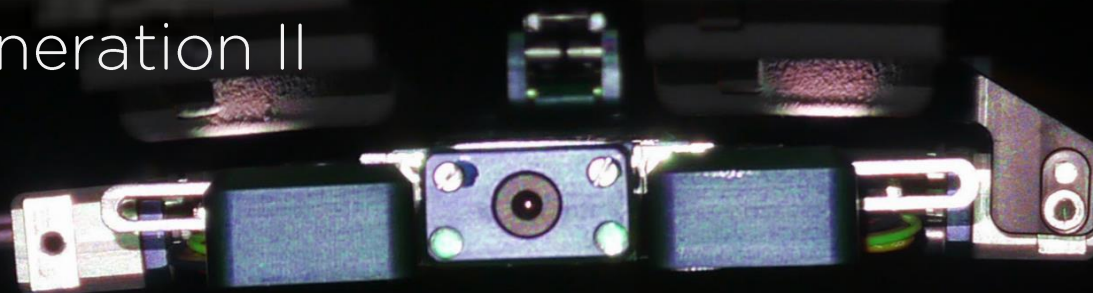


GUSTO X-RIS Generation II



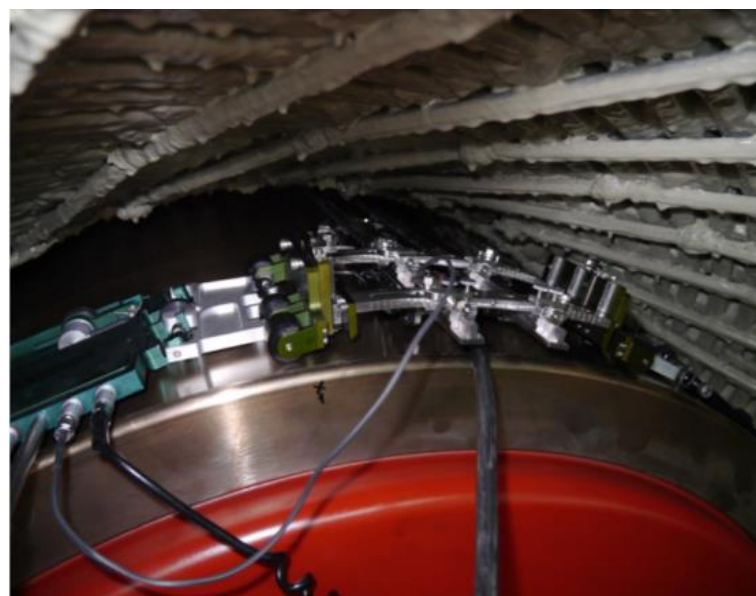
Independent in-situ generator inspections

Generators are crucial components in an industrial power plant and are designed to operate reliably for many years. The condition of the generator and its core deteriorates over time, increasing the likelihood of failures. Quantitative testing and periodic inspections of the generator core are necessary to avoid unplanned outages. Our X-GIS G2 robot enables inspections to be carried out not only when the rotor has been removed, but also with the rotor still in place, thus saving you time, effort and money.

Condition testing normally requires the rotor to be removed from the generator. Not only could this possibly damage the generator, but it is also time-consuming work that can only be performed during a major shutdown. However, thanks to our X-GIS robotic inspection, removal of the rotor can be avoided. The X-GIS system is a proven concept for in-situ mechanical inspections which can be performed on many brands of generators

