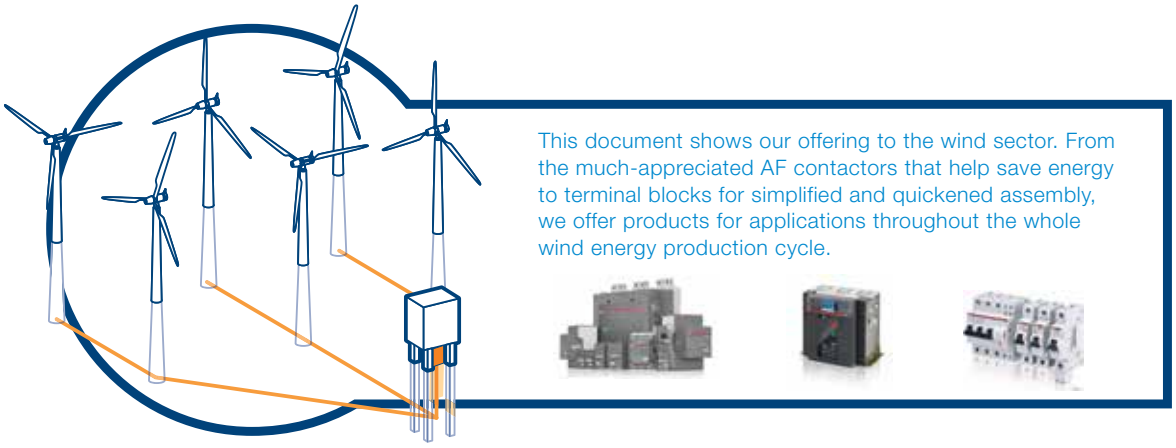
ABB in wind industry
Low voltage products portfolio

Power and productivity
for a better world™

ABB in wind industry
Low Voltage Product portfolio

ABB is driven by a continous search for innovation. That is why many of our ideas have revolutionized the electrical industry. Often recognized as a provider of single, high-quality products, the extent of ABB's solution offering is often forgotten. ABB pioneered the wind and solar industry and has worked closely to the largest rolling stock manufacturers for a long time. With a clear nordic presence ABB knows the mining industry by heart. We are known for our individual products, but our solutions are what really stands apart.



This document shows our offering to the wind sector. From the much-appreciated AF contactors that help save energy to terminal blocks for simplified and quickened assembly, we offer products for applications throughout the whole wind energy production cycle.

