SIEMENS

Siemens D3 platform – 3.0-MW, 3.2-MW, 3.3-MW, and 3.4-MW direct drive turbines

Reduced complexity, increased profitability

siemens.com/wind

As the major driver of innovation with more than 30 years of experience, Siemens is the ideal business partner.

SWT-3.0-101

SWT-3.0-113

SWT-3.3-130

Your trusted partner

Siemens has been a major driver of innovation in the wind power industry since 1980, when wind turbine technology was still in its infancy. Technology has changed with the times, but Siemens' commitment to providing its customers with proven wind turbine solutions remains the same. The combination of robust and reliable turbines, highly efficient solutions for power transmission and distribution, and a deep understanding of the entire energy market ensures that Siemens will continue to take the wind power industry to new levels.

Drawing on more than 30 years of experience in the wind power industry, 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.

With an increasing number of turbines being installed at inland, coastal, and offshore sites, reliability and best-in-class maintenance under challenging conditions are essential for optimizing the return on investment throughout a project's lifecycle.

Over the past 30 years, Siemens has accumulated millions of hours of service experience. Drawing on this substantial knowledge, the company has established a flexible range of service solutions that are designed to optimize the output of wind turbines.

Intelligent ways to drive down the cost of electricity

Wind power is coming of age. It is fast becoming directly competitive with traditional energy sources. Driving down the levelized cost of wind energy is a key target for Siemens as we strive to make wind power independent of subsidies through innovation and industrialization.

Our platform strategy is founded on the knowledge and experience of more than 30 years in wind power. Standardization and modularization are fundamental to the platform approach, allowing us to streamline manufacturing and installation and develop a lean design process.

Each of our products is a member of one of four platforms: the Siemens G2, Siemens D3, Siemens G4, and Siemens D7. "G" denotes geared turbines, "D" signifies direct drive technology, and the associated numbers represent the predominant power rating.

The D3 platform comprises onshore direct drive wind turbines with a power rating of 3.0-MW, 3.2-MW, 3.3-MW, and 3.4-MW.

State-of-the-art technology for outstanding performance

Siemens D3 platform wind turbines embody proven innovation in the field of direct drive generators, with hundreds of units already installed and operational. As wind power plants develop capacities similar to conventional power plants, power-generation companies throughout the world are striving for greater efficiency and cost-effectiveness. Siemens' solution: increase availability and profitability through innovative technology.

Performance and profitability go hand in hand

A holistic approach to the design, manufacturing, construction, installation, and servicing of a wind turbine is essential. Siemens D3 platform wind turbines balances and optimizes all of these elements in a compact system.

Optimized efficiency

The Siemens D3 platform offers a simple, efficient, and straightforward wind turbine design. Thanks to direct drive technology, the number of rating and wear-prone components are reduced, which increases simplicity. Efficiency is improved by using a permanent magnet generator, which does not expend any energy on excitation. The generator on the Siemens D3 platform wind turbines is also equipped with a fixed internal stator. This straightforward design allows operation within narrower tolerances and keeps the dimensions of the nacelle compact.

Simplified design

Thanks to the removal of the gearbox and other design simplifications, Siemens has given service technicians more space inside the nacelle, where key components are readily accessible and can be replaced without impacting others. The D3 platform wind turbines have a dual cooling system that provides even cooling of the generator for improved energy efficiency.

The key components of Siemens D3 platform wind turbines – the blade, hub, nacelle, tower, and controller – are all adopted from the existing Siemens portfolio. The utilization of proven components combined with rigorous testing on rigs and in the field enables Siemens to eliminate many of the variables traditionally associated with the introduction of such an innovative product.

Higher towers for increased yield

Higher towers significantly increase the energy yield of a wind turbine. At the same time, they pose considerable challenges in terms of transportability and cost. Siemens offers a range of towers with a hub height from 85 m for high wind sites up to 135 m for sites with moderate wind speeds. The tubular steel tower consists of multiple tower sections that are designed with a focus on section length, weight, and dimensions for transportation throughout Europe. Standard processes, standard materials, and a global supplier base ensure an economically viable business model and efficient installation time in any site conditions.

Ease of transportation and construction

The D3 platform has a compact design and has been engineered to meet even the most demanding transportation routes. Key bridge and tunnel clearance specifications were carefully considered when engineering the machine. As a result, the Siemens D3 platform wind turbines can navigate many of the most challenging transport routes.

Proven technology, advanced performance

Siemens NetConverter®

The NetConverter® system offers maximum flexibility in the turbine's response to voltage and frequency control, fault ride-through, and output adjustment. As a result, Siemens wind turbines can be configured to comply with a variety of relevant grid codes in major markets and can be readily connected to the grid.

Siemens IntegralBlade® technology and Aeroelastically Tailored Blade technologies

The Siemens D3 platform wind turbine rotors benefit from blades manufactured using patented IntegralBlade® technology. The blades are made in one piece from fiberglass-reinforced epoxy resin in a single production step. As a result, all glue joints – the potential weak points that could expose the structure to cracking, water ingress, ice formation, and lightning damage – are eliminated.

