Galvanic Isolator Safety and Liability Considerations

Galvanic isolators are installed on boats to prevent galvanic corrosion when the boat is connected to a shore power source; however, that is not their only important function. The fact that a galvanic isolator is installed in series with the safety grounding conductor of the shore power cable makes this product a critical link in safety grounding of the boat. If an electrical fault on the boat occurred and this safety grounding path was interrupted, personnel on or in the vacinity of the boat could be subject to serious electrical shock or potential electrocution. A number of electric shock drownings have been reported due to loss of grounding conductor continuity and some other marina drownings are highly suspected to also have been due to this cause.[1]

Background Information

Galvanic isolators, and products that perform the same functions for land-based applications have an extensive usage history. Land based products called decouplers are commonly used in the general corrosion protection industry, where it is necessary to prevent the flow of dc current while providing ac continuity, the same function performed by galvanic isolators. All such decouplers, when used in the grounding path of electrical equipment, must meet specific requirements of the U.S National Electrical Code (NFPA 70); namely Article 250.2, which defines an “effective ground fault current path,” and Article 250.4(A)(5) which defines the requirements of an effective ground fault current path. While the key requirement is that the grounding conductor can never be compromised, there are two key criteria that emphasize this:

• The grounding conductor continuity must be permanent so safety grounding is always provided

• The grounding conductor must be low impedance so circuit protective devices function properly.

In the U.S., the electrical standards for most boats/yachts do not come under the U.S. National Electrical Code (NEC), but rather under the American Boat and Yacht Council (ABYC) standard A-28. In the most recent revision of A-28 (published in 2008), ABYC made provisions similar to National Electric Code requirements, establishing a fail-safe criterion that reflects the safety considerations taken into account by the National Electric Code. Products that meet or exceed the fail-safe criteria are not required to be monitored by A-28, as the primary safety concern has been eliminated.

DEI Galvanic Isolators

DEI only manufactures fail-safe galvanic isolators that have been tested for compliance to all NEC requirements, to the Canadian Standards Association (CSA) 10-500 requirements (similar to the NEC requirements), to the European Union requirements, and to current ABYC A-28 requirements. “Fail- safe” means that an open circuit failure is not allowed even when the galvanic isolator is subject to a current and time duration that will raise the conductor to its melt temperature. DEI Marine manufactures galvanic isolators termed "Fail-Safe Plus" which meet and exceed all A-28 requirements as well as Fail-Safe MAX marked products, which exceed fault current requirements even further, to a point at which the grounding conductor would melt before the Fail-Safe MAX device's ratings would be exceeded.

With independent (third-party) testing to these higher level safety criteria, the DEI galvanic isolators offer greater safety and liability protection for boat builders, electrical installers, operators and owners.

On Monitoring Systems

When A-28 was initially written, it did not adopt the previously established criteria for an effective grounding path outlined in the NEC. As a result, early galvanic isolators in the industry were not required to "fail-safe". To compensate for this hazardous situation, A-28 added a requirement for a monitoring system, to provide an alarm if the galvanic isolator failed open-circuit. While most manufacturers have adopted fail-safe designs, monitored systems are still available.

DEI believes that this is a poor substitute for a galvanic isolator that meets failsafe requirements and offers assured safety grounding. The very event that would cause a galvanic isolator to fail open may well be the event that creates the potentially hazardous condition when grounding is lost, and which may also damage the monitor that is to provide the alarm. Even when the monitor alarm works properly, a potential hazard exists until the alarm is noted and the problem corrected.

The most reliable galvanic isolator design is one that does not allow the safety hazard to exist.

Liability Implications of Monitored Systems

As a galvanic isolator manufacturer, we do not believe that a lawsuit resulting from an electric shock or electrocution that was the result of a galvanic isolator failing open circuit, even if it meets the current A-28 requirements by having a monitoring system, would be defensible given the availability of fail-safe products that eliminate this risk.

References:

1. James D. Shafer and David E. Rifkin, Electric Shock Drowning Incidents – Marinas, paper, February, 2006.