Attachment 2

Sample Turbine Specifications Brochure

SIEMENS

Siemens Wind Turbine SWT-2.3-108

The new productivity benchmark

www.siemens.com/wind

The industry standard, redefined

The Siemens 2.3-MW family has firmly established itself as the tried and tested workhorse for reliability, with a range of rotor diameters for different wind conditions. Our new SWT-2.3-108 adds a new, larger rotor to the family, setting a new standard for productivity

Greater output from lower wind speeds

Since wind turbine technology was in its infancy, Siemens has been a major driver of innovation. And with its enhanced reliability and productivity in low to moderate wind speeds, the new SWT-2.3-108 is yet another example of the commitment to customers success.

Longer blades. More energy

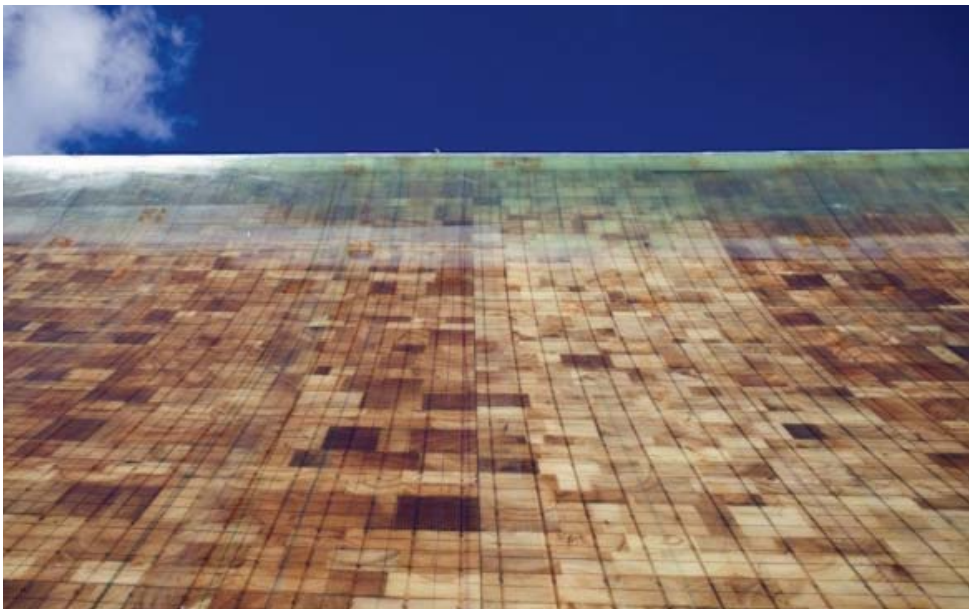
In recent years, Siemens created a product line specifically to extract more energy from moderate wind conditions. The SWT-2.3-108's innovative rotor blade design now extends productivity even further. The new 108-meter rotor with its unique blade properties is perfectly optimized for sites with low wind speeds.

Your trusted partner

With its combination of robust and reliable wind turbines, highly efficient solutions for power transmission and distribution and a deep understanding of the entire energy market, Siemens continues to be a leading supplier. Long-lasting customer relationships based on an excellent delivery record provide for a sound, sustainable and profitable investment.

With over 140 years of experience in the energy sector, a strong focus on renewables and a global network of highly skilled and trained employees, Siemens has proven itself to be a trustworthy and reliable business partner. And it will continue to be in the future.

For superior availability, reliability and a lower levelized cost of energy, look no further than the new Siemens SWT-2.3-108 turbine.



Advanced blade technology allows for longer lifecycles and contributes to lower levelized cost of energy

Superior performance provides higher yields

Optimum energy output at moderate wind conditions

The SWT-2.3-108 wind turbine is designed to increase the energy returns from sites with moderate wind conditions. The advanced blade design, with a rotor diameter of 108 meters and pitch regulation, optimize power output and increase control over energy output.

High availability

Currently, the Siemens fleet of 2.3-MW wind turbines sets the industry standard for availability. The SWT-2.3-108 will build on the reputation for reliability that the market has come to expect from a Siemens wind turbine.

High yield with minimal maintenance

Siemens optimizes the return on investment in its wind turbines through intelligent maintenance that allows high yield with low operational costs.

The rugged structural design, combined with an automatic lubrication system, internal climate control and a generator system without slip rings contributes to exceptional reliability. The innovative design of the SWT-2.3-108 allows for longer service intervals.

Superior grid compliance

The Siemens NetConverter® system is designed for maximum flexibility in the wind turbine's response to voltage and frequency variations, fault ride-through capability and output adjustment. The advanced wind farm control system provides state-of-the-art fleet management.

