

[V82]

Optimised for low to medium wind speeds

With a larger rotor and a more powerful generator, the V82 outperforms any comparable megawatt-class turbine in areas with low to medium wind speeds. Hydraulic ACTIVE-STALL™ technology ensures that the rotor harnesses maximum energy from the available wind while minimising loads and controlling the power output. The output of 1650 kW is maintained above rated wind speed, and the ACTIVE-STALL™ technology furthermore provides fail-safe shutdown of the turbine in all conditions. With the V82 Vestas has designed a wind turbine that offers unparalleled performance at a truly cost-effective price.

Low sound level

Vestas has made a special effort to dramatically reduce the sound level of the V82. The result is clearly audible. At all wind speeds, the sound level of the V82 is among the lowest. The V82 is also available with a two-speed generator, which makes it possible to reduce the sound level even further to meet specific requirements – for instance lower sound level at night time or at low wind speeds.

Excellent grid compatibility

Wind turbines have come to play an important role in managing grid operations due to the ever increasing contribution wind energy is making to the total production of electricity. In some markets, wind turbines are required to actively support and help maintain stability of grid operations on similar terms to conventional power plants. Vestas meets this new challenge by offering Grid+™ – Vestas' advanced grid compliance system featuring:

- Full load and dynamic phase compensation that supports reactive power regulation to maintain power factor within specified range.
- Uninterrupted power supply back-up to maintain full operation of all auxiliary systems in the wind turbine during grid disturbances.
- Continuous regulation of active and reactive power as well as voltage balance in the grid.
- Fault ride-through during grid disturbances.

High reliability

Like all Vestas turbines, the V82 has been approved by Det Norske Veritas (DNV) according to the strictest standards in the wind industry. The nacelle is based on the well tested and proven design of the V60/1000, V64C/1500 and the V72C/1500 of which more than 700 turbines are installed at sites ranging from arctic to tropical climates and in various wind regimes.

You benefit from our experience

Vestas has played a major role in the wind industry for more than 20 years. We have installed approximately 12,000 wind turbines in almost every corner of the world. This makes Vestas one of the most experienced wind turbine manufacturers in the market, and we make sure that our customers benefit from this vast amount of know-how and the feedback we receive every day. A good example is the fact that more than 2,500 Vestas turbines comprised by Vestas' service programme averaged 98.6% availability in 2003.

Optimal wind turbine for any site

The ability to design and supply tailored solutions is one of Vestas' absolute core qualifications achieved through decades of thorough product development. Our product programme is continuously optimised, and we offer the broadest product portfolio in the market. This is why Vestas is always able to supply a truly competitive wind turbine for any site, irrespective of wind regime, climatic conditions or site location.

Operational data

Nominal output 1650 kW
Power regulation ACTIVE-STALL™
Rated wind speed 13 m/sec.
Rated wind speed according to IEC 11.6 m/sec.
IEC Class II

Cut-in

One speed version 3.5 m/sec.
Two speed version 2.5 m/sec.
Cut-out – 10 min. 20 m/sec.
Cut-out – 1 min. 24 m/sec.
Cut-out – 1 sec. 32 m/sec.

Rotor

Rotor diameter 82 m
Rotor swept area 5281 m²
Blade pitch Hydraulic, fail-safe

Rotor speed

One speed version 14.4 rpm
Two speed version 14.4/10.8 rpm

Brake system

Mechanical brake Single unit disk brake, hydraulic fail-safe
Aerodynamic brake Full blade pitch

Drive train

Gear type Planetary/helical gears
Transmission 1:70.2 – 50 Hz
1:84.3 – 60 Hz
Cooling Liquid cooling with pump
Main shaft Forged shaft and flange
Main bearing Self-aligning roller bearings
Oil lubrication Automatic

Generator

Type Asynchronous
Nominal voltage 690 V/50 Hz
600 V/60 Hz
Nominal frequency 50 Hz
60 Hz

Nominal power

One speed version 1650 kW
Two speed version 1650/900 kW
Cooling Liquid cooling with pump

Yaw system

Type Ball bearing slewing ring with gearing and disk brake
Yaw brakes 6 hydraulic brakes
Drive mechanism 6 helical gears with electric motors

Tower

Type Conical, steel, painted
Hub height According to approvals

Controller

Type Computer control system
Grid cut-in Thyristor coupling switch
Phase compensation Regulated, staged
Remote control WindMan® Professional