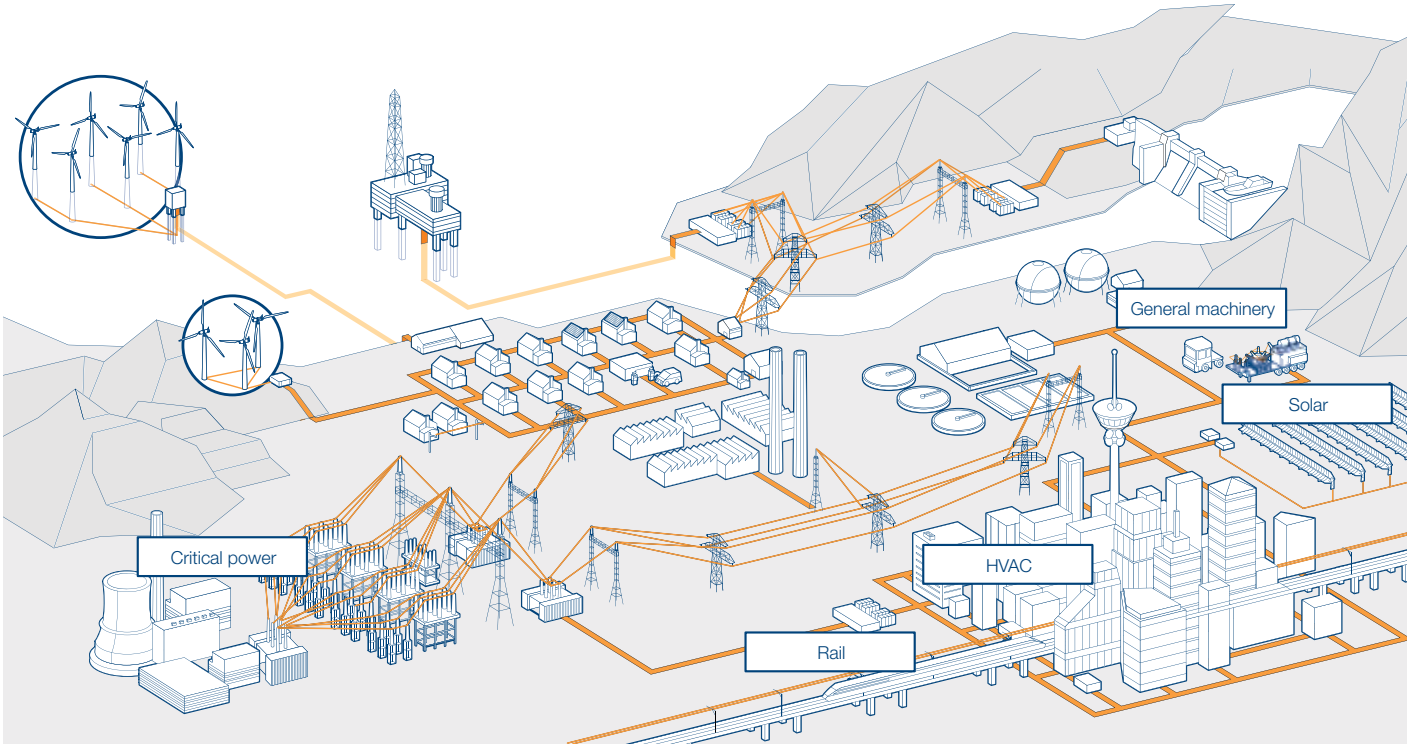


ABB in wind industry
Deliveries from A to Z into the wind industry

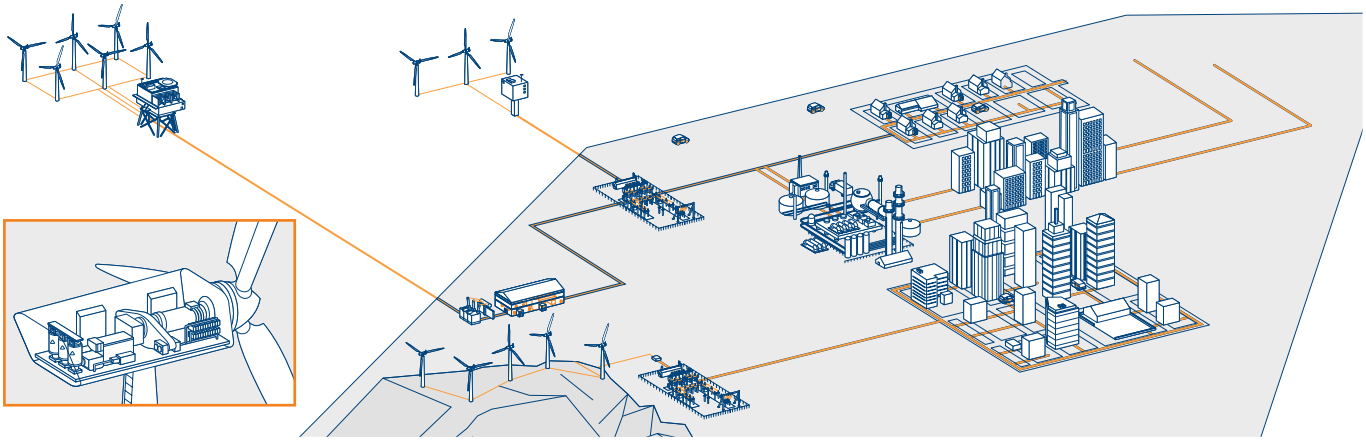
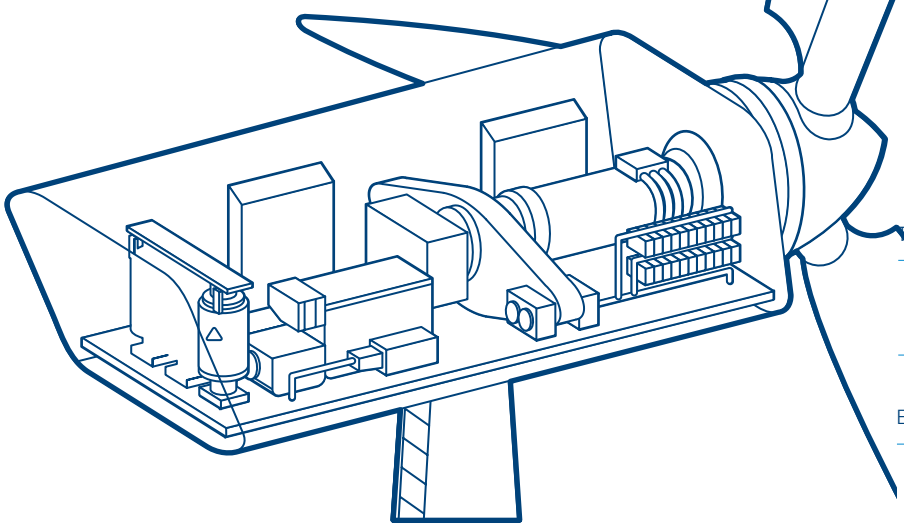


