



Rotor Flux Probes

for Online Rotor Winding Condition Monitoring

As the energy environment becomes increasingly competitive and unpredictable, the efficiency of your generating equipment is placed under ever greater scrutiny.



The importance of monitoring rotor-shortened turns

Your ability to identify, understand, and manage rotor-shortened turns is essential to continued reliable generator operation. That's because these shorts reduce the efficiency of your generator and can result in increased excitation and cooling requirements, load limitation, and thermal or magnetic imbalance—issues that can further damage your plant and your bottom line. Fortunately, GE designs, manufactures and installs a range of air gap search coils—suitable for most generator types—that support online rotor winding condition monitoring and analysis.

Shorted turns are the result of failed insulation between individual windings in a generator's rotor. The main causes of inter-turn faults are attributed to cyclic fatigue during operation, contamination, or damage during manufacture or assembly.

As the intervals between visual inspection opportunities continue to lengthen, the ability to perform condition assessment under generating conditions becomes even more important to your continued successful operation. Slot leakage flux measurement is the only available method to detect, localize, and quantify rotor inter-turn short circuits while the rotor is excited.

GE's array of air gap-mounted flux probes provide the accurate data you need to enable reliable assessment of your rotor circuit. Measurements can be performed periodically or, with the addition of a GHM package, monitoring can take place in real time.

Customer benefits

- **Enhanced monitoring capability** through accurate rotor condition data provided during continued operation
- **Lower costs and less complexity** due to improved outage scheduling and planning
- **Reduced downtime** through enhanced fault detection accuracy
- **Enhanced reliability, availability** and flexibility due to better informed operational decisions
- **Excellent flexibility** through a wide range of probe design types and significant probe installation experience on all types of generators

The slot leakage flux measurement principle

Rotor flux probes contain two fine-wire sensing coils (aligned in the radial and tangential planes) that are positioned in the air gap between the rotor and stator. As the magnetic field surrounding the rotor rotates, the variations in flux density induce a voltage in the sensing coil that is proportional to the ampere-turns in the adjacent rotor winding coil.

By analyzing this measured voltage waveform, it is possible to calculate the number and location of any rotor inter-turn short circuits.

Rod-type probes

Designed for use in both air- and hydrogen-cooled generators with radially vented core arrangements, GE's rod-type probes incorporate a miniaturized sensing head that reduces the diameter of the probe tip and enables installation through the back of the stator core along a ventilation slot. The probe tip is adjusted to protrude a set distance into the air gap to achieve the required proximity to the rotor surface for accurate rotor flux measurement.

Rod-type probes can be installed permanently without removing the rotor and with minimal modification to the stator frame. Additionally, our installation method allows for easy extraction of the search probe when threading or unthreading the rotor, and if the probe tip suffers accidental damage a replacement can be fitted easily.

Because the signal cables from our rod-type probes exit from the core back, the stator wedges do not need to be removed or modified—translating to reduced installation costs and ensuring that the bar restraint remains unaffected.



Universal probe

GE's universal rod-type flux probe and key bar mounting bracket are suitable for use on a wide range of GE and other OEM generators. The universal probe's modular arrangement allows it to be installed in most units with little or no modification required. This "off-the-shelf" solution enables a short delivery lead time to allow installation during an unplanned outage, even on machines originally manufactured by other OEMs.

The universal probe helps reduce downtime and avoids the additional cost of a bespoke design solution.

Wedge-type probes

Our wedge-type probes offer the only practical monitoring method for stators with axially vented cores and certain configurations of slot wedge or vent spacer. These probes fit into the generator bore, replacing one of the stator bar wedges. This design allows for the use of a large sensing element that delivers high sensitivity for reliable and accurate measurements.

Developed to provide the highest level of machine integrity possible, GE's wedge-mounted probes differ from those available from other manufacturers in three key ways:

- The sensing element is integral to a specially manufactured slot wedge, removing the inherent risk involved in modifying—and potentially weakening—an existing wedge.
- The sensing coils can be raised and lowered to position the coil close to the rotor surface when in operation, but can be retracted to allow safe insertion and removal of the rotor.

- Where practical, the cable is shrouded by adjacent wedges—not glued to the surface—to help make sure foreign material does not become loose within the air gap.

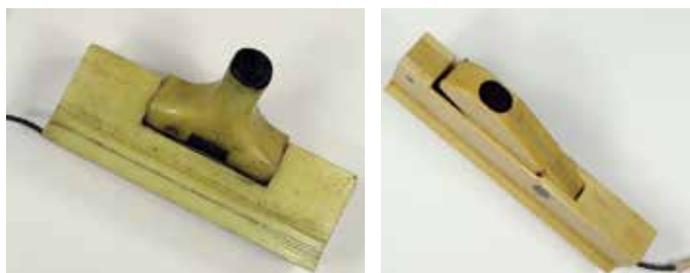
Depending on your machine type, choose one of the following wedge-mounted probe designs:

- Flip-up Style Probe: This design is suited for machines with a large air-gap clearance. The probe is supplied with an insertion tool to allow the coil to be retracted for rotor removal.
- Pop-up Style Probe: Similar to the flip-up probe in its installation and operation, this probe is intended for generators with restricted air-gap clearance. To allow rotor removal, the sensing coils are mounted in a sprung carrier that retracts under pressure and then returns to its pre-set position.

All wedge profiles are carefully toleranced and machined from high quality epoxy laminate insulation material to match those of the original design, helping to ensure minimal bar restraint change.

Proven solutions

GE offers a range of availability and performance boosting solutions, covering all cooling technologies, all generator sizes, and all OEMs. Local presence, global expertise and a strong heritage are the basis of our universal portfolio of generator service solutions.



To find out more about GHM Rotor Flux Probes, please contact your local GE representative or visit gepower.com.

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