Built on experience

Siemens Wind Turbine SWT-2.3-82 VS

Answers for energy.

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Built on experience

The SWT-2.3-82 VS turbine is the classical workhorse for utility-scale wind turbine projects. It is the result of our unique experience from more than 25 years of leading-edge design and construction of wind turbines and represents the best of the qualities for which we are known throughout the wind industry. It is an efficient and reliable machine combining a solid and conservative design approach with high-performance technical features, such as the unique NetConverter® system with variable speed concept and the IntegralBlade® technology.

The SWT-2.3-82 VS wind turbine is suited for tough and demanding applications onshore and offshore, particularly for high wind speed sites or sites with noise restrictions.

Technical description

General design

The SWT-2-3-82 VS wind turbine is a high-wind (IEC Class IA) version of the classical SWT-2.3-93 wind turbine.

Rotor

The SWT-2-3-82 VS turbine has a threebladed rotor with pitch regulation for power output optimization and control. The rotor speed is variable in order to maximize the aerodynamic efficiency, and speed compliance during power regulation minimizes the dynamic loads on the transmission system.

Blades

The B40 blades are made of fiberglass-reinforced epoxy in Siemens' proprietary IntegralBlade® manufacturing process. In this process, the blades are cast in one piece, leaving no weak points at glue joints and providing optimum quality. The aerodynamic design represents state-of-the-art wind turbine technology, and the structural design has special Siemens safety factors over and above all normal industry and customer requirements. The design has been thoroughly verified by static and dynamic testing of both prototypes and serial production blades.

Rotor hub

The rotor hub is cast in nodular cast iron and is fitted to the main shaft with a flange connection. The hub is large enough to provide a comfortable working environment inside the structure for two service technicians during maintenance of bolt connections and pitch bearings.

Blade pitch system

The blade pitch arrangement is used to optimize and regulate power output through the operating range. The blades are feathered to minimize wind loads during standstill under extreme wind conditions.

Main shaft and bearing

The main shaft is forged in alloy steel and is hollow for the transfer of power and signals to the blade pitching system. The main shaft is supported by a self-aligning double spherical roller bearing, grease lubricated from an automatic lubrication system. The bearing seals are maintenance-free labyrinth seals.

Gearbox

The gearbox is a custom-built, three-stage planetary-helical design. The planetary-helical, high-torque stage provides a compact high-performance construction. The intermediary and high-speed stages are normal helical stages arranged with an offset of the high-speed shaft and thus allowing passage of power and control signals to the pitch systems. The gearbox is equipped with large-capacity cooling and filtering systems that ensure optimum operating conditions.

Generator

The generator is a fully-enclosed asynchronous machine with squirrel-cage rotor, which does not require slip rings. The generator rotor construction and stator windings are specially designed for high efficiency at partial loads. The generator is internally ventilated and cooled with an air-to-air heat exchanger.

Mechanical brake

The mechanical brake represents the secondary safety system of the turbine. It is fitted to the gearbox high-speed shaft and has two hydraulic calipers.

Yaw system

The yaw bearing is an externally geared ring with a friction bearing. Eight electric planetary gear motors drive the yawing. The yaw gear motors are fitted with brakes, assisting the passive friction of the bearing for stable maintenance of the yaw position.

Controller

A standard industrial computer is the basis of the turbine controller. The controller is self-diagnosing and includes a keyboard and display for easy status readout and adjustment of settings.

Power conversion

The NetConverter® power conversion system allows generator operation at variable speed, frequency and voltage while supplying power at constant frequency and voltage to the MV transformer. The power conversion system is a modular arrangement for easy maintenance.

Tower

The SWT-2.3-82 VS turbine is mounted on a tapered tubular steel tower. The tower can be fitted with a personnel hoist as an option.

Operation

The wind turbine operates automatically, self-starting when the wind reaches an average speed of about 3–5 m/s. During operation below rated power, the pitch angle and rotor speed are continuously adjusted to maximize the aerodynamic efficiency. Rated power is reached at a wind speed of about 13–14 m/s, and at higher wind speeds the output is regulated at rated power. If the average wind speed exceeds the maximum operational limit of 25 m/s, the turbine is shut down by feathering of the blades. When the wind drops back below the restart speed, the safety systems reset automatically.