ABB supplies products and services to the wind industry, from products and services used in wind turbines to power transmission and distribution systems of the wind power plant. This document focuses on products found inside or close to the wind turbine.



Generators

Doubly-fed/full converter concepts (up to 8 MW, 690 V – 12 kV

Medium voltage (up to 10MW, 3.3kV)

Turbine control and protection products

For drivetrain and other sub-systems

Wind turbine converters

Doubly-fed/full power low voltage (up to 6 MW, 690 V)

Medium voltage (up to 10MW, 3.3kV)

Transformers

Dry-type/Liquid-filled (up to 72.5 kV and 40 MVA)

Enclosures and connections

Enclosures

Wire and cable management connections and terminal blocks

Motors and drives

Brake motors for yaw & pitch control

AC motors for generator cooling, fans and hydraulic systems.

Variable speed motor control

Switchgear

Medium voltage (12-40.5 kV)

High voltage (72.5 kV)

ABB in wind industry
The best solutions in Low Voltage Products

- Wind economy engineered into each megawatt;
- Create the perfect wind economy with every turn;
- Invest in wind economy from every direction.

Helps to increase reliability, safety and performances of the wind turbines by having:
– The longest experience and a deep understanding of the specificities of the Wind power industry.
– The largest portfolio that include dedicated and unique products and solution for all wind turbine sub-systems.

Offers global support on a local level by having:
– Presence in more then 100 countries.
– Global and local wind experts.
– Products & Services available in all markets.

Is the better reliable long term partner to choose by being:
– An independent supplier (not manufacturing wind turbines).
– Recognized as market leader in the wind proven solutions.
– Able to achieve high technological challenges at a lower cost energy (LCOE).

Visit our web portal here.

ABB in wind industry
Gamesa reduces design and assembly costs

The client
With 18 years of experience, Gamesa is a global technological leader in the wind industry, an industry continuously evolving to meet with greater demands for sustainable energy production. As part of potentiating energy production, Gamesa Electric switched to the AF contactor in their equipment and has thanks to the functional benefits of the AF contactor and ABB's experience saved money, time and space.

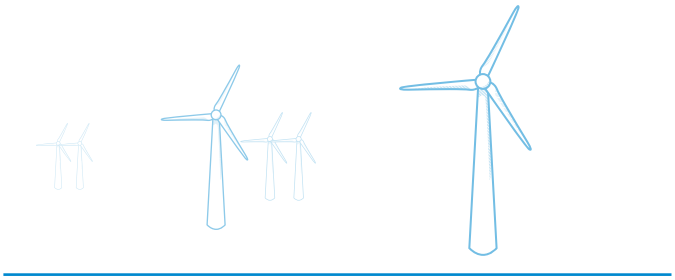
The challenge
Having installed 24,143 MW through 2011, Gamesa is among the world leaders in the wind turbine design market. To meet with a growing market and with competition Gamesa is always looking for ways to improve efficiency and availability of products and services. One of the cost reduction lines identified showed that a lot of time and money could be saved in the assembly and design of the wind turbine's control panels. Therefore, Gamesa decided to sit down with ABB to come up with a solution.