How the X-RIS G2 works

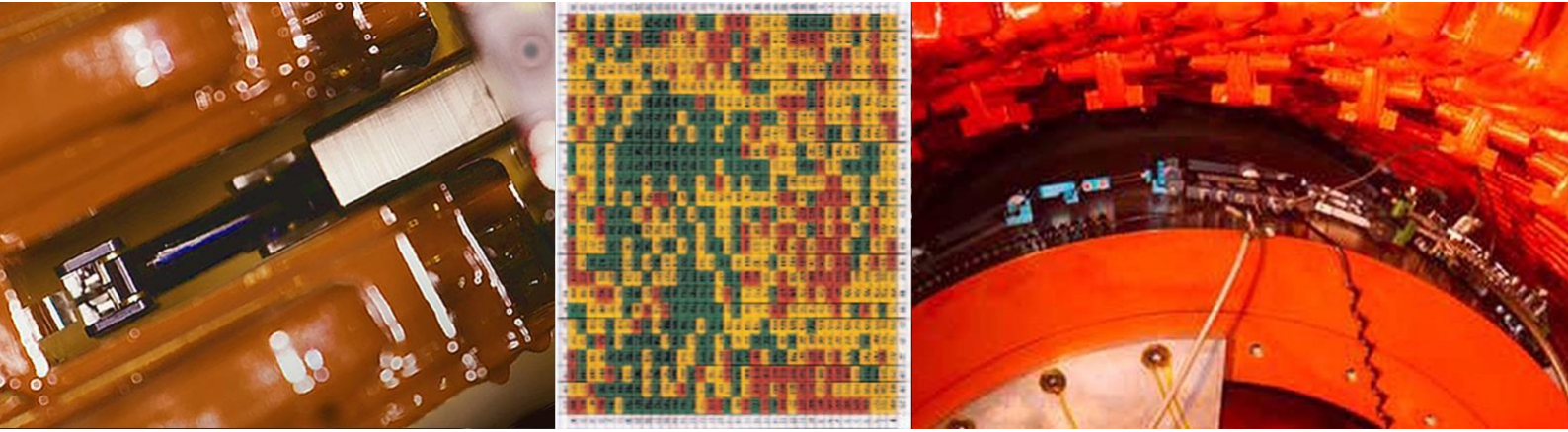
A chain containing motor drives and a docking station for the inspection robot is mounted around one of the retaining rings of the generator. The chain is positioned accurately in front of each slot so that the robot can be inserted into a gap as small as 17 mm (0,67 inch) and up. The robot then moves to the other end of the stator core and back in order to perform the ELCID, wedge test and visual inspections all in the same run to save time.



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Which tests can X-RIS G2 perform?

- > Low flux leakage test: Electromagnetic core flux leakage testing (ELCID or equivalent) is a standard feature. The step irons are measured with a separate module.
- > Wedge tightness testing: The robot is provided with a stator wedge tap tester that determines the wedge tightness based on spectral analysis of the sound response.
- > Visual testing: The robot is equipped with 4 camera modules: a forward viewing camera is used for general inspection of the stator teeth and wedges, another camera inspects the rotor body and cooling slots, and 2 further cameras inspect the stator cooling slots.

Regular testing increases reliable operation and prevents potentially costly downtime and repairs. Our inspectors can provide you with information and recommendations regarding:

- > Condition of the generator
- > Routine maintenance/overhaul
- > Long-term condition

Key Benefits of X-RIS (with in-situ rotor)

- > Less manpower is required to prepare the generator for inspection (0.5 - 3 shifts instead of up to several weeks)
- > Reduction of outage costs up to USD 330.000
- > Reduction of lost productivity due to outage time (which can amount to millions of dollars)
- > Fewer risks of damage to the generator
- > A generator inspection can stay out of the critical path of an outage
- > High reproducibility
- > All data is stored for future comparison and data trending
- > Low flux leakage testing with excitation through rotor forging reduces dismantling of the generator
- > Better anticipation and planning possible for next major outage (plan repair work or postpone)
- > X-RIS can be combined with in-situ retaining ring testing (X-ICAP)

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Why GUSTO X-RIS G2?

Why most generator inspection systems are visual and many can carry out ELCID tests, the X-RIS G2 is one of the few turbogenerator inspection systems that is also able to do wedge tapping for performing wedge tightness tests.

If you choose to use X-RIS, you can also take advantage in combining it with an X-CAPS end cap inspection system.

The X-RIS G2 was developed in collaboration with the same leading robotics company that developed the Brush ROGIS system.

Gusto is an Independent Brush Specialist and our tests are 100% independent so you can make unbiased decisions.