Remote control

The SWT-2.3-82 VS turbine is equipped with the unique WebWPS SCADA system. This system offers remote control and a variety of status views and useful reports from a standard Internet web browser. The status views present electrical and mechanical data, operation and fault status, meteorological data and grid station data.

Turbine Condition Monitoring

In addition to the WebWPS SCADA system, the turbine is equipped with a web-based Turbine Condition Monitoring (TCM) system. The TCM system carries out precise condition diagnostics on main turbine components continuously and in real time. It gives early warning of possible component failures by continuous comparison of current vibration spectra with previously established reference spectra. The TCM system has various alarm levels, from informative through alerting level to turbine shutdown.

Grid compliance

The SWT-2.3-82 VS turbine complies with all currently valid grid code requirements on relevant markets. Voltage and frequency control and other grid-related adjustments can be implemented by the integrated Park Pilot facility in the WebWPS SCADA system, and the turbine has ride-through capability for all normal faults.

Technical specifications

Rotor	
Diameter	82.4 m
Swept area	5,300 m^2
Rotor speed	6–18 rpm
Power regulation	Pitch regulation

Blades	
Type	B40
Length	40 m

Aerodynamic brake	
Type	Full span pitch
Activation	Active, hydraulic

Transmission System	
Gearbox type	3-stage planetary/helical
Gearbox ratio	1:91
Gearbox oil filtering	Inline and offline
Gearbox cooling	Separate oil cooler
Oil volume	Approx. 400 l

Mechanical brake	
Type	Hydraulic disc brake

Generator	
Type	Asynchronous
Nominal power	2,300 kW
Voltage	690 V
Cooling system	Integrated heat exchanger

