



ABB wind turbine converters

Increased turbine output for creating the perfect wind economy

Power and productivity
for a better world™



Creating the perfect wind economy with every turn

ABB technology helps to make wind power economically viable.

The wind power market continues to expand

Wind turbine manufacturers and wind farm owners are experiencing steady growth which is predicted to continue. With many governments resuming their push for increased renewable power capacity, the cost of energy is gaining more focus.

Diverse grid codes provide special challenges

Wind farm owners and turbine manufacturers need to efficiently produce power and achieve the desired return on investment while meeting grid code requirements. They must avoid making costly retrofits to newly installed turbines in response to grid code changes.

Power utilities and governments have developed grid code specifications that outline expected wind farm behavior in response to defined fault conditions. These codes help wind

farms avoid black-outs and other service disruptions resulting from transmission grid faults. Such faults can significantly impact the stability of the entire grid.

ABB wind turbine converters for a better wind economy

The wind turbine converter plays an important role in helping customers create the perfect wind economy. The selection of the right wind turbine converter is critical in the turbine design and for a higher wind farm return on investment.

As part of the electrical drivetrain, ABB converters help turbines produce more megawatts more economically while providing the technology to meet the grid code needs of today and tomorrow. They are designed for high efficiency and are backed by a comprehensive set of global life-cycle services that ensure trouble-free operation and maximum availability.



More than delivering a product

From the early evaluation phase of a new wind turbine to final operation, ABB provides consulting, support, training and services.

ABB converter specialists are experts in every aspect of the drivetrain system. They will support turbine manufacturers in selecting the most suitable drivetrain concept, design and dimension the drivetrain components to function in perfect sync and provide support in the grid code certification process.

ABB helps its customers to create the perfect wind economy by:

- Providing wind turbine converters designed to deliver maximum efficiency and productivity at low operational expenditure
- Optimally designing and dimensioning the drivetrain
- Ensuring grid code compliance
- Offering global service and support throughout the entire lifetime of the equipment ensuring trouble-free operation and maximum availability



Grid code compliance

ABB has the expertise and technology to ensure its customers' wind turbines meet the grid code needs of today and tomorrow.



Grid code reassurance

As the installed capacity of wind farms increases, the share of power they provide to the transmission network rises. As such, the way a wind farm deals with a grid fault has a significant impact on the stability of that grid.

Utility companies regulate these conditions by ensuring wind farms meet demanding regional grid code specifications. Grid codes are becoming more demanding and vary between countries. The wind turbine converter plays an important role in helping the wind turbine meet these grid code requirements and to obtain the necessary operational certification.

Globally active in grid code working groups and research

ABB's customer commitment is that its wind turbine converters support the needs of the wind turbine in meeting the diverse grid code requirements. ABB invests significantly into research and development and is active in grid code and power quality working groups supporting power system reliability. ABB engineers provide technical feedback on the feasibility of proposed grid code changes, ensuring the current technology and production costs are compatible with the proposed changes.

Low voltage ride-through and grid support

A common requirement for all grid codes is a fault ride-through capability where the wind farm and the turbines must be capable of operating continuously at reduced voltage and must not trip off-line because of transient voltages. Wind farms have to remain connected during voltage dips and to provide active and/or reactive power to the network during the fault.

ABB has designed its wind turbine converters to provide full reactive current immediately when the grid fault starts.

Low voltage ride-through laboratory

ABB has taken the testing and certification process one step further. Its multi-megawatt grid code laboratory is designed to replicate a complete wind turbine with generator, wind turbine converter, transformer, medium voltage switchgear, and is connected to a 20 kV transmission line. This configuration allows ABB engineers to test the low voltage ride-through behavior of wind turbines in a controlled environment. Various wind conditions can be simulated with a speed-controlled motor driving the generator. This allows testing of multiple power levels more efficiently, reducing on-site testing costs.

Complete drivetrain tests

Besides comprehensive real-time simulations of grid code disturbances, fault ride-through and power quality tests of the wind turbine converter, ABB is able to perform tests of the complete drivetrain – including generator and converter – to verify the performance and to ensure a smooth integration of the drivetrain into the customer’s wind turbine.

