



## Bus Protection for Impedance Grounded Systems

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There is a strong drive in the industry to focus on arc flash hazards as defined in the NFPA 70E Standard for Electrical Safety in the Workplace. In industrial settings, this has led to two trends. One trend is to install high-speed bus protection to reduce the incident energy of an arc flash through faster fault clearing. The second is to limit the current from a phase-to-ground fault by adding an impedance ground to the system. The limited ground fault current on an impedance grounded system can be a challenge for the sensitivity of bus protection.

This paper reviews the options for bus protection, including high-impedance differential, low-impedance differential, overcurrent (unrestrained) differential, and zone sequence interlocking. However, the focus of this paper will be on reliability of bus protection for bus ground faults. Specifically, the paper will discuss issues regarding sensitivity to detect the limited ground fault current, and security against false tripping. The suitability of each type of bus protection will be discussed including the installation requirements, settings and sensitivity of settings, and the security of protection for various fault events and system operating conditions. The paper will also briefly cover CT connections (specifically residual connections vs. zero-sequence CTs) and CT performance issues.

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