The ABB solution
To improve efficiency and simplify assembly, Gamesa, after consulting the engineers of ABB, switched from conventional contactor technology in their equipment to the ABB AF contactor. Gamesa, which goal was to reduce the design process and assembly cost by 20%, is happy with the result – reaching both the goal of a 20% cost reduction and at the same time providing a more reliable product. Thanks to the flexibility of coil connections for the AF contactor, Gamesa has been able to reduce the length of cables in their cabinets. The compactness of the AF contactor along with a reduction in energy consumption has helped reduce the size of cabinets and has helped simplify the assembly process. Built-in functions like RC-filter and surge suppression are other aspects that help Gamesa stay on top of its business.

Products Gamesa uses

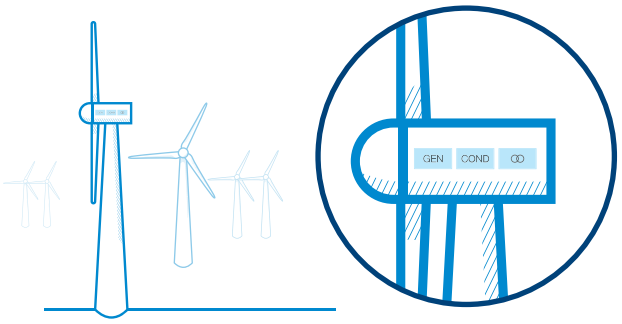
Contactors	Breakers	MMS	MCB
			

ABB in wind industry
Sub systems in Wind turbines



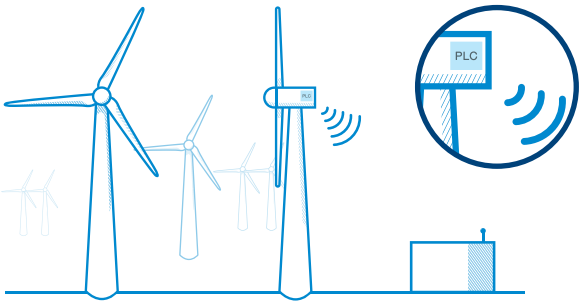
The following two pages introduces you to the most common applications inside a wind turbine. ABB products help these applications function reliably and safe. Go to the table on page 8 to see exactly what type of products ABB offers per application type.

Drivetrain



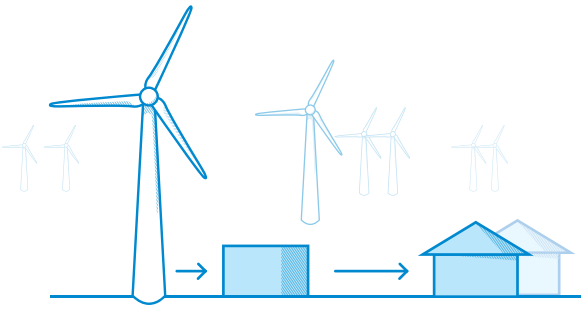
This is the power circuit, where input is the power from generator and output is power to the grid. Since high power, typical components are ACBs and large contactors. Another key product is overvoltage protection (OVR, SPD). Modern drivetrains normally includes a converter. In addition to the main circuit, the converter itself has several functions that need low voltage components.

Main controller



The main controller is the brain of the turbine, taking care of overall decisions, control, monitoring and communication. The main component is a plc. Around the plc several products are needed, eg for power supply, protection and communication

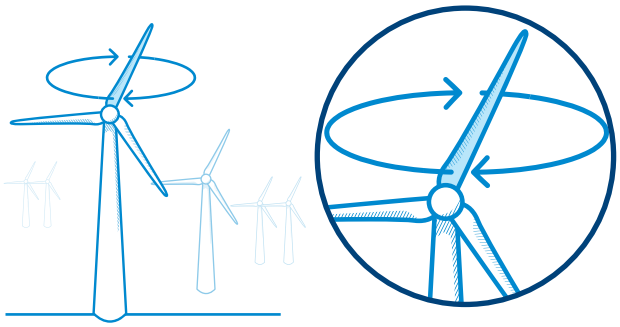
Grid connection



This is the point where grid is connected as MV to the turbine (working at LV). Main component is a transformer. On LV side is used circuit breaker or switch disconnector and over voltage protection.

