

## Analog Safety Control

### Relay-based Safety Control for Emergency Diesel Generators (EDG)

Framatome's relay-based analog safety control represents a pre-qualified stand alone system built from discrete hardwired components

#### Challenge

EDG safety controls are periodically modernized. Customers request one-to-one modernization by means of analog technology for most of older plants. Furthermore, new safety requirements from revised standards may also result in functional redesigns of older systems.

Also, for new EDG sets the implications from the qualification concerns of digital controls demand a simple and robust alternative control.

#### Solution

The discrete analog EDG safety control incorporates long-term experience of Framatome with an ideal system set-up for nuclear power plants. It considers different infrastructures by modular interfaces and various configurations. As a possible diversification to digital systems, it is based on analog relay technology with a long tradition and proof of suitability of the individual components. Maintenance is supported by the interchangeability of the discrete devices with a high degree of availability as well as a recognition effect resulting from standardized arrangements.

The design follows a modular concept with standardized interfaces, allowing easy system configuration, integration and commissioning. Framatome's selected parts pool guarantees a broad spectrum of qualified components.

The comprehensive design of discrete analog EDG safety control modules allows worldwide application, and a reliable and cost-efficient project execution



Example of a relay-based analog EDG safety control cubicle

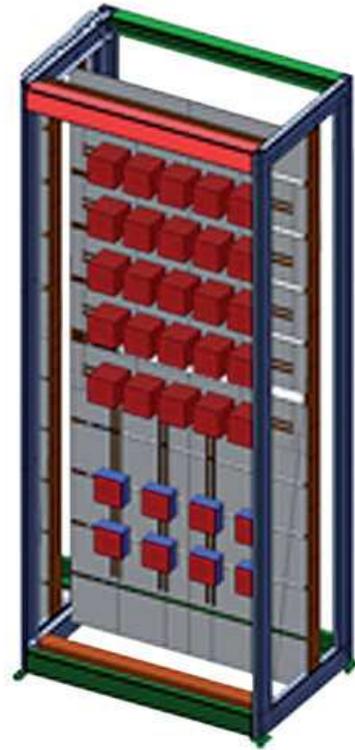
#### Customer benefits

- Easy system integration and commissioning
- Accelerated authority approval
- Analog solution for easy qualification approval
- Modular extension
- Broad spectrum of qualified parts from the selected parts pool

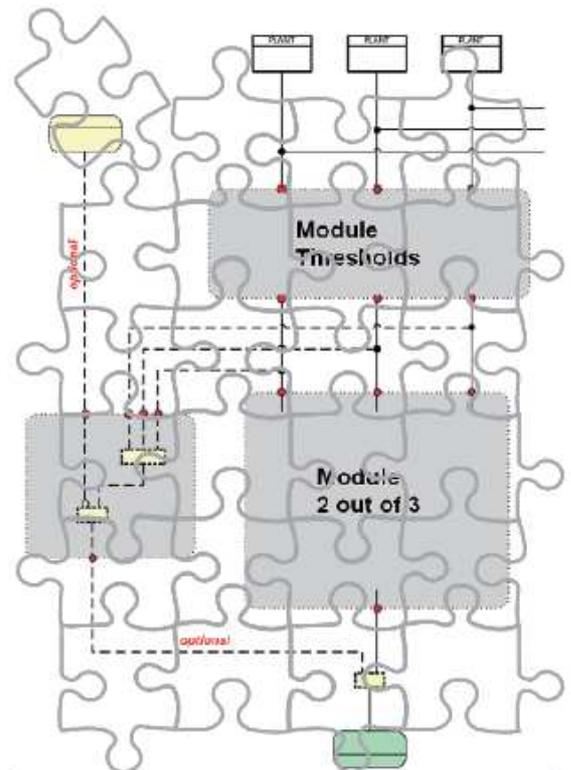
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## Technical information

- Discrete devices in hardwired technology for standalone or diversification
- Global requirements for worldwide application
- Easy application with different engine types
- Covers all required safety functions of EDG systems
- Separation of safety classes 1E and N1E with integrated priority voting feature
- Local and remote control options
- Analog and binary inputs/outputs
- Standardized limit transducers and signal validations
- Qualified and fit-for-function selected discrete devices for various control functions
- Prolonged qualified lifetime of 20 years (IEEE/RCC-E/KTA)
- Operating conditions: 273-333 K, 95 % rel. humidity
- Standard seismic proven cubicle:  
IP54 900 x 600 x 2200 mm (w x d x h)



Finite element model for seismic calculations



Modular concept: standard interfaces and comprehensive safety functions allow easy system integration and commissioning

## References

Framatome is a specialist for digital and analog I&C technology in nuclear power plants. Vast experience with reactor protection systems from the last 35 years is also tapped to build reliable EDG safety controls. In addition to digital controls, Framatome has delivered more than 60 analog EDG controls of hardwired discrete technology. Collected experience with different applicable regulations (IEEE, RCC-E, KTA) all over the world allows comprehensive design that covers various standards.

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