ACTIVE-STALL™

Main Specification

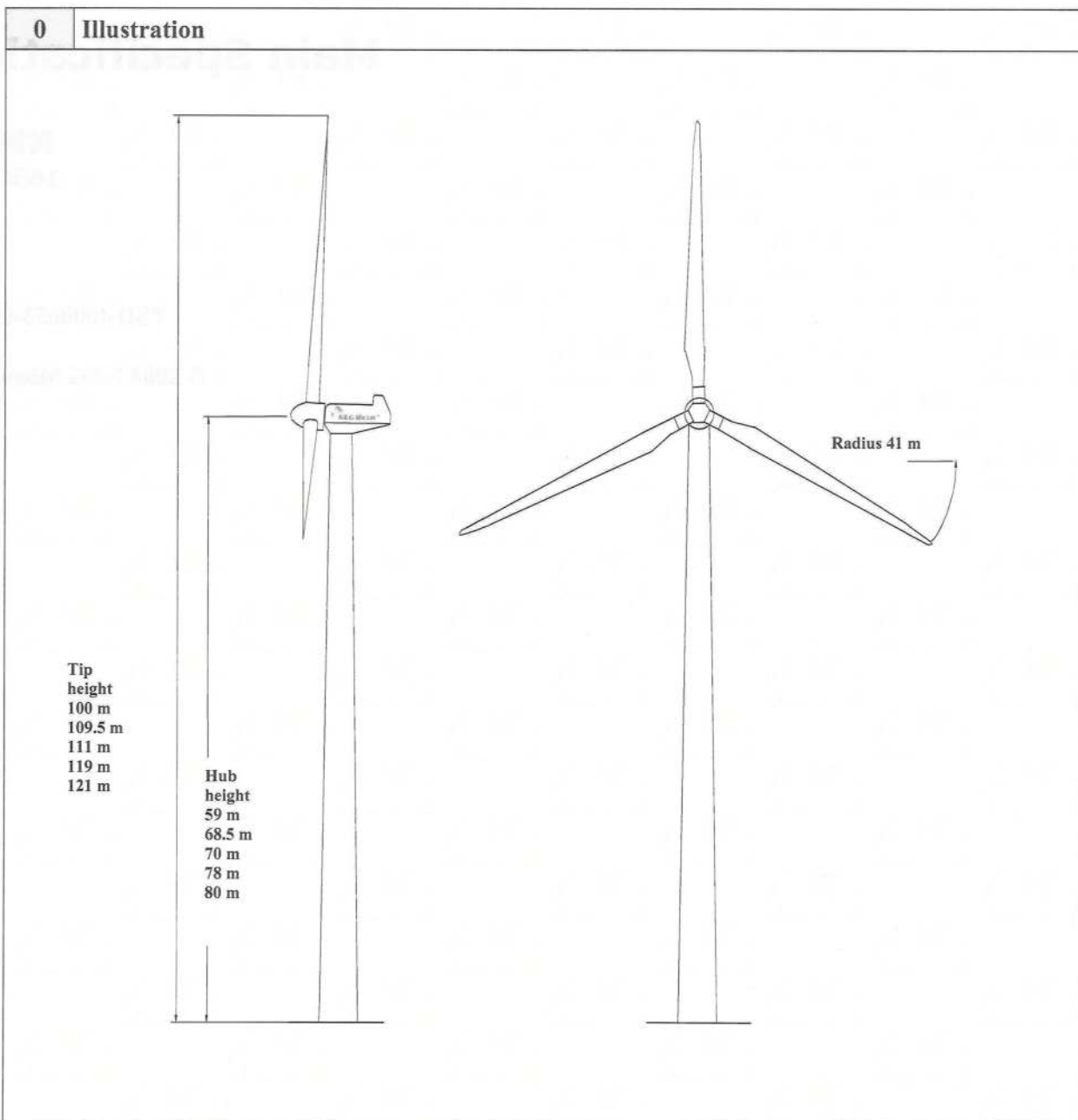
NM82
1650 kW

TSD 4000053-05 EN

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Rev	Description	Date	By	Appr	Checked	Drawn
01	Initial issue	2004-05-10	J. Jensen	P. Pedersen	M. Madsen	K. Kristensen
02	Revision 1	2004-06-15	J. Jensen	P. Pedersen	M. Madsen	K. Kristensen
03	Revision 2	2004-07-20	J. Jensen	P. Pedersen	M. Madsen	K. Kristensen