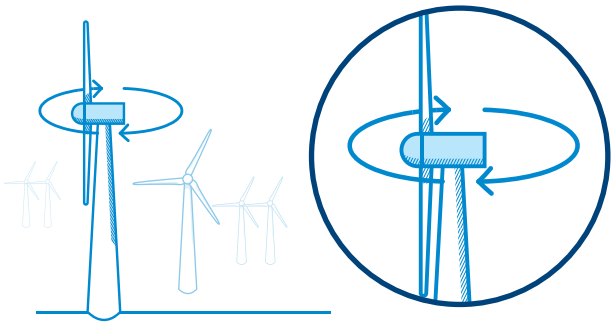
ABB in wind industry
Sub systems in Wind turbines

Pitch system



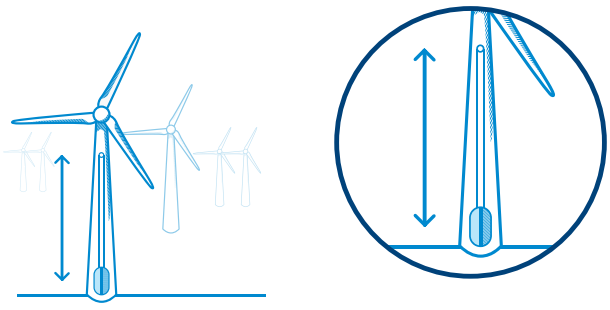
Pitching refers to changing angle of the turbine blades. The function is to maximize output power from the wind turbine as well as protect the turbine at high wind speeds (pitching out to reduce or stop rotation speed). Some main components are the motors for each blade and the controls for them. Other main functions are for example related to communication and safety.

Yaw system



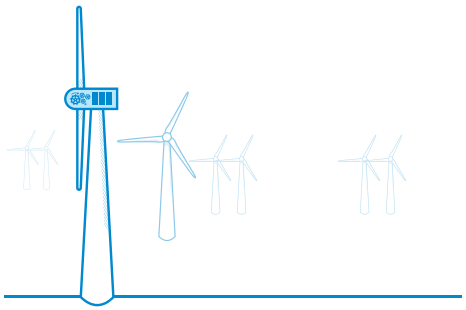
The yaw system is turning the complete nacelle so that the rotor (with the blades) is always facing the wind. This is to maximize power output from turbine. The main components are motors and its control. Typically 3 to 8 motors are used.

Auxilliary and supply systems



These are internal systems of the turbine like lightning, elevator and cooling systems (air or liquid).

Hydraulic and cooling system



Hydraulic and cooling systems are supported by hydraulic pumping and cooling systems which transfer heat losses from equipment such as generators, gearboxes and converters. Hydraulic systems are also used in safety circuits such as yaw, pitch and brake systems.