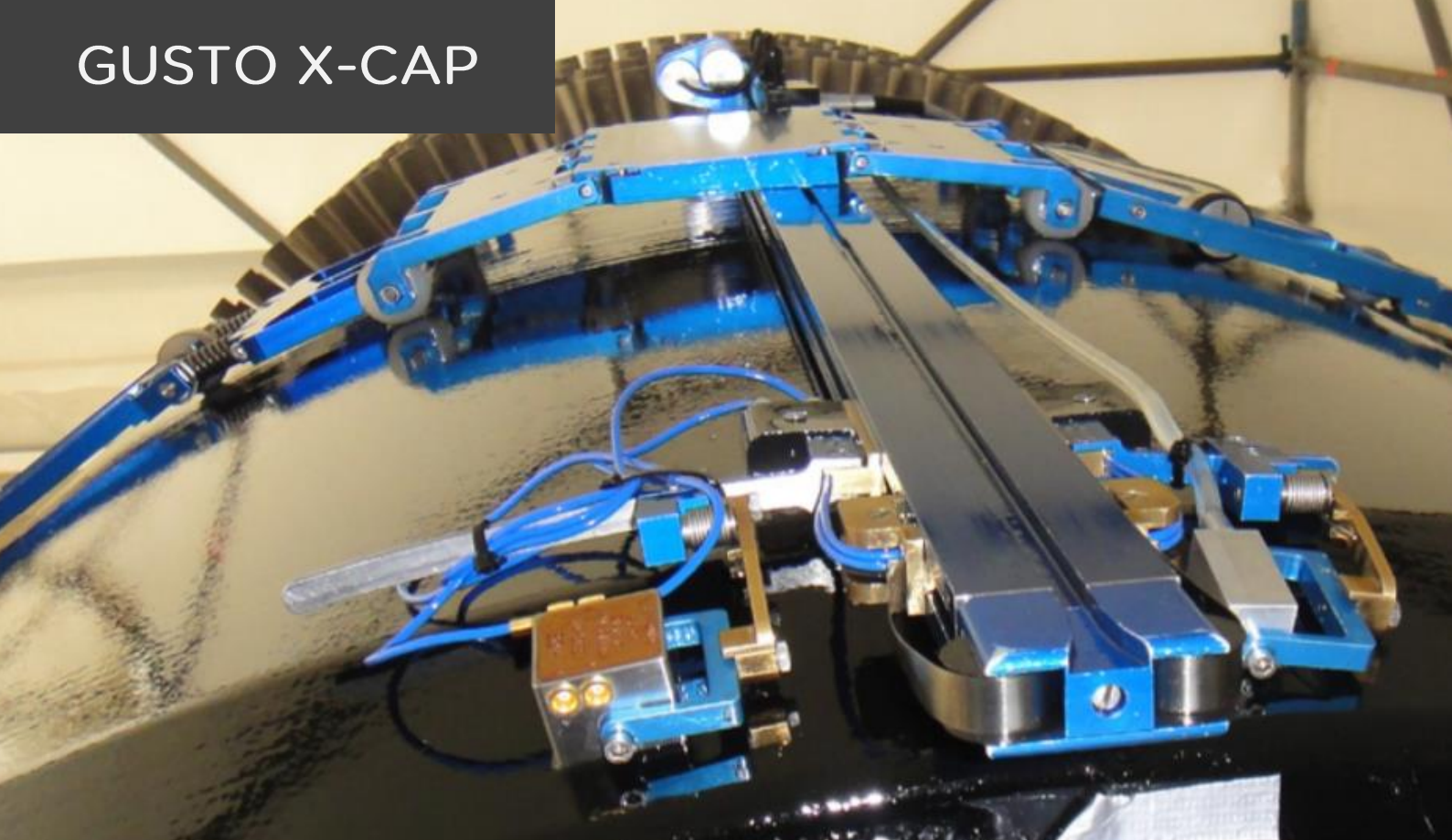
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X-CAP | In situ End Caps Inspection System

Among the critical components of the Generator are the end caps (retaining rings) at each end of the rotor. These are susceptible to damage as a result of specific chemical influences and mechanical or electrical forces. However, replacing the end caps involves substantial costs. Our X-CAP system represents a cheaper yet equally effective alternative.

End caps have a long lifespan and often last for the entire life of the generator. However, the smallest of cracks in the retaining ring poses a risk to safety and could result in extremely costly damage. To avoid such risks, many manufacturers recommend that the retaining rings are inspected periodically. X-CAP offers a cost-effective alternative. The system detects and analyses flaw indications in the retaining rings, enabling you to determine whether the retaining ring needs to be monitored or replaced.

One crucial advantage is that it is no longer necessary to disassemble the rotor and the end caps for inspection purposes, saving time, effort and money with non-destructive testing.

The X-CAP system is adjustable to fit virtually all generators, and if required, the inspection can be performed within 24 hours on site.

Ultrasonic crack detection is focused on the shrink-fit areas and wall thickness steps. Damage, such as stress corrosion cracking and top tooth cracking, is detected. In addition, eddy current scanning is added to accurately map the outer surface. The ring's coating is left in place. If cracks are discovered, ring geometry and flaw data are used in a computer model to calculate the residual lifespan. Furthermore, we establish the inspection interval for monitoring purposes.

X-CAP | In situ End Caps Inspection System

Specifications

- > For generators with a ring diameter of 600mm and upwards.
- > Minimum gap between retaining ring and stator: 8mm
- > Technique: UT-TOFD, UT-TRL and ET scanning
- > Surface: 360° circle and 1-10mm pitch
- > Defect heights of 0,5 mm and upwards are detected
- > Typical test duration for two rings in-situ: 24 hours

Key Benefits

- > Major savings, since end caps will not always have to be replaced
- > Awareness of the condition of the retaining rings; possibilities to identify trends
- > Savings through avoiding disassembly of rotor and end caps
- > Quick testing process which minimizes downtime
- > Rapid deployment
- > X-CAPS can be combined with X-RIS (robotic inspection of the generator)
- > Independent testing

If you would like to know more or need a personalised quotation please contact us.

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