Proven track record

Siemens has a proven track record of providing reliable wind turbines that last. The company's first commercial turbine was installed in 1980 and still operates today. The world's first offshore wind farm in Vindeby, Denmark, was installed in 1991 and is also still fully operational. In California, Siemens installed over 1,100 units between 1983 and 1990, with 97% still in operation today.

Siemens takes its commitment to reliability seriously and prides itself on the long lifespan that its wind turbines have demonstrated.

Siemens' Turbine Condition Monitoring® system instantly detects deviations from normal operating conditions

No compromise on reliability

SWT-2.3-108: The newest member of an extremely reliable product family

Siemens wind turbines are designed to last. The robust design of the SWT-2.3-108 allows for trouble-free output throughout the complete lifecycle of the machine.

Instead of glueing the blades together from a number of spars and shells, they are cast in a single process. This not only enables both low weight and enormous strength, there are no glue joins which could potentially expose the blades to cracking and lightning damage.

Climate control within the nacelle protects vital equipment from the outside environment. The wind turbine also offers controlled-wear strategies for critical components, which results in a further reduction of maintenance costs.

Safety first

Safety is at the heart of all Siemens' operations. From production to installation, operation and service, Siemens strives to set the standard in safety.

The fail safe capabilities within a wind turbine, combined with Siemens' superior lightning protection system, are designed to enhance security for the turbine.

Advanced operations support

Given the logistical challenges associated with servicing wind farms, Siemens has equipped its turbines with a Turbine Condition Monitoring® system that reduces the need for on-site servicing.

Siemens' Turbine Condition Monitoring® system compares the vibration levels of the main nacelle components with a set of established reference spectra and instantly detects deviations from normal operating conditions. This allows Siemens to proactively plan the service and maintenance of the wind turbines, as any unusual event can be categorized and prioritized based on severity.

Using the knowledge gained from monitoring thousands of wind turbines over the years, Siemens' experts are exceptionally skilled at analyzing and predicting operational anomalies. This allows Siemens to proactively plan service and maintenance activity as each event can be categorized and prioritized based on severity. Siemens can then determine the most appropriate course of action to keep the wind turbine running at its best.

Technical Specifications

SWT-2.3-108

Rotor

Type	3-bladed, horizontal axis
Position	Upwind
Diameter	108 m
Swept area	9144 m²
Speed range	6-16 rpm
Power regulation	Pitch regulation with variable speed
Rotor tilt	6 degrees

Blade

Type	Self-supporting
Blade length	53 m
Root chord	3.4 m
Aerodynamic profile	NACA63.xxx, FFAxxx, SWPxxx
Material	GRE
Surface gloss	Semi-gloss, <30 / ISO2813
Surface colour	Light grey, RAL 7035

Aerodynamic brake

Type	Full-span pitching
Activation	Active, hydraulic

Load-Supporting Parts

Hub	Nodular cast iron
Main bearing	Spherical roller bearing
Main shaft	Alloy steel
Nacelle bed plate	Steel

Transmission system

Coupling hub - shaft	Flange
Coupling shaft - gearbox	Shrink disc
Gearbox type	3-stage planetary/helical
Gearbox ratio	1:91
Gearbox lubrication	Splash/forced lubrication
Oil volume	Approx. 400 l
Gearbox oil filtering	Inline and offline
Gearbox cooling	Separate oil cooler
Gearbox designation	PEAB 4456 (Winergy) or EH851 (Hansen)
Coupling gear - generator	Double flexible coupling

Mechanical brake

Type	Hydraulic disc brake
Position	High speed shaft
Number of callipers	2

Canopy

Type	Totally enclosed
Material	Steel
Surface gloss	Semi-gloss, 25-45, ISO2813
Colour	Light grey, RAL 7035

Generator

Type	Asynchronous
Nominal power	2,300 kW
Protection	IP 54
Cooling	Integrated heat exchanger
Insulation class	F

Grid Terminals (LV)

Nominal power	2,300 kW
Voltage	690 V
Frequency	50 Hz or 60 Hz

Yaw system

Type	Active
Yaw bearing	Externally geared slew ring
Yaw brake	Passive friction brake
Yaw drive	Eight electric gear motors with frequency converter

Controller

Type	Microprocessor
SCADA system	WPS via modem
Controller designation	KK WTC 3.0
Controller manufacturer	KK Electronic A/S