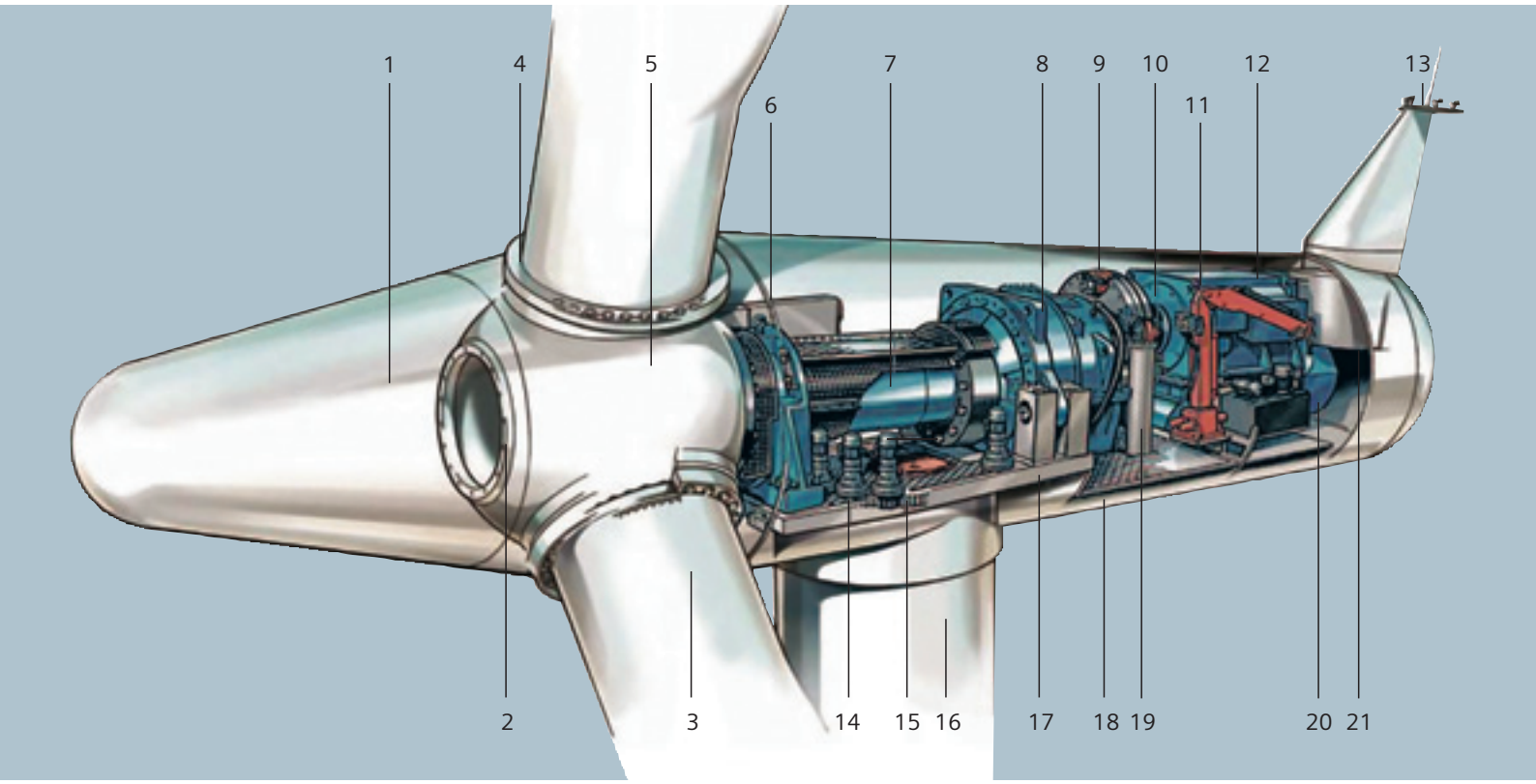
Yaw system	
Type	Active

Monitoring system	
SCADA system	Web WPS
Remote control	Full turbine control

Tower	
Type	Cylindrical and/or tapered tubular
Hub height	80 m or site-specific

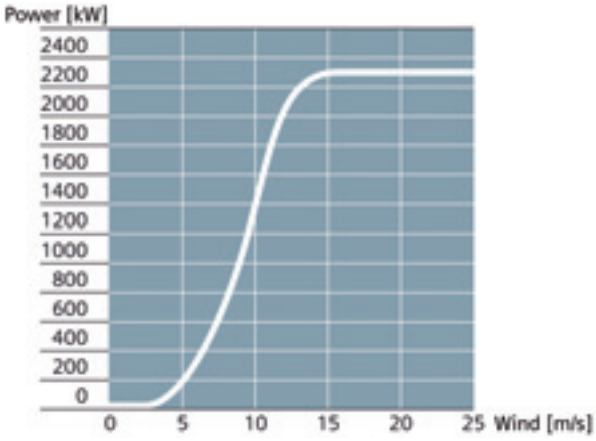
Operational data	
Cut-in wind speed	3–5 m/s
Nominal power at	13–14 m/s
Cut-out wind speed	25 m/s
Maximum 3 s gust	55 m/s (standard version) 70 m/s (IEC version)

Weights	
Rotor	54 tons
Nacelle	82 tons
Tower	Site-specific



Sales power curve

The power curve data are valid for standard conditions of 15° Celsius air temperature, 1013 mBar air pressure and 1.225 kg/m³ air density, clean rotor blades, and horizontal, undisturbed air flow.



Nacelle arrangement

1. Spinner
2. Spinner bracket
3. Blade
4. Pitch bearing
5. Rotor hub
6. Main bearing
7. Main shaft
8. Gearbox
9. Brake disc
10. Coupling
11. Service crane
12. Generator
13. Meteorological sensors
14. Yaw gear
15. Yaw ring
16. Tower
17. Nacelle bedplate
18. Canopy
19. Oil filter
20. Generator fan
21. Oil cooler

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Siemens AG
Energy Sector
Freyeslebenstrasse 1
91058 Erlangen, Germany

Siemens Wind Power A/S
Borupvej 16
7330 Brande, Denmark
www.siemens.com/wind

For more information, please contact
our Customer Support Center.
Phone: +49 180 524 70 00
Fax: +49 180 524 24 71
(Charges depending on provider)
E-mail: support.energy@siemens.com

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