WD2.5-103™

Technical Data

WDRVM
We Energize The World

WD25103

Technical Data

Rotor

Diamater	103 m
Rotor swept area (m²)	8328
Rotational speed (rpm)	8.0 - 15.6 (13.9 rpm nominal)
Rotational direction	Clock Wise (front view)
Weight (incl. Hub)	Approx. 56 T

Blades

Number of blades	3
Length (m)	50.3
Airfoils	NACA 63.XXX
Material	GFRP with epoxy resin
Weight (excl. T-Bolts)	Approx. 11.65 T

Tubular Tower

Modular Type	Height	Weight
3 Sections	70 m	176 T
4 Sections	80 m	230 T
5 Sections	90 m	270 T

Gearbox

Type	3 Stages (2 planetary stages / 1 helical stage)
Ratio	1:85.00
Cooling	Oil/Air Heat exchanger
Efficiency	97% at rated power

Generator

Type	PMSG (Permanent Magnet Synchronous Generator)
Rated Power	2.5 MW (2,500 KW)
Voltage	690 V ac
Frequency	50 Hz / 60 Hz
Protection Class	IP 54
Number of poles	6
Rotational Speed	680 : 1380 rpm (rated 1182 rpm)
Efficiency	97.2 % at rated power

Mechanical Design

The WD2.5-103™ 2.5 MW is a three-bladed upwind variable-speed WEC with pitch control horizontal axis, 2.5MW rated power and traditional drive train concept for onshore application. The reason for this approach is the rather low technical risk, a big number of possible component suppliers worldwide and the easier implementation of the technology.

The drive train concept consists of two rotor shaft bearings (double row tapered roller bearing and cylindrical roller bearing) in one single bearing housing, a high ratio gearbox and a high speed generator.

Brake

The rotor braking system consists of two brake calipers fixed at the rear end of the gearbox housing. The brake disc is connected to the flange of the coupling hub on the high speed shaft. The rotor brakes are serving as holding brakes and an emergency stop braking system additionally to the pitch system which also acts as an aerodynamic primary brake.

Lightning Protection

The WD2.5-103™ uses a complete total lightning protection system in accordance to the international standard of IEC 61024-1, This system conducts the lightning from both sides of the blade tip down to the root joint and from there across the nacelle and tower structure to the grounding system located in the foundations which is made of pure stainless-steel, As a result, the blade and sensitive electrical components are protected from damage.

Technical Data

Main Control System

The WD2.5-103™ 2.5 MW uses both DFIG/PMSG generators in order to maintain the demand of the market worldwide.
The converter provides a constant frequency power supply to the grid during variable speed operation of the generator and power is controlled through IGBT converters.
The converter system is located at the tower base. The converter is mounted inside a steel cabinet.

Benefits:

- Active and reactive power control.
- Low harmonic content and minimal losses.
- Increased efficiency and production.
- Prolonged working life of the turbine.

WDRVM SCADA System

WDRVM uses its own developed SCADA system WDRVMcontrol®.
A full SCADA system with statistic functions for different wind farms or wind farm control system, that allows realtime operation and remote control of wind turbines, meteorological mast and electrical substation via satellite-terrestrial network. Modular design with control tools for active and reactive energy, noise, shadows and wake effects, TCP/IP architecture with a Web interface.

Maintenance Awareness System

WDRVM developed the MAS®, which is a system that warns the (wind farm or wind turbine) owner of potential deterioration or malfunctions in the wind turbine's main components.

Benefits:

- Reduction in major corrective measures.
- Increase in the WEC availability
- Preferential terms in negotiations with insurance companies
- Integration within the control and SCADA.

Technical Data

Grid Connection

The WD2.5-103™ 2.5 MW is designed with various types of generators, synchronous as well as with an asynchronous generator.

A permanent magnet generator used for the synchronous generator version of the turbine. The power is fed into the grid through a double phase converter system (permanent magnet generator). Depending on the used blades, different torque / speed operation points are defined. Therefore, the rated operation is defined by ranges.

The asynchronous generator is a double fed asynchronous slip ring machine. The stator is directly connected to the grid. The rotor power is fed into the grid or taken from the grid by means of an inverter system.

The converter provides a constant frequency power supply to the grid during variable speed operation of the generator.
The converter system is located at the tower base. The converter is mounted inside a steel cabinet.

Grid Code Compliance

The WD2.5-103™ 2.5 MW turbines are characterised by excellent control capabilities for maintaining the voltage and stabilising the frequency of the public grid. They meet all the requirements for the worldwide national grids their fault-ride-through and brake chopper options capability enables them to effortlessly bridge dips and high grid voltage.

The WDRVM wind farm management system allows the grid operator to directly control the active and reactive power of the wind farm in the grid.

With these features the turbines are certified for the grids of the most demanding markets. They can also be adapted to new and complex connection requirements, ensuring seamless integration into the local grid.

Our aim is to offer the best power quality on the market. WDRVM intensively tests grid connection technology, both in the field and on the test bench.