ABB in wind industry
Product list

Products		Subsystems									Turbine size		
Product data (typical, range, example)	Product name Alternative product range in brackets	Drivetrain - full converter types	Drivetrain - doubly-fed type	Drivetrain - fixed speed types	Pitch system	Yaw system	Main turbine controller	Other Aux. systems	Hydraulic and cooling systems	Grid connection	Small Wind (city & rural - up to 100kW)	Community wind (around 100-approx 500kW)	Utility scale turbines (MW & multi MW)
Circuit-breaker													
MCCB - Molded Case Circuit Breakers up to 250A	Tmax XT		C	x	x	x	x	x	x	x	x	x	x
MCCB - Molded Case Circuit Breakers 400-1600A	Tmax		C/Gr	x						x		x	x
ACB - Air Circuit Breakers up to 6300A	Emax	Gr	Gr							x			x
MCCB - Variable frequency versions up to 1600A	Tmax VF	Ge	Ge									x	x
ACB - Variable frequency versions up to 4000A	Emax VF	Ge	Ge										x
MCB - Miniature Circuit Breakers up to 63A	S200	C	C	C	x	x	x	x	x	x	x	x	x
HMCB - Miniature Circuit Breakers up to 125A	S800				x	x	x	x	x	x	x	x	x
Switches & Fusegear													
Fusible switches	Easyline	x	x	x				x	x		x	x	x
Switch fuse	OS	x	x	x				x	x		x	x	x
Load break switches	OT				x	x	x	x	x	x	x	x	x
Current limiting fuses	Hi-Tech	x	x	x	x	x	x	x	x	x	x	x	x
Fuseholders	E90	C	C	C	x	x	x	x	x	x	x	x	x
Contactors & motor Control													
Block contactors up to 40A (AC3) / 15kW	AF (A)	C	C		x	x		x	x		x	x	x
Block contactors 40-400A	AF (A)		C					x	x		x		x
Block contactors up to 2650A (AC1)		Ge/ (Gr)	x	x								x	x
Overload relays	TAF, EAF				x	x						x	x
Manual motor starters	MS116, MS132 (MO325)	C	C		x	x		x	x				
Mini contactors	B6, B7	C	C		x			x	x			x	x
Softstarters up to 40A / 15kW	PSR, PSE					x							x
Softstarters up to 1200A	PST(B)			x								x	x
Pluggable system (Compact power distribution)	SMISSLINE				x	x	x	x	x				x
Safety & people protection products													
Safety plc	Pluto				x		x					x	x
Safety relays	RT, JSB	C	C		x	x	x	x	x		x	x	x
Emergency stop push buttons	CE, MPE, MPM	C	C		x	x	x	x	x	x	x	x	x
Safety labels, tags, signs, barricade tapes								x	x		x	x	x
Emergency exit lighting								x	x				x
Arc guard system	TVOC-2									x			x
Limit switches - safety applications	LS					x		x	x			x	x
RCD/RCBO - Residual current devices	DS200, F200, DS951	C	C	C	x	x	x	x	x		x	x	x
Enclosures													
Distribution board	ArTu-k	x	x	x	x	x	x	x	x			x	x
Automation board	IS2	x	x	x	x	x	x	x	x			x	x
Switchgear	MNS									x			x
Grounding and lighting protection													
SPD - Surge protection devices, Type1 (Din-rail type)	OVR T1	Gr	Gr	Gr						x			x
SPD - Surge protection devices, Type2 (Din-rail type)	OVR T2	G/ Gr/C	G/ Gr/C	G/ Gr/C	x	x	x	x	x	x	x	x	x
SPD - Surge protection devices, Type1 (full metallic)	Lovos	Gr	Gr	Gr									x
SPD - Surge protection devices, Type2 (full metallic)	Lovos	Gr	Gr	Gr									x
Mechanical grounding system	Blackburn	x	x	x	x	x	x	x	x	x	x	x	x
Exotermic grounding system	Blackburn	x	x	x	x	x	x	x	x	x	x	x	x

ABB in wind industry
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Connection and cable management													
Terminal blocks 4-240 mm² (screw clamp / spring / ADO)	SNK, SNA	x	x	x	x	x	x	x	x		x	x	x
Industrial IEC plugs & sockets, 690 V								x	x			x	x
Industrial IEC plugs & sockets, 400 V								x	x			x	x
DIN-rail socket outlet	M1xxx	C	C	C	x	x	x	x	x			x	x
Cable ties	Ty-Rap	x	x	x	x	x	x	x	x	x	x	x	x
Stainless steel cable ties	Ty-Rap	x	x	x	x	x	x	x	x	x	x	x	x
Flexible conduit and fittings	T&B fittings	x	x	x	x	x	x	x	x	x	x	x	x
Compression connectors	Blackburn, E-Z-Ground	x	x	x	x	x	x	x	x	x	x	x	x
Conduit bodies	BlueKote	x	x	x	x	x	x	x	x	x	x	x	x
PVC-coated conduit	OCAL-BLUE	x	x	x	x	x	x	x	x	x	x	x	x
ATX liquid-tight flexible metal conduit and fittings	T&B fittings	x	x	x	x	x	x	x	x	x	x	x	x
High temperature wire terminals	Sta-Kon	x	x	x	x	x	x	x	x	x	x	x	x
Other and various products													
Power supplies (1- 3- phase) up to 40 A	CP range	C	C		x		x	x	x		x	x	x
Interface relays	CR range, R500/600	C	C		x		x	x	x		x	x	x
Temperature monitors	CM range				x		x				x	x	x
Signal converters	CC range, ILPH	C	C		x		x				x	x	x
Current sensors	ES	C	C									x	x
Steel modular framing	Kindorf	C	C	x	x	x	x	x	x	x	x	x	x
Pilot devices - pilot lights (various types and colors)	Compact/CE, Modular/ MPE	C	C		x	x	x	x			x	x	x
Pilot devices - pushbuttons (various types and colors)	Compact, Modular ranges	C	C		x	x	x	x	x		x	x	x
Pilot devices - selector switches (various types)	C..S, M..S	C	C		x	x	x	x	x		x	x	x
Electricity meters	A-, B-, C- series	Gr		Gr							x	x	
Measuring devices													
Motors	M				x	x						x	x
Turbine controllers, PLC	S500				x		x				(x)	x	x
Drives, motor control	ACS				x	x						x	x
Service													
Replacement products	All	x	x	x	x	x	x	x	x	x	x	x	x
Spare parts and consumables	All	x	x	x	x	x	x	x	x	x	x	x	x
Service training	Circuit breakers (ACB, MCCB)												
Service training	Contactors, softstarters, arc guard												
Maintenance	Circuit breakers (ACB, MCCB)												
Repair	Circuit breakers (ACB, MCCB)												
Repair	Contactors, softstarters												
Engineering and consulting	All										x	x	x
Extension, upgrades and retrofits	All										x	x	x
Complete service offer	Switchgear											x	x
Service offer described in other documents	Various												

