

Technical note

Generators for wind turbines

ABB slip ring unit testing laboratory

The slip ring unit (SRU) is a key component in doubly-fed (DF) wind power generators. ABB's SRU testing laboratory enables simulation of the load and environmental conditions at generator installation sites, so ABB can customize its modular SRUs for the specific site where the generator will be operated. This results in improved SRU operating performance and an extended service life.

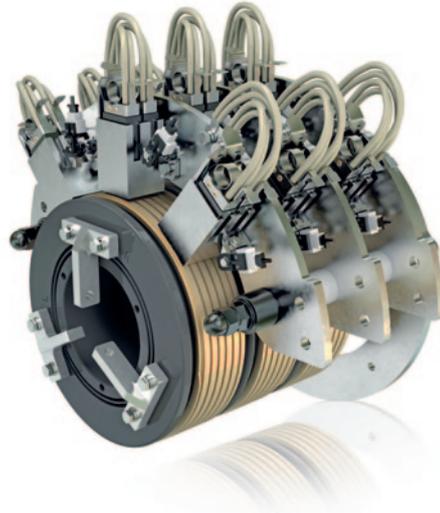
Optimizing SRUs for load conditions

In doubly-fed generators power is fed to the grid from both the stator (approx. 2/3 of P_n) and the rotor (approx. 1/3 P_n). The stator is directly grid connected while the rotor is connected through a converter. Slip rings are needed to transfer power out of the spinning rotor. The SRU consists of a hub with slip rings and current rods for each of the three phases coming out of the rotor. The brushes are fitted in brush holders, which are connected to a brush rocker, and they are pressed against the spinning slip rings and take the power from the rotor.

ABB's innovative modular slip ring design – developed in conjunction with leading SRU manufacturers – enables load optimization and effective cooling based on load conditions. An advanced brush set up provides easy brush installation and maintenance. The construction is standardized for different load cases by using the same brush size and optimizing the number of brushes for each phase. The standard option is a widely used brush grade with proven performance in most environmental conditions.

Comprehensive testing under actual site conditions

Wind turbine OEMs install their standard turbines in a wide range of different environments, from coastal areas to dry, high altitude locations. Environmental conditions at the installation site can have a significant effect on the operation and service life of the SRU. By undertaking comprehensive testing with the installation site conditions, ABB's SRU testing laboratory enables the SRU set up to be customized according to the specific load conditions.

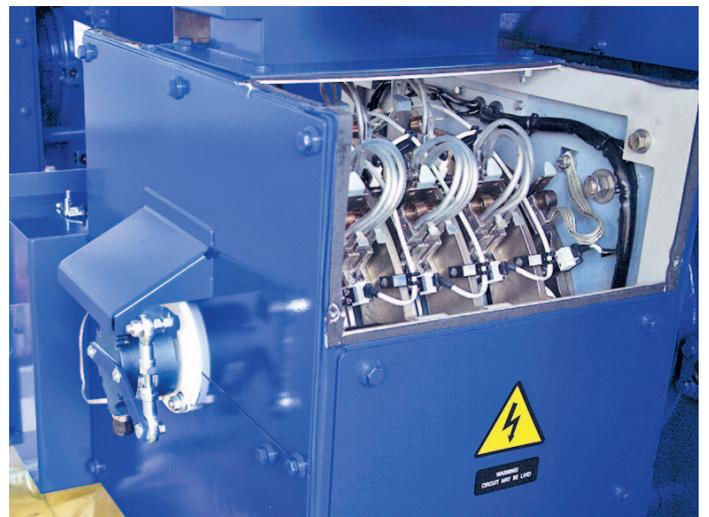


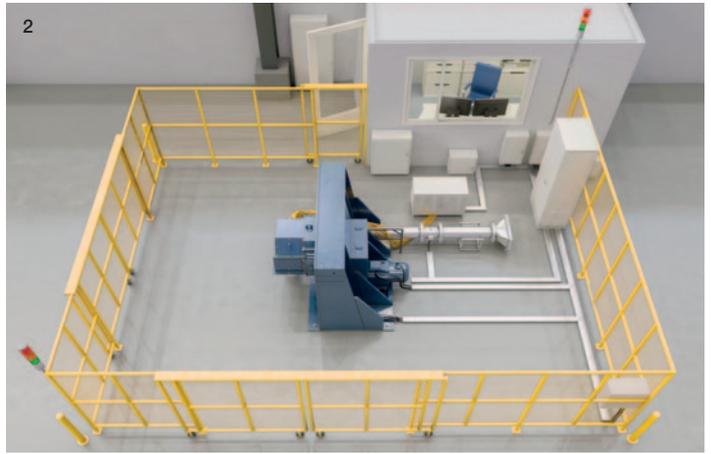
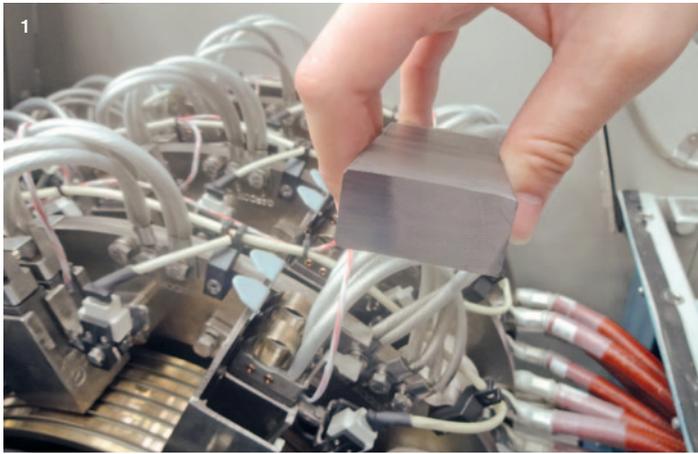
Modular SRU for easy customization