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1 Main Data				
		50 Hz	60 Hz	60 Hz UL
Nominal Power		1650 kW	1650 kW	1650 kW
Rotor diameter		82 m	82 m	82 m
Swept area		5281 m ²	5281 m ²	5281 m ²
Hub height. IEC IIb		59 m, 68.5 m, 70 m, 78 m	70 m, 78 m.	59 m, 70 m, 80 m
Rotational speed		14.4 rpm	14.4 rpm	14.4 rpm

2 Nacelle Base Frame			
		50Hz	60Hz
Material		EN-GJS-400-18U-LT	EN-GJS-400-18U-LT
Standard colour		RAL 7035	RAL 7035
Corrosion class, outside		Acc. to DS EN ISO 12944:C5 I	Acc. to DS EN ISO 12944:C5 I

3 Rotor			
		50Hz	60Hz
Number of blades		3 pieces	3 pieces
Tip speed (synchronous)		61.8 m/s	61.8 m/s
Rotor shaft tilt		5°	5°
Eccentricity (tower center to hub center)		3447 mm	3447 mm
Solidity (Total blade area/rotor area)		5.0 %	5.0 %
Power regulation		Active Stall®	Active Stall®
Rotor orientation		Upwind	Upwind

4 Blades			
		50Hz	60Hz
Type description		AL 40	AL 40
Blade length		40 m	40 m
Material		Carbon/wood/glass/epoxy	Carbon/wood/glass/epoxy
Standard colour		RAL 7035	RAL 7035
Gloss		Class 2: (30-70%) in accordance with (1), to be measured acc. to DS/ISO2813	Class 2: (30-70%) in accordance with (1), to be measured acc. to DS/ISO2813
Type of rotor air brake		Full blade	Full blade
Blade profiles		FFA -W3, NACA 63.4	FFA - W3, NACA 63.4
Twist		20°	20°
Largest chord		3.08 m	3.08 m
Blade area (projected)		86 m ²	86 m ²
Note! (1) Technical Criteria for Danish Approval Scheme for Wind Turbines			

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5	Blade bearing		
		50 Hz	60 Hz
	Type description	Ball bearing	Ball bearing
	Number of bearings	3 pcs.	3 pcs.

6	Hub		
		50Hz	60Hz
	Type description	Spherical	Spherical
	Material	EN-GJS-400-18U-LT	EN-GJS-400-18U-LT
	Corrosion class, outside	Acc. to DS EN ISO 12944:C5 I	Acc. to DS EN ISO 12944:C5 I

7	Main shaft		
		50Hz	60Hz
	Type description	Forged shaft and flange	Forged shaft and flange
	Material	34CrNiMo6 + QT	34CrNiMo6 + QT
	Corrosion class	Acc. to DS EN ISO 12944:C2	Acc. to DS EN ISO 12944:C2

8	Main Bearing		
		50Hz	60Hz
	Type description	Spherical roller bearing	Spherical roller bearing
	Number of	1 piece	1 piece
	Lubrication	Oil pump	Oil pump

9	Main Bearing Housing		
		50Hz	60Hz
	Type description	Flange bearing	Flange bearing
	Material	EN-GJS-400-18U-LT	EN-GJS-400-18U-LT

10	Gearbox		
		50 Hz	60Hz
	Type description	1. step planet, 2. step helical	1. step planet, 2. step helical
	Gear house material	Cast	Cast
	Ratio	1:70.2	1:84.3
	Mechanical power	1800 kW	1800 kW
	Bending strength acc. to ISO 6336	$S_F > 1.6$	$S_F > 1.6$
	Surface durability acc. to ISO 6336	$S_H > 1.25$	$S_H > 1.25$
	Scuffing safety acc. to DNV 41.2	$S_S > 1.3$	$S_S > 1.3$
	Shaft seals	Labyrinth	Labyrinth
	Oil sump	App. 250 l	App. 250 l

11	Cartridge Gear Heater - for Arctic Version only		
		50 Hz	60 Hz
	Rating	800 W/ pcs.	800 W/ pcs.
	Number of	4 pieces	4 pieces

12	Oil pump		
		50 Hz	60Hz
	Voltage	3 x 690 V	3 x 480 V

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