ABB in wind industry
Solutions

To be able to follow the Wind market changes on technologies ABB has develop specif products for Wind application increasing the perfomances, the efficency and realability and trying to keep down the cost:

Coordinated solution for main circuit in drivetrain

- Electrical coordination of contactors and circuit breakers improves system availability and reliability, and minimizes damage of components in case of short circuit.
- ABB offers complete coordination tables for contactors with ACBs and MCCBs Type 1 and Type 2 coordination according to IEC 60947.
- In the table below are a few examples of coordination available according to different ratings of a turbine.

Power	Voltage	Circuit-breaker	Contactor	Coordination
1.2 MW	690 V	T7 V	AF1250	Type 2
1.5 MW	690 V	E2	AF1650	Type 2
2.0 MW	690 V	E3	AF2050	Type 2
2.5 MW	690 V	E3	AF2650	Type 2

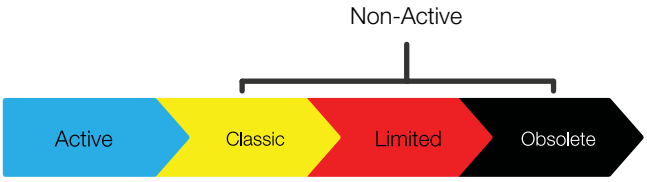
Motor control solution

- Several auxiliary systems of the turbine such as pitch, yaw or hydraulic systems use motors at 400V and 690V. Motor control and protection products are therefore widely used in wind turbines
- ABB offers different innovative alternatives for complete motor protection solutions up to 690V such as circuit breakers, short-circuit current limiters, manual motor starters, contactors,thermal overload relays but also pre-assembled starters adaptable on Smissline system for higher flexibility and reliability.

ABB in wind industry
Solutions

Grid connection
- The wind industry is increasing request of communication of information such as real-time measurements, status, alarms, warnings, trips, protection trip data (why, when, how much), maintenance data to supervision systems like SCADA and so following the IEC61850 standard for the design of electrical substation automation.
- ABB breaker solutions includes either one external converter unit (RTU560CMG10 or RTU560CIG10) with one Emax or Tmax circuit breaker or an integrated solution within the Emax2 breaker.

Earthing, lightning and overvoltage protection
- Because of their height and exposed location wind turbines are prone to direct lightning. Transient overvoltages due to the lightning current can cause severe damage to the wind turbine installation, the equipment and also create expensive downtime.
- ABB offers complete solutions to design complete lightning protection system (LPS) of wind-power including low-voltage surge protection devices (SPDs), medium and high-voltage surge arresters (SAs) and earthing and lightning protection (ELP).



Safety
- Wind turbines, as any machinery, has a high level of requirements in terms of safety and protection. Although products are installed in each sub system it is important to have a complete and coordinated turbine approach.
- ABB has a complete range of safety products for people protection and wind turbine reliability, in particular for machine safety but also products such as the Arc Guard System. ABB can also provide coordination tables for the discrimination and back-up between different circuit breaker (ACB, MCCB, MCB) to insure reliability, simplicity and cost of effectiveness.

Service
- Wind turbines function is to produce as much electricity as possible during their lifetime, which can be up to 20 years or more if regular maintenance is given.
- ABB can supply the complete low voltage service package, including: customer personnel training; spare parts & consumables; extensions, upgrades and retrofit: Increasing or restoring performances, replacement using Life Cycle Management and engineering & consulting.

Contact us

ABB
Low Voltage products division

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