Capitalize on ABB engineering

Wind turbine design demands a significant amount of technical engineering. ABB supports turbine manufacturers during their converter engineering phase, working with the customer to integrate the converter into the turbine design and control system. Additionally, ABB engineers help the turbine manufacturer understand how to obtain the best performance out of the converter to increase the overall turbine performance.

Turbine certification support

Turbine certifications are based on the grid codes used in the region where the turbine will be installed. When turbine manufacturers are applying for certification, ABB engineers can help the manufacturer use and maximize the converter’s technology to meet the requirements of the grid code.



ABB wind turbine converters

ABB offers the complete range of wind turbine converters for onshore and offshore installations.

ABB offers the complete range of converters for wind turbines – from small wind turbines for residential or small business use to utility-scale wind turbines installed in onshore or offshore wind farms. ABB wind turbine converters help increase turbines' energy production through high availability, grid code compliance and long life cycles.

Converters for doubly-fed and full power concepts

ABB offers doubly-fed and full power converter designs. Doubly-fed power converters feature reactive power control, high efficiency at the nominal point and very low total harmonic distortion (THD). Full power converters isolate the wind turbine generator from line transients and enable fast response to line faults. They provide better ride-through capabilities and support during grid faults.

Converters for small wind turbines (2 – 110 kW)

ABB offers a wide range of small wind turbine converters for residential or small business use. ABB's portfolio includes single-phase and three-phase wind turbine converters as well as grid-tie transformerless solutions. The compact converters are characterized by high efficiency and are easy to install and maintain.

Converters for utility-scale wind turbines

Low voltage wind turbine converters (600 kW – 6 MW)

Low voltage wind turbine converters are available in full power or doubly-fed designs, with air or liquid cooling. They feature ABB's direct torque control (DTC) which monitors the generator torque 40,000 times per second, enabling the most efficient generator control. This provides the foundation for grid code and fault ride-through compliance. Liquid-cooled converters transfer the heat from the converter to outside the turbine and enable the cabinets to be completely enclosed, with no openings thereby keeping salty, sandy and dusty air out. Converters over 2 MW offer a design option to use parallel connected sub-converters for increased efficiency and optimized turbine installation.

Medium voltage wind turbine converters (4 – 10 MW)

Designed for larger turbines, ABB's medium voltage full power converters provide fault ride-through and grid code compliance. They are characterized by low parts count, long life expectancy even under load cycling, high availability and low losses. The modular design allows easy customization to meet customer requirements. The liquid-cooled converters enable low cost and efficient cable installation.

ABB's low and medium voltage wind turbine converters are available in in-line, back-to-back or face-to-face configurations and are suitable for nacelle or tower installation.



ABB low voltage wind turbine converter



ABB medium voltage wind turbine converter

Reliability

ABB wind turbine converters are based on the same world leading ABB variable-speed drive technology installed in thousands of applications worldwide. They are designed for operation in harsh environmental conditions, such as dust, sand and salt and are available with up to IP54 levels of protection.

Remote monitoring

Wind turbines typically have a built-in condition monitoring capability that is used to assess the overall status of the turbine. However, sometimes wind farm engineers and turbine manufacturers need more information to help assess fault conditions or to analyze the turbine's performance.

ABB provides remote monitoring capabilities that allow wind farm operators to directly access the converter to obtain data such as voltage, power, reactive power, temperature and speed.



Service and support

ABB offers comprehensive global life-cycle services to help customers' wind turbine converters operate like new.

ABB engineers not only work with turbine manufacturers during the design and converter specification phase, but provide their services throughout the entire life cycle of the converters.

Installation and commissioning

ABB's certified onshore and offshore commissioning engineers have extensive know-how and experience in wind turbine converters and mechanical start-ups, which makes commissioning fast and smooth and lays the foundation for high reliability and efficiency.

Technical support

ABB provides remote services for fast failure analysis as part of its maintenance program for wind turbine converters. On customer request, a 24/7 support line for getting instant advice by ABB's certified engineers, and on-site field support can be provided.

Spares and consumables

Having the correct spare parts available at the correct locations, either at the turbine manufacturer's warehouse, regional stocking centers or at wind farms, needs to be well-planned to ensure the highest wind turbine energy production. ABB can help plan spare part stocking throughout the life cycle of the wind turbine.

