



# DET NORSKE VERITAS

## TYPE CERTIFICATE

**Vestas V112 3.0MW**

**IEC TC-219701-1**  
Type Certificate number

**2012-06-25**  
Date of issue

Manufacturer:  
**Vestas Wind Systems A/S**  
**Hedeager 44**  
**DK-8200 Aarhus N**

Valid until: 2016-10-07

Conformity evaluation has been carried out according to **IEC 61400-22: 2010 "Wind Turbines - Part 22: Conformity Testing and Certification"**. This certificate attests compliance with IEC 61400-1 ed. 3: 2005 and IEC 61400-22 concerning the design and manufacture.

**Reference documents:**

Design Basis Conformity Statement:	IEC DB-219701-1
Design Evaluation Conformity Statement:	IEC DE-219701-1
Type Test Conformity Statement:	IEC TT-219701-1
Manufacturing Conformity Statement:	IEC MC-219701-1
Foundation Design Evaluation Conformity Statement(s):	IEC FE-219701-1
Type Characteristics Measurement Conformity Statement(s):	IEC TM-219701-1
Final Evaluation Report:	PD-642197-122PQ01-81Rev.2

**Wind Turbine specification:**

IEC WT class: 2A/3A. For further information see Appendix 1 of this Certificate.

**Date: 2012-06-25**

  
**Claus F. Christensen**

**Management Representative**  
**Det Norske Veritas, Danmark A/S**



**DANAK**  
PROD Reg. no. 7031

**Date: 2012-06-25**

  
**Ole Kjær**

**Project Manager**  
**Det Norske Veritas, Danmark A/S**

**DET NORSKE VERITAS, DANMARK A/S**

## APPENDIX 1 - WIND TURBINE TYPE SPECIFICATION

### General:

IEC WT class acc. to IEC 61400-1 ed. 3: 2005:	IEC WT class 2A/3A
Rotor diameter:	112m
Rated power:	3075 kW
Rated wind speed $V_r$ :	12.0 m/s
Hub height(s):	84 m (IEC 2A) 94 m (IEC 2A) 119 m (IEC 3A)
Operating wind speed range $V_{in}$ - $V_{out}$ :	3 – 25 m/s
Design life time:	20 years

### Wind conditions:

	2A	3A
$V_{ref}$ (hub height):	42.5 m/s	37.5 m/s
$V_{ave}$ (hub height):	8.5 m/s	7.5 m/s
$I_{ref}/I_{15}$ ( $V_{hub}=15$ m/s) acc. to IEC 61400-1 ed. 3: 2005:	0.16	0.16
Mean flow inclination:	8°	8°

### Electrical network conditions:

Normal supply voltage and range:	3 x 650 V 10-35 KV
Normal supply frequency and range:	50 Hz $\pm$ 6% 60 Hz $\pm$ 6%
Voltage imbalance:	IEC 61000-3-6- TR max 2%
Maximum duration of electrical power network outages:	Two 3 months periods
Number of annual electrical network outages:	52 per year

### Other environmental conditions (where taken into account):

Air density:	1.225 kg/m <sup>3</sup>
Normal and extreme temperature ranges:	-10°C to +40°C
Extreme temperature range:	-20°C to +50°C
Relative humidity:	100% (40% of time) and 90% (rest of time)
Solar radiation:	1000 W/m <sup>2</sup>
Salinity:	Present
Design conditions in case of offshore WT (water depth, wave conditions etc.):	Not relevant – Onshore turbine
Description of lightning protection system:	Designed according to IEC 61400-24, Protection level 1 and 61312-1
Earthquake model and parameters:	Not relevant

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### Main components:

Blade type:	Vestas 55m blade
Gear box type:	Bosch Rexroth GPV 570D (i=1:113.257)
Main Bearing:	SKF 240/950 CA/W33 or FAG F-582562.PRL-WPO
Generator type:	Vestas MAGPower 3.3MW DGIPM 560-12m
Transformer type:	Siemens Geafol 4GD6592-1ZY 3350 kVA-3450kVA
Tower type:	Tubular Steel Towers HH84 (dwg: 0017-1750) HH94 (dwg: 0017-3183) HH94 US RNSP (dwg: 0005-4987) HH119 (dwg: 0016-8671)
Foundation	Gravity based concrete slab HH84, IEC2A, GWL at foundation (0014-4605) Gravity based concrete slab HH84, IEC2A, GWL at terrain (0014-4606) Gravity based concrete slab HH94, IEC2A, GWL at foundation (0014-4674) Gravity based concrete slab HH94, IEC2A, GWL at terrain (0014-4677) Gravity based concrete slab HH119, IEC3A, GWL at foundation (0014-4695) Gravity based concrete slab HH119, IEC3A, GWL at terrain (0014-4696)
Crane:	Type / Not present
Service lift:	Avanti Shark or Power Lift Sherpa-SD
Controller:	VMP Global