



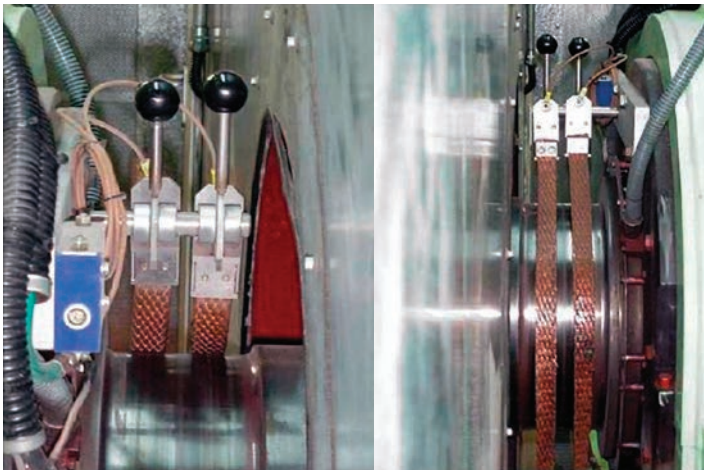
Rotor Shaft Grounding System Copper Braids

Driving-End (DE) Module

The shaft grounding system is installed to protect against the damaging influences of induced voltages, electrical charging, high frequency voltage peaks from the excitation system, and capacitively transmitted voltage from the rotor winding. To reduce electrical erosion damage to the shaft journals, bearings and seals, a reliable rotor shaft-grounding system should be in place. GE offers an improved system that uses flexible copper braids instead of carbon brushes. These grounding braids are highly wear-resistant and require less maintenance than traditional carbon brushes.

Grounding the generator rotor

Shaft voltages in electrical machines are a natural phenomenon and cannot be avoided. The turning rotor in a generator builds up a voltage between the shaft and ground that is caused by static charges, magnetic induction, and capacitive coupling to the excitation system.



The combination of high shaft voltages and insufficient bearing and seal ring insulation may cause high shaft currents. However, with appropriate grounding protection for the rotor train, the risk of forced outages can be reduced significantly.

The conventional method of grounding the generator rotor relies on carbon brushes running on the rotor shaft. In difficult environments, the functioning of this conventional shaft grounding system is reduced or even neutralized by dust and abrasion.

Frequent maintenance is required to ensure protection against high shaft voltages (voltage peaks) that lead to currents and cause electrical erosion damage (pitting) to shaft journals, bearings, and seals. Melting of the bearing shells is a possible worst-case scenario on a running unit. Furthermore, because the grounding brushes also are the coupling point of rotor earth fault protection, reduced grounding functionality can cause false earth fault alarms or trips.

Copper braids for improved reliability

GE improves reliability and maintainability with our driving-end (DE) module for shaft grounding at the driving-end of the shaft. To help ensure reliable contact with the moving rotor surface, copper braid contacts are used instead of the carbon brush contacts. These copper braids demonstrate— especially in a difficult environment— much better grounding behavior and are more resistant to wear in service, requiring less maintenance.

Generally, the formation of low- resistance loops that conduct current is efficiently prevented on large electrical machines by attaching a shaft grounding contact only to the driving end and by insulating all other parts of the shaft (bearings, seals) on the non-driving end. The grounding braids will be connected to ground via a DE module that incorporates protection elements to limit high shaft voltages and to reduce currents in case of low-impedance loops.

The DE module improves generator reliability by preventing bearing and sealing damage through arcing/pitting, as well as significantly reducing the risk of false earth fault alarms and trips.

Customer benefits

- Grounding braid exchange is possible during operation.
- Braids are more resistant to wear and require less maintenance.
- Reliability and maintainability are improved.
- Risk of false earth fault alarms or trips is reduced.
- The driving-end (DE) module lowers the risk of damage caused by shaft voltage and current.



Copper braids



Driving-end module

DE module advantages

Proven shaft grounding braids deliver superior contact quality. The DE module is designed to reduce the risk of damage caused by high currents, high voltages, or high frequency pulses.

- During normal operation, grounding braids remove electro-static charges and the correspondingly low current flows through the module.
- In case of a second connection to ground along the shaft at the DE side, high currents are prevented by the low-resistance circuit within the module.
- The module also contains voltage-limiting, protective and high frequency absorbing elements. It acts as a sensor for the rotor monitoring device.

Product installation

A prerequisite for the installation of the shaft grounding braids is sufficient space on the generator driving-end side.

Before installation, an analysis of the induced shaft voltage also is recommended to exclude other problems and to simplify the fine-tuning of the rotor earth fault detection

Application

All types of generators, independent if they operate in industrial plants or power utilities, OEM and other OEMs.

References

Since the mid-1990s, DE shaft grounding braids have been installed on all the legacy Alstom new generators.

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 Shaft Grounding Copper Braids, please contact your local GE representative or visit gepower.com.

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