Eaton grounding solutions
Electrical Engineering Services & Systems

Increase reliability and reduce machine degradation from medium-voltage ground faults.

Medium-voltage (MV) equipment within utility and industrial facilities is vulnerable to the damaging effects of high ground fault currents both internal to generators and external on the distribution system. Eaton's range of grounding solutions increases safety, reliability and process continuity by safeguarding equipment such as generators, transformers and switchgear against these harmful ground fault currents especially arcing ground faults.

Approximately 80 to 85 percent of all electrical faults can be attributed to single-line-to-ground (SLG) faults, proper grounding is essential to protect MV generators and other devices that are not engineered to withstand the full fault current of these events. During arcing ground faults, the associated transient overvolatages and voltage escalation can impose voltages several times rated, reducing system and equipment insulation life, resulting in immediate failure or failure over time. SLG faults can also cause winding faults resulting in motor and generator failure, transformer failure, coil failure, electronic equipment failure and cable insulation failure.

Fundamental to ensuring coordinated ground fault protection and eliminating nuisance trips, an effective grounding solution not only protects against equipment damage, but will help to establish and maintain proper voltage references, eliminate transients and promote an overall balanced system.

Powering Business Worldwide

Custom engineering services for grounding solutions

System evaluation — Includes a review of system design; overall plant configuration and nameplate data; field verification of existing conditions; ground fault protection system evaluation and ground fault coordination.

System studies and sizing — Features a comprehensive ground fault protection study to determine the optimal grounding solution, as well as analysis of the system incorporating IEEE standards and industry requirements.

Equipment specification — Includes a custom-designed grounding solution that meets the application needs from a physical and electrical standpoint. Incorporates conductor sizing, calculations and settings development, findings from ground fault protection and recommendation of appropriately designed, configured and located grounding transformers and grounding resistors.

Custom installation and testing — Includes the removal of existing grounding systems and upgrade to the modern solution, incorporating site safety, project and construction management and component- and system-level testing to ensure proper integration, all completed in accordance with customer and published standards, and Eaton best practices from numerous successful grounding installations.

Eaton MV grounding solutions alternatives

While there are several different methods to ensure proper grounding, each provides unique advantages. When selecting a grounding scheme, it is important to balance cost and reliability, while taking into account the impacts on system performance, personnel safety and equipment protection.

	LRG	HRG	HHRG
	Low-resistance grounding (LRG) Contributes a calculated required amount of fault current on MV systems reducing equipment damage.	**High-resistance grounding (HRG)** Provides minimal ground fault current and limits over-voltages during arcing ground faults, preventing machine insulation degradation on low- or medium-voltage systems.	**Hybrid high-resistance grounding (HHRG)** Rapidly switch to high-resistance ground during MV generator internal ground faults minimizing generator winding damage.
Intended application	Systems with multiple sources of ground fault current; i.e. utility tie transformers and local generators	Continuous process loads or stations with one or more generators	Generators with LRG connected to an LRG system with one or more sources of ground fault current especially aging generators
Purpose	Limit ground fault current; reducing damage yet allow relay pickup and trip	Limit ground fault current to minimum level; permits system/process to operate with ground fault	Protects generator from excessive internal ground fault current often enabling field repair
Advantage	Ground fault protection and selectivity on systems with multiple levels of ground fault protection	Allows continuous process to operate with system ground fault until operators shut down in orderly manner	Generator damage with HRG significantly less than with LRG often enabling lower cost field repair
Ground fault protection, coordination and selectivity (multiple levels)	Yes	No, protection and detection only	Yes
Fault segregation	Yes	Yes, using pulsing circuit and detection sensor	Yes
Ground fault current level	200 - 1200A	5 - 10A	LRG 200 – 400A HRG 5 – 10A
Transient overvoltage during an arcing ground fault	No Concern	No concern when HRG current equal to system capacitance charging current	No concern when HRG current equal to generator capacitance charging current
Plant interruptions	Yes but localized	No	N/A

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