ALLIS ENGINEERING

25096 Jefferson Ave., Suite C, Murrieta CA 92562
951-894-1700 Fax: 951-894-5700
888-64-ALLIS

Why test and certify Main Breaker Ground Fault Systems?

The National Electric Code (NEC) requires testing on all new installation and recommends testing on a three (3) year basis (Section 230-95© and 517-17©).

About 15% of ground fault protection systems tested by NETA (International Electrical Testing Association) and its members are improperly installed, contain defective components, or do not operate correctly.

Why Have Ground Fault Protection? The reasoning…

A low level arcing ground fault can destroy switchgear in fractions of a second, before the main service over-current protection will operate. The NEC and insurance companies believe that GFI testing should be done at a minimum of every three years.

A 480/277V solidly grounded system has sufficient voltage to maintain an arc between one phase and a ground but not enough current to cause a large main breaker or fuse to clear the fault quickly. The resulting arc is similar to an electric weld, consuming large amounts of metal in the fractions of a second it takes the breaker fuse to operate.

A properly installed and operating ground fault protection system will detect and clear the fault in milliseconds, fast enough to limit damage to acceptable levels.

Ground fault protection is required by the National Electrical Code and is usually installed only on larger circuits and services of 480/277V 1000 amps and larger, but is increasingly found on smaller breakers as well.

According to NETA, and others, a grounding system cannot be certified unless ALL sub-breakers on branch circuits of the same feed which are GFI equipped have also been properly tested and certified. Testing of GFI equipped large breakers is the only opportunity for a facility to find out if a breaker is fully operational and to exercise these.

How Do They Work?

The several different types of systems all operate under the current balance principle: Monitor that the current going out any one phase is coming back on another phase or neutral. If some current is going out on a phase but is not coming back on the ground path (conduit, piping, earth, building steel, etc.) a ground fault has occurred.

All systems have: current transformer(s) [CT's] to detect ground fault current, a relay or logic box to determine tripping current value and time, and an operating mechanism to trip the breaker or switch. Some systems have a test panel for simulating a ground fault signal to trip test the breaker and monitor panels indicating system status, but these are not true tests of the ground fault interruption functionality.

Which Tests Should Be Performed?

- Field acceptance testing is recommended by the National Electrical Code.
- Inspect neutral main bonding connection.
- Verify proper installation of sensor(s) and grounding connections.
- Inject current through current sensor and verify pickup and timing characteristics of relay(s).
- Test operation with control voltage supply reduced to 277 instead of 480 volts.
  (One phase could be at 0 volts during a ground fault)
- Check operation of special features like zone interlocks, etc.

What Problems Are Found?

- Neutral grounded downstream or neutral bonded to ground in wrong location. Causes false or inadequate tripping.
- Incorrect current sensor installation and wrong polarity. Causes false tripping.
- Inadequate control power or connections. Causes lack of trip of the protective device.
- Failure to trip within the manufacturers' tolerances. Causes inadequate protection.

Why Not Just Use Test Pushbutton?

Does **not** comply with the **N**ational **E**lectrical **C**ode requirements. Does not detect many of the problems listed above (incorrect neutrals, current sensor polarity, etc.) and does **not** comply with most manufacturers' instructions, UL and NEMA recommendations.

What is the Cost of Ground Fault Protection Testing?

Minimal compared to the damage to property and lives a poor ground protection unit and/or a poorly grounded electrical system can cause. It also helps keep insurance premiums in check.

Ask for a proposal

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