

Air gap inspection service

In-situ visual inspections for motors and generators



ABB offers visual inspection services for motors and generators with the rotor in-situ. A super-slim robotic inspection crawler – ABB Air Gap Inspector – moves in the air gap between the rotor and stator, covering the entire length of the core. It provides a video feed of the stator and rotor inner surfaces, windings, wedges, stator teeth, air ducts, rotor support blocks and parts of the end windings.

Providing enhanced inspections

Visual inspections by ABB Air Gap Inspector are used for condition assessment of motors and generators. These inspections can be used to enhance preventive maintenance work, including ABB preventive maintenance level L3 and ABB Ability™ LEAP (Life Expectancy Analysis Program).

Visual inspections of the core using ABB Air Gap Inspector do not require the rotor to be removed. A major outage on a large synchronous motor or generator can last up to 20 days or more if the rotor is removed. The outage can be considerably reduced by using the ABB Air Gap Inspector to perform the inspection with the rotor in place. This can mean significant cost savings for the plant. In addition, ABB Air Gap Inspector produces more effective inspections than are possible using conventional borescope methods.

Extending ABB preventive maintenance L3

ABB's recommended maintenance program for motors and generators consists of four levels, L1-L4, with maintenance actions performed over the product lifetime.

Visual inspections by ABB Air Gap Inspector are used to extend preventive maintenance level L3.

During scheduled L3 maintenance (when the end covers are removed but the rotor is in place) the robotic crawler helps to provide a more effective visual inspection of the stator and rotor, enabling parts to be examined that are normally not accessible at this stage. The data produced can help with early detection of issues that might otherwise only be visible during L4 maintenance, and can be utilized to plan future maintenance activities and support decision-making on their time and scope.

In case it is not possible to remove the rotor during L4 maintenance (e.g. because of space or access limitations), L3 maintenance can be performed together with an in-situ robotic visual inspection. This cannot completely replace L4 maintenance, but it can provide additional information about the status of internal parts, helping in the implementation of further maintenance action.

Supporting ABB Ability™ LEAP

ABB Ability™ LEAP is designed to assess the condition of the stator winding insulation and provide an estimation for its remaining lifetime. A robotic visual inspection can be used as part of ABB Ability™ LEAP Advanced, which is carried out with the end covers removed but the rotor in place.



Using a robotic visual inspection to support ABB Ability™ LEAP Advanced results in an improved lifetime estimation. Detailed visual inspection of the inside of the stator and of the rotor helps to increase the confidence of the remaining lifetime estimation. Additionally, ABB Air Gap Inspector can localize any faults that are detected by ABB Ability™ LEAP. These faults – such as contamination, partial discharges and loose wedges – will be confirmed by the crawler, and their exact location and severity can be assessed.

Broad scope of use

The robotic crawler traverses the stator core laminations using a magnetic roller mechanism and can be used in air gaps of 10 mm and upwards. Unlike conventional inspection devices, which are restricted to turbo/hydro generators with very large air gaps, ABB Air Gap Inspector can be used on all synchronous motors and generators with an air gap of 10 mm or more.

Hardware and methodology

- The in-situ robotic visual inspection equipment comprises:
1. ABB Air Gap Inspector, robotic crawler including track modules
 2. Tether for connecting crawler to control system
 3. Control system to operate crawler
 4. Display to show live, visual inspection of air gap

The crawler is equipped with five cameras: three in front, one at the rear and one on the bottom. The camera focal length is adjustable to suit different types of motors and generators. The front-mounted, side-facing cameras can be angled to provide the best possible view of objects such as the stator teeth and air ducts.

Output from the cameras passes through the tether to the display and the high resolution video feed is recorded for future analysis.

Light is provided by LEDs mounted next to the cameras, and the intensity can be set by the user.

The crawler attaches itself to the stator using magnets fitted under the belts. The spacing of the track modules is configurable to allow the crawler to fit in a wide variety of motor and generator designs. This is accomplished with configurable linkages between the tracks and crawler body and at the hinge between the track halves.

Key features and benefits

- Visual inspection of the air gap without removal of the rotor.
- Avoiding the need to remove the rotor means significant savings in time and costs as well as reduced risk.
- Extent and quality of inspections are greatly enhanced compared to conventional methods.
- 100% uniform, high resolution coverage of the whole length of the stator core.
- All data are recorded for later, in-depth assessment and expert evaluation when necessary.
- Allows for consistent repeatability of inspections.
- Can also capture still images.

For more information, please contact your local ABB representative or visit:

new.abb.com/motors-generators/service

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