)
Air density	see Annex 2
Solar radiation	The turbine shall resist solar radiation (including UV) with 1000 W/m² throughout the design lifetime
Description of lightning protection system	Designed acc. to IEC 61400-24 Protection Level I

Vestas Wind Technology India Private Limited Chennai 600 119

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PROVISIONAL TYPE CERTIFICATE - ANNEX 1

Major components

Blade	Type	Aerodynamic structural shells supported by internal webs
	Manufacturer	Vestas Wind Systems A/S
	Material	Carbon fibre reinforced epoxy and glass fibre
	Blade length	59 m
	Number of blades	3
	Drawing / Data sheet / Part no.	0065-1417.R05
Blade bearing	Type	3 row roller bearing
	Manufacturer	TMB
	Drawing / Data sheet / Part no.	29099950.V01
Pitch system	Type	One cylinder per blade
	Manufacturer	LJM, Glual and Hengli
	Controller type	Hydraulic
	Motor / actuator	Hydraulic
Main shaft	Type	Forged hollow trumpet shaft
	Manufacturer	Taewoong
	Material	42CrMo4
	Drawing / Data sheet / Part no.	29085835
Main bearing	Type	Two double row spherical roller bearing
	Manufacturer	SKF
	Drawing / Data sheet / Part no.	230/630 CA/HM2 W33 24188 ECA/HM2 W33
	Manufacturer	KOYO
	Drawing / Data sheet / Part no.	230/630 RHAW33T 24188 RHAW33
	Manufacturer	FAG
	Drawing / Data sheet / Part no.	F-582558.PRL-WPO F-582559.PRL-WPO
Gearbox	Type	3 stage planetary gearbox
	Manufacturer	Winergy
	Gear Ratio	1:112.8
	Drawing / Data sheet / Part no.	PEAB 4440, 29099324
	Manufacturer	ZF
	Gear Ratio	1:112.8
	Drawing / Data sheet / Part no.	Atlas 1.21, 29099326
Yaw system	Drive type	Electrical Motor
	Manufacturer	ABB or Lafert
	Drawing / Data sheet / Part no.	29094938
	Bearing Type	Friction Bearing (PETP slide plate)
	Manufacturer	Vestas Wind System A/S
	Drawing / Data sheet / Part no.	29012647.V01
	Gear Type	Planetary-/worm gear combination, 3 step planetary / 1 step worm gear

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PROVISIONAL TYPE CERTIFICATE - ANNEX 1

	Manufacturer	Bonfiglioli or Comer
	Drawing / Data sheet / Part no.	29014048(left) / 29014049(right)
	Brake Type	Friction brake, motor brake included in the motor unit
	Manufacturer	ABB or Lafert (Motor Brake)
	Drawing / Data sheet / Part no.	29094938
Generator	Type	Asynchronous generator with wound rotor – DVSG 500/4M sp
	Manufacturer	Vestas Wind Systems A/S
	Number of poles	4
	Nominal power	2260 kW
	Voltage	690 V
	Rated grid frequency	50 Hz
	Insulation class stator/rotor	H/H
	Protection class	IP54
	Data sheet	0057-1280.V06
Converter	Type	Full-quadrant IGBT converter
	Manufacturer	Vestas Wind Systems A/S
	Rated voltage	480 V
	Rated power	240 kVA
	Rated grid frequency	50 Hz
	Rated current	300 A
	Data sheet	0042-3461.V06
Transformer	Type	Dry-type transformer - DTTH1N 1600/100
	Manufacturer	SGB
	Nominal power	2300 kVA
	Rated frequency	50 Hz
	Rated voltages - primary side	10.5 kV
	Rated voltage - secondary side	Full winding: 0.69 kV - Tap: 0.483 kV
	Vector group	Dyn5
	Data sheet	0070-0676.V00
	Type	Dry-type transformer - 4GT6443-8EY
	Manufacturer	Siemens
	Nominal power	2300 kVA
	Rated frequency	50 Hz
	Rated voltages - primary side	10.5 kV
	Rated voltage - secondary side	Full winding: 0.69 kV - Tap: 0.48 kV
	Vector group	Dyn5
	Data sheet	0070-0642.V00
	Type	Dry-type transformer - SCLB10-2300/35
	Manufacturer	JST
	Nominal power	2300 kVA
	Rated frequency	50 Hz
	Rated voltage - primary side	35 kV
	Rated voltage - secondary side	Full winding: 0.69 kV - Tap: 0.483 kV
	Vector group	Dyn5
	Data sheet	0063-7426.V01