The laboratory follows the conditions of IEC standard 60068-1 7th edition on environmental testing procedures, and turbine load conditions can be emulated based on IEC 61400. Customer requirements and site conditions can also be included in the testing regimes.

Different load parameters are simulated on the basis of ABB's wide experience in generators, research data, environmental conditions and customer specifications. Two separate converters are used for the rotating and feeding system sides, so that all major turbine operation points can be tested.

Efficient cooling and easy maintenance





1 Low brush wear under installation site conditions | 2 Simulation lab set up

Realistic test conditions

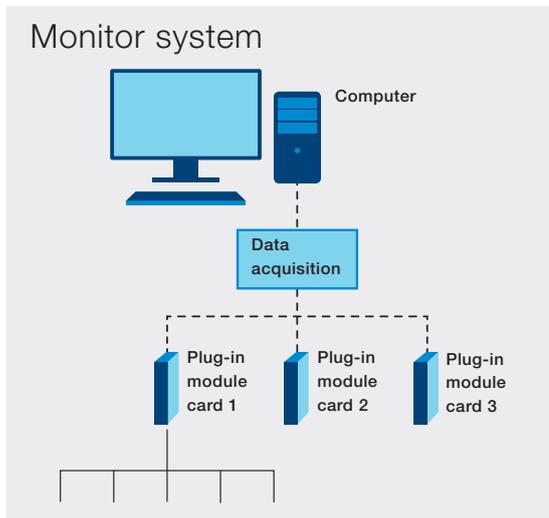
To ensure that the tests are conducted in realistic conditions, the test rig includes a real SRU housing and fans in a configuration similar to a complete generator in a wind turbine nacelle. The comprehensive test program includes a brush wear test, high voltage tests, and air flow measurement for effective dust removal. Operation in different load conditions (speed and current) as well as in extreme conditions can be verified.

The results of the testing are used to establish the rate of brush wear and determine the maintenance periods. They also allow the correct number and grade of brushes to be selected, as well as the ring material. Load optimization ensures safe operation temperatures and effective cooling.

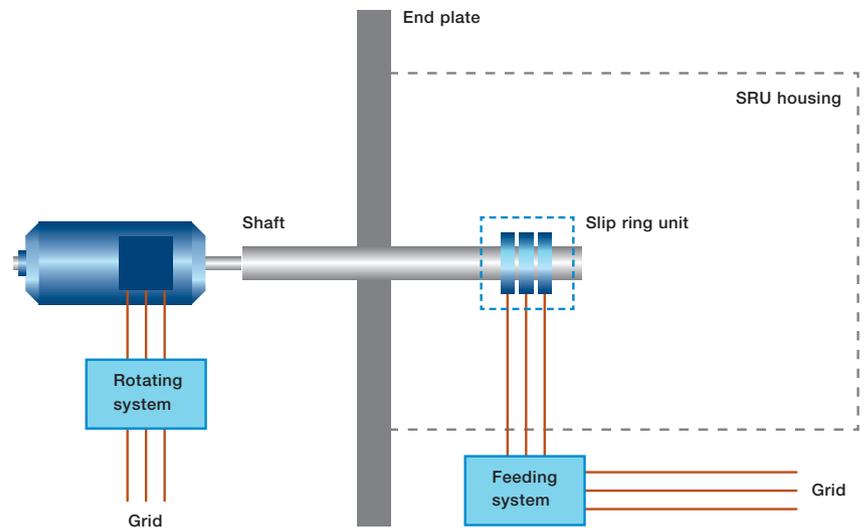
Another advantage is that using pretested components eliminates the need for design changes and avoids unnecessary turbine shut downs. Site specific optimization also minimizes maintenance and enables long service intervals, resulting in maximized availability and kWh production.

Main benefits

- SRUs can be thoroughly tested in different speed and load situations
- All major turbine operation points can be checked under different temperature conditions
- Nuisance shutdowns are eliminated
- Minimized maintenance and long service intervals
- Turbine availability and energy production are maximized



Tailored load testing system



We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB Ltd does not accept any responsibility whatsoever for potential errors or possible lack of information in this document.

For more information please visit:
www.abb.com/motors&generators

We reserve all rights in this document and in the subject matter and illustrations contained herein. Any reproduction, disclosure to third parties or utilization of its contents – in whole or in part – is forbidden without prior written consent of ABB Ltd.