Tower

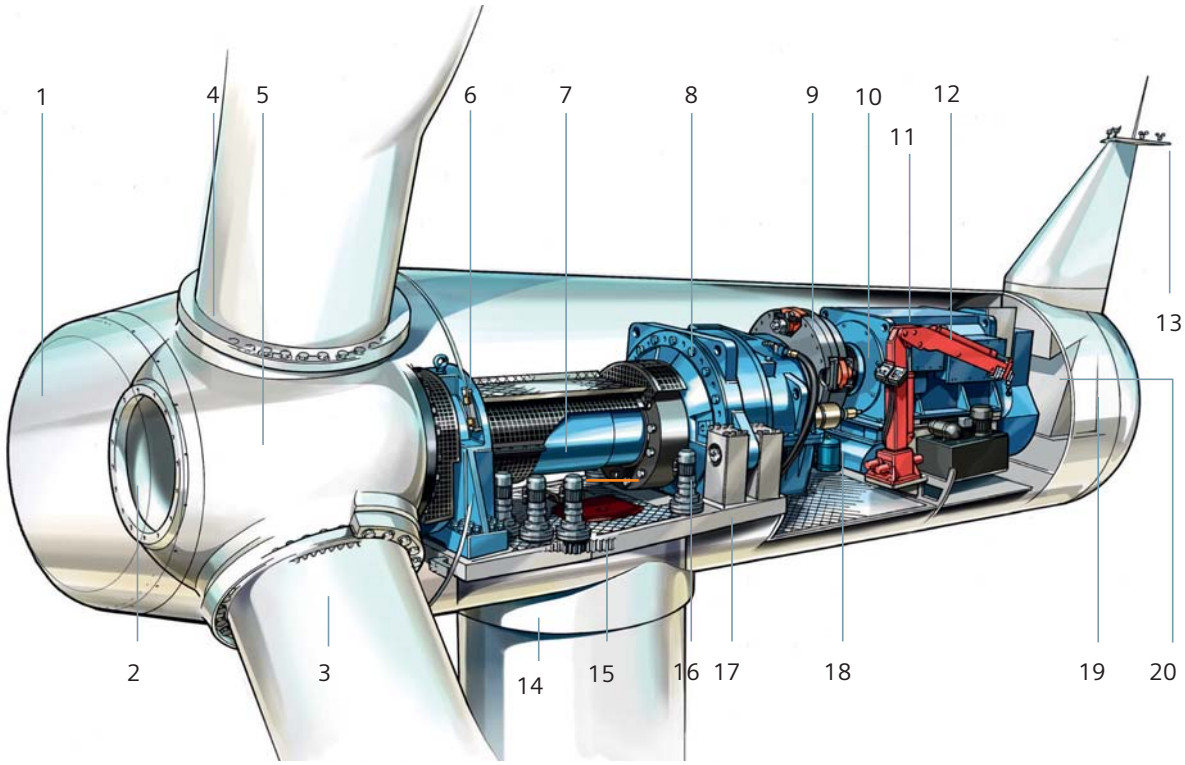
Type	Cylindrical and/or tapered tubular
Hub height	80 m or site-specific
Corrosion protection	Painted
Surface gloss	Semi-gloss, 25-45, ISO2813
Colour	Light grey, RAL 7035

Operational data

Cut-in wind speed	3-4 m/s
Rated power at	11-12 m/s
Cut-out wind speed	25 m/s
Maximum 3 s gust	59.5 m/s (IEC version)

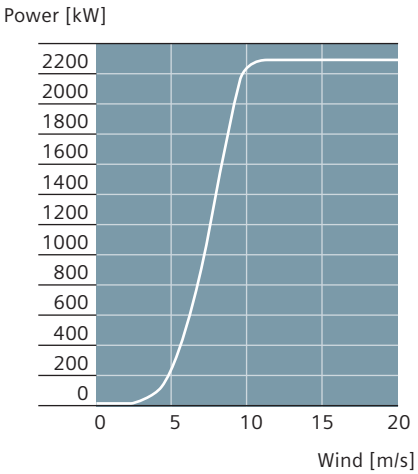
Weights (approximately)

Rotor	60,000 kg
Nacelle	82,000 kg



Sales power curve

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



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. Generator
12. Service crane
13. Meteorological sensors
14. Tower
15. Yaw ring
16. Yaw gear
17. Nacelle bedplate
18. Oil filter
19. Canopy
20. Generator fan

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Wind Power Division
E50001-W310-A184-X-4A00

Printed in Germany
Dispo 34804 c4bs No. 7491
MCS 12.11.1
Printed on elementary chlorine-free
bleached paper.