Vestas Wind Technology India Private Limited Chennai 600 119

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PROVISIONAL TYPE CERTIFICATE - ANNEX 1

High-voltage switchgear	Type	CGM.3-V
	Manufacturer	Ormazabal
	Protection relay	ekorRPGCI
	Maximum operating voltage	38 kV
	Rated grid frequency	50 Hz
	Data sheet	0056-9771.V01
	Type	8DJH
	Manufacturer	Siemens
	Protection relay	7SJ80
	Maximum operating voltage	24 kV
	Rated grid frequency	50 Hz
	Data sheet	0052-9957.V01
Tower	Type	Tubular steel
	Manufacturer	Vestas Wind Systems A/S
	Number of sections	see Annex 2
	Length	see Annex 2
	Drawing / Data sheet / Part no.	see Annex 2
Foundation load(s)		see Annex 2
Manuals	O&M manual	0001-1995.V24 and 0072-8177.V0
	Transport manual	0070-1964.V02
	Installation / Commissioning manual	0071-1732.V01
Service lift		Not included
Crane		Not included

Vestas Wind Technology India Private Limited Chennai 600 119

DNV·GL

PROVISIONAL TYPE CERTIFICATE - ANNEX 2

Turbine ID	Rated power [MW]	Rated wind speed V_r [m/s]	Annual average wind speed at hub height V_{ave} [m/s]	Reference wind speed V_{ref} [m/s]	Hub height extreme wind speed V_{e50} [m/s]	Normal air density [kg/m³]	Low temperature air density [kg/m³]
1	2.0	9.0	7.3	34.6	44.5	1.144	1.325*
2	2.1	9.2	7.3	34.6	44.5	1.144	1.325*
3	2.2	9.4	7.3	34.6	44.5	1.144	1.325*
4	2.2	9.4	7.0	33.9	47.5	1.149	1.325*

* Note for LT: The -30°C minimum operating temperature has been verified for loads and structural integrity by considering an air density of 1.325 kg/m³

Turbine ID	Tower No.	Tower Sections	Tower Drawing	Tower length [m]	Foundation Loads document
1	T787600	4	0063-6016.V01*	116.1	0072-9169.V00 0072-9170.V00**
2	T787600	4	0063-6016.V01*	116.1	0072-9169.V00 0072-9170.V00**
3	T787600	4	0063-6016.V01*	116.1	0072-9169.V00 0072-9170.V00**
4	T787601	4	0075-5160.V01*	116.1	0077-5407.V00

* The optional oscillation damper has not been assessed by DNV GL
** Up to 3m above ground due to raised foundations

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600 119

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PROVISIONAL TYPE CERTIFICATE - ANNEX 3

Outstanding issues.

For Type Certification and Design Evaluation following issues need to be addressed by Vestas:

1. The independent DNV GL load calculations shall be finalized.
2. Final manuals need to be assessed by DNV GL
3. Open items in the Blade Design Assessment are to be closed for full Type Certification.

For Type Certification and Type Testing following issues need to be addressed by Vestas:

1. Load measurements for Vestas V120 2.0/2.1/2.2 MW 50 Hz VCS Mk11 wind turbine are pending for Type Certification.
2. Approval of fatigue and final static blade tests, with the inclusion of the TE web reinforcement for Vestas V120 2.0/2.1/2.2 MW 50 Hz VCS Mk11 wind turbine is pending for Type Certification.

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