Technical Data

1. Pitch System
State-of-the-art electric pitch system with modern drive and emergency power supply technology.

2. Rotor bearing unit
Zero-play double rotor bearing system for increased gearbox and bearing reliability.

3. Yaw system
Proven technology with slewing ring, hydraulic caliper brakes and electrically driven planetary gearbox drives.

4. Hydraulic torque support
Elastomer bearing with hydraulic features reduces constraint forces on gearbox and main bearings.

5. Cooling system
A smart patented combination of nacelle ventilation and component cooling with special cold / hot climate and sandstorm protection features for effective turbine operation under various environmental conditions.

6. Generator system
Highest flexibility with alternative generator systems (DFIG or PMSG) to adapt and optimize the turbine to local grid requirements.

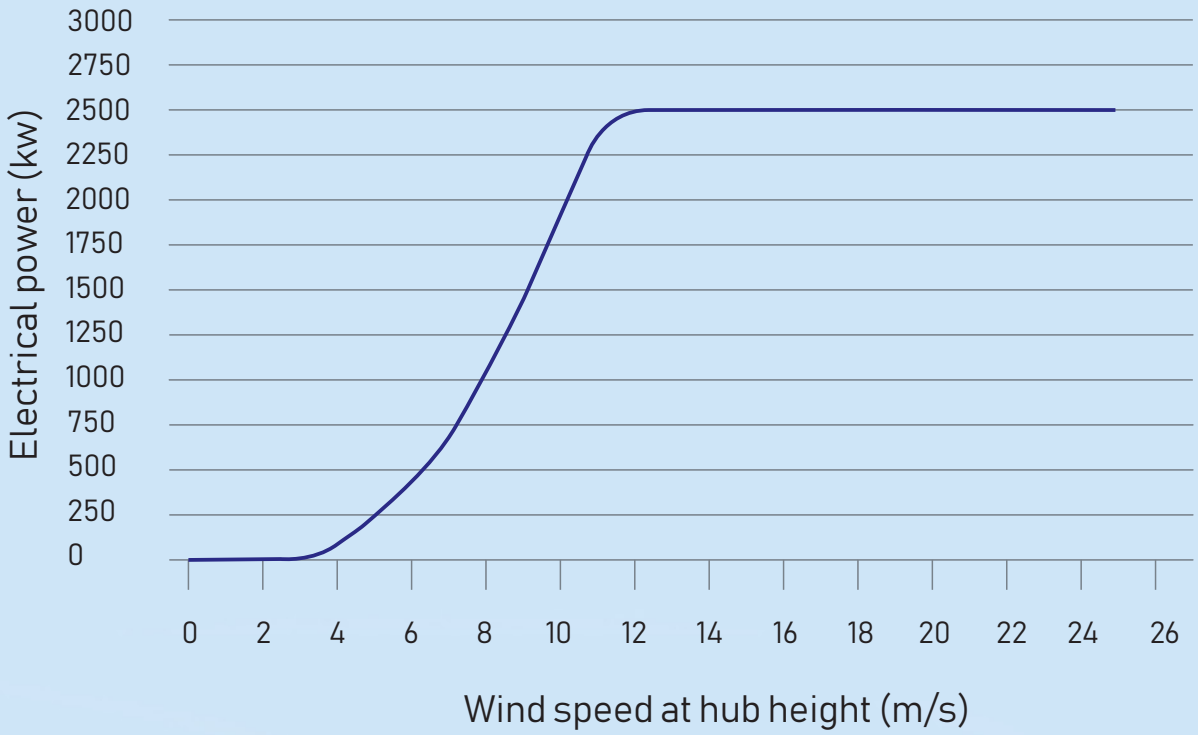
7. Internal service crane
Simple and cost-effective system consisting of curved profiles with monorail trolley chain hoist offers in combination with our spacious nacelle cover and even platform design excellent conditions for maintenance and repair jobs.

8. Metrological Mast
Equipped with 2 anemometer, 2 wind vanes, 1 ice detection (optional), 2 aviation beacons lights, 1 all-weather surveillance camera, and 2 lightening protection rods.

WD25103

Power Curve

(for Air Density 1.140 kg/m³)



Wind Speed (m/s)	Power (kW)
3.0	0
4.0	81
5.0	211
6.0	400
7.0	668

Wind Speed (m/s)	Power (kW)
8.0	1027
9.0	1460
10	1921
11	2358
12 - 25	2500

The WD2.5-103™ power curve is calculated in accordance with NACA 63 airfoils, the above power curve calculations and parameters are based on the below conditions:

Grid Frequency 50Hz
Rotor position 1
AirDensity: 1.140 kg/m³
Yaw-angle 0°
Hub height 80 m
Cut-in speed: 3 m/s
Wind exponent 0.14
Rotor Diameter 103 m
Cut-out speed: 25 m/s

WDRVM
Industrial City of Hessia
Homs - Syria
Tel : +963 31 5040
Fax : +963 31 5041
www.wdrvm.co
info@wdrvm.co