The third generation of Siemens blades incorporates innovative aeroelastic properties, including blade twisting and blade bending. Thanks to the aeroelastically tailored blade (ATB) technology, the blades can be longer without transferring added loads from the rotor to the turbine structures. The ATB technology enables the blade to harvest more energy from the wind, which increases the annual energy production.

Siemens WebWPS SCADA system

Via a standard Web browser, the Siemens WebWPS SCADA system provides a variety of status views of electrical, mechanical, meteorological, and grid station data as well as operation and fault status.

High Wind Ride Through functionality

Wind turbines are normally programmed to shut down if the 10-minute mean wind speed exceeds 25 m/s. This may lead to significant challenges for the grid system if the turbines in large wind farms are shut down more or less simultaneously.

The Siemens D3 platform supports grid stability with the High Wind Ride Through system. It replaces the fixed high wind shutdown threshold with an intelligent load-based reduction in output power at certain storm-level wind speeds.

Power boost functionality

The Siemens Wind Power power boost functionality is a wind turbine control feature that increases the annual energy production of the turbine by raising the rating up to 5 % depending on site conditions. The feature is implemented, operated, and controlled on each wind turbine.

Vibration diagnostics service

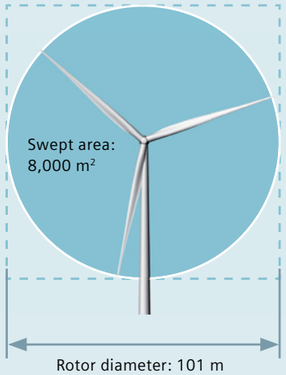
Our vibration diagnostics service enables us to detect anomalies early on and prevent potential failures. This requires our diagnostics experts to analyze vibration patterns and compare them with values from the Siemens database. This database is founded on archived records from almost 10,000 Siemens wind turbines. Thanks to these analyses combined with predictive methods, we can optimize service planning and repair components proactively before serious damage can occur. Since July 2008, we have been able to detect 97 percent of all potential gear-tooth cracks and prevent them from becoming fatal.

Service

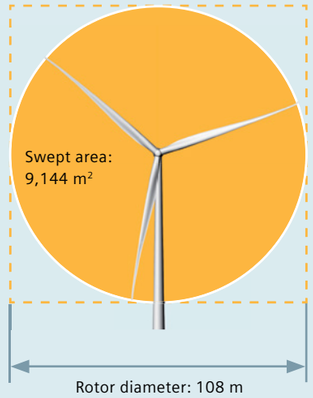
With an increasing number of turbines being installed around the globe, consistency is essential for generating an optimal return on investment throughout a project's lifetime. Whether you operate wind turbines at inland, coastal, or offshore sites, our service team will craft an intelligent Siemens service solution that is custom-made for your needs. They will collaborate with you to deliver reliability and maximum output under all conditions.

Ongoing improvements in safety

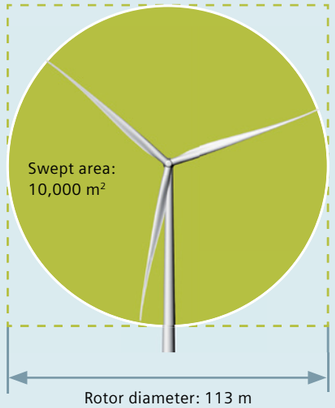
Safety is at the heart of all Siemens operations. From production to installation, operation, and service, Siemens strives to set the standard for a zero-harm culture.



SWT-3.0-101/SWT-3.2-101/SWT-3.4-101	
IEC Class	IA
Rotor diameter	101 m
Blade length	49 m
Swept area	8,000 m²
Hub height	74.5 – 94 m*
Power regulation	Pitch regulated
Annual output at 8.5 m/s	12.8 GWh (3.0 MW) 13.1 GWh (3.2 MW) 13.5 GWh (3.4 MW)



SWT-3.0-108/SWT-3.2-108/SWT-3.4-108	
IEC Class	IA
Rotor diameter	108 m
Blade length	53 m
Swept area	9,144 m²
Hub height	74.5 – 94 m*
Power regulation	Pitch regulated
Annual output at 8.5 m/s	13.2 GWh (3.0 MW) 13.7 GWh (3.2 MW) 14.0 GWh (3.4 MW)



SWT-3.0-113 / SWT-3.2-113	
IEC Class	IIA
Rotor diameter	113 m
Blade length	55 m
Swept area	10,000 m²
Hub height	83.5 – 127.5 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	11.8 GWh (3.0 MW) 12.2 GWh (3.2 MW)

SWT-3.3-130	
IEC Class	IIA
Rotor diameter	130 m
Blade length	63 m
Swept area	13,300 m²
Hub height	85 –135 m*
Power regulation	Pitch regulated
Annual output at 7.5 m/s	13.7 GWh

*According to defined tower program

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