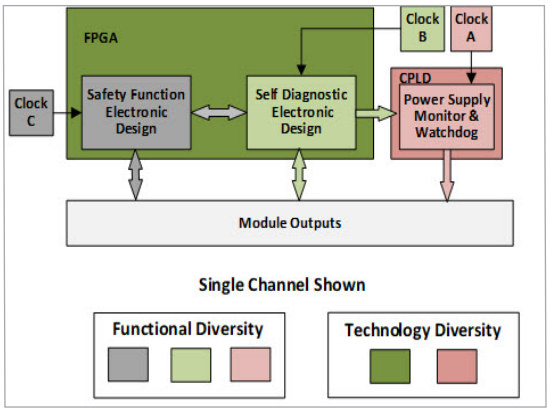
Diversity (Digital Safety System)

Fully Qualified Safety-Related Digital Platform



Curtiss-Wright is proud to present the RadICS Digital Instrumentation and Control (DI&C) Platform. Approved by the U.S. Nuclear Regulatory Commission (NRC) in 2019, the RadICS Platform is robust, flexible, and scalable. It provides state-of-the-art functions, services, and safeguards for both safety and non-safety applications in the nuclear industry. The RadICS Platform consists of a Logic Module, basic input/output modules, and specialty modules all housed in a seismically qualified chassis.

The RadICS Platform design incorporates unique technological and functional diversity attributes based on internal features of the RadICS Modules. This strategy flows directly from the design strategy used to achieve IEC 61508:2010 SIL 3 certification, which incorporates extensive and robust self-monitoring features to achieve the SIL 3 rating in a single channel configuration. Third party auditing of the SIL processes and procedures ensures continuous application of the certifying criteria. Exhaustive manufacturing verification and fault insertion testing confirms that the individual system modules are set to the safe state when critical failures are detected.

The RadICS Platform design was evaluated using the methodology described in the NRC document NUREG/CR-7007, "Diversity Strategies for Nuclear Power Plant Instrumentation and Control Systems." The evaluation credits important functional and technology diverse features that demonstrates the internal diversity of the RadICS Platform and allows for implementation without the use of a Diverse Actuation System (DAS).

The RadICS Platform employs several internal-diversity features to provide sufficient protection to address common cause failure (CCF) vulnerabilities that might be introduced by the Field Programmable Gate Array (FPGA) technology:

- Functionally Independent and Diverse Self-Testing and Diagnostics: Provides physically separate FPGA logic circuits for self-monitoring features that are independent and functionally diverse from the FPGA logic circuits executing control functions. The self-monitoring features put the Modules in the safe state when critical failures are detected.
- Functionally Independent and Diverse Power Supply and Watchdog (PSWD) Monitoring: Provides a functionally diverse method of monitoring the FPGA logic and power supplies. The PSWD Unit provides an independent method of placing a RadICS Module in a safe state when critical failures are detected.
- Separate Clocks for Diverse Functional Domains: Physically separate clocks are used for safety functions, self-testing, and PSWD monitoring to ensure different timing or order of execution based on the parallel processing of the FPGA and Complex Programmable Logic Device (CPLD) circuits.
- Diverse Chip Technologies: The CPLD-based PSWD Unit is separate and phyiscally and technically diverse from the FPGA components.

The RadICS Platform diversity strategy is a markedly stronger diversity case than other platforms previously accepted by the NRC. The internal diversity accreditation significantly reduces diversity and defense-in-depth (D3) analysis requirements thus removing the central barrier to digital system licensing. The RadICS Platform diversity approach provides other benefits by simplifying the overall I&C systems designs, since a separate DAS is not required to mitigate digital CCF vulnerabilities.

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A process for evaluating potential loss of function due to CCF that could result from the use of digital technology