Preventive maintenance

The turbine converter performs critical duties in power generation and its failure may result in loss of production and revenue. Adopting and implementing ABB's converter-specific preventive maintenance schedules reduces the risk of failure and increases the lifetime of the converter, lowering overall operational costs. ABB developed preventive maintenance kits containing all the genuine ABB spare parts needed to perform a specific maintenance task, helping to simplify the preventive maintenance process.



Training

ABB provides a wide selection of wind turbine converter training to turbine manufacturers and wind farm operators. The training can take place at ABB training centers or at the customers' locations.

Service agreements

Depending on the needs of the turbine manufacturer or wind farm operator, ABB can bundle individual services in one contract. A contract can be made at any stage of the wind turbine converter's service life.

Global network, local presence

ABB's global presence and worldwide organization with its network of selected partners provide local support, training and services as and when required.

Services for ABB wind turbine converters

- Installation and commissioning
- Grid integration support
- On-site support
- Training
- Remote diagnostics
- 24/7 support line
- Maintenance
- Customized maintenance contracts
- Spare parts and logistics network

Benefits

- Reduced down- and recovery time
- Lifetime extension of converter
- Enhanced operational efficiency
- Lowered capital expenditure
- Improved cost control



ABB wind turbine drivetrain packages

ABB can provide the complete electrical drivetrain, including converter and generator.

ABB generators

ABB has supplied more than 35,000 generators over the last 30 years to leading wind turbine customers all over the world. It offers the complete range of generators for wind turbines, supporting all drivetrain concepts. It has been the leader in Permanent Magnet Generator (PMG) technology since the 1990s.

The standard power range is from 100 kW to 8 MW, with generators available up to 20 MW and 15 kV.

ABB generators are designed for harsh operating conditions. The special ABB high performance F-class insulation system and the rigid form-wound windings guarantee a long lifetime with high overload capability in high temperatures, even with the continuously changing loads common to wind turbines. The bearing construction is designed for reliable operation with long service intervals.

Electrical drivetrain packages

ABB provides electrical drivetrain packages that work in perfect sync. ABB experts support turbine manufacturers in designing and dimensioning the drivetrain components and provide support in the grid code certification process. Besides comprehensive simulations and tests of the wind turbine converter, ABB is able to perform tests of the complete drivetrain to verify the performance and to ensure a smooth integration of the drivetrain into the customer's wind turbine.

Complementary ABB products for wind power

ABB's offering for wind power extends beyond just the electrical drivetrain. ABB is one of the largest suppliers of electrical products and solutions to the wind industry.

Transformers

ABB transformers for wind applications include small turbine step-up transformers located inside the wind turbine, as well as large transformers used to connect the wind farm substation to the transmission grid.

Low voltage AC drives and motors

ABB motors and drives are used for various applications in wind power such as pumps, fans and yaw systems.

Contactors, breakers and more

ABB offers the complete range of low voltage products, such as breakers, PLCs and contactors for use in wind turbines.

Power quality systems (STATCOM)

ABB's STATCOM systems and synchronous condensers provide reactive power compensation and fault-ride through capabilities and deliver grid code compliance to wind farms.



ABB, an experienced global partner

With over 30 years of wind power experience, ABB has the know-how and experience you can trust.



Benefits of buying from ABB

Reliable products

ABB wind turbine converters are based on the same world leading ABB variable-speed drive technology installed in thousands of applications worldwide. They are designed for reliable operation in harsh environmental conditions.

Drivetrain components working in sync

ABB drivetrain specialists will support turbine manufacturers in selecting the most suitable drivetrain concept, design and dimension the drivetrain components to function in perfect sync and provide support in the grid code certification process.

Grid code expertise

Activity in grid code working groups and standard definition enables ABB to ensure its converters have the adaptable technology to meet current and future grid code requirements. ABB wind turbine converters are subjected to comprehensive fault ride-through and power quality tests to ensure they can withstand grid disturbances and comply with all standards.

Global support

ABB's global service organization ensures preventive maintenance, refurbishment and spare parts contracts are readily available anywhere.

ABB, your partner in wind power

- Global leader for wind power electrical products and solutions
- More than 30 years of wind power experience
- Delivered more than 50,000 converters and generators
- Active in grid code and power quality working groups
- State-of-the-art grid code testing facilities
- Global support and service with a 24/7 hotline

Contact us

For more information contact your local ABB representative or visit:

www.abb.com/converters-inverters
www.abb.com/windpower

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