

Article Overview

Verification of new relay protection involves type testing, secondary injection, functional checks, and commissioning tests to ensure correct operation under fault conditions and compliance with standards.

Overview of Relay Verification

Relay protection verification ensures that protection devices operate correctly under abnormal power conditions. The process is divided into several stages:

- o Type Testing: Conducted at the manufacturer's facility to confirm that the relay meets specifications and standards such as IEC 60255, IEEE C37.90, IEC 61000, and IEC 60068. This includes both hardware and software testing to simulate fault conditions and verify correct operation .
- o Factory Acceptance Tests (FAT): Performed before delivery to verify the relay configuration, firmware, and communication functions. This ensures that the relay is free from manufacturing defects and that all settings are correctly applied .
- o Commissioning Tests: Conducted on-site to verify installation, wiring, and correct operation of the relay in the actual system. This includes checking all outputs, indications, and auxiliary devices, as well as testing the complete protection scheme .

Secondary Injection Testing

Secondary injection testing is a key method for verifying relay operation without energizing the primary circuit:

- o Apply test currents and voltages to the relay terminals to simulate fault conditions.
- o Check pickup and dropout voltages, contact operation, and timing at 80% and 100% nominal voltage.
- o Test time-delay relays at 0%, set point, and 100% delay.
- o Verify overcurrent, differential, and other protection functions individually, ensuring correct phase connections and settings .

Functional Testing for IEC 61850 Relays

Modern substations often use IEC 61850 communication protocols, requiring additional verification:

- o Use System Specification Tool (SST), System Configuration Tool (SCT), and IED Configuration Tool (ICT) to configure and validate relay functions.
- o Test horizontal (GOOSE, Sampled Values) and vertical (Client/Server) communication links.
- o Perform end-to-end SCADA signaling checks and verify interlocking logic.

- o Retest any functions after firmware updates or configuration changes to ensure system integrity .

Practical Considerations

- o Staff Competency: Ensure personnel are trained in safe use of test equipment, switching procedures, and network access authorizations .
- o Documentation: Maintain detailed records of all tests, settings, and deviations for compliance and future reference.
- o Workflow Optimization: Use modular testing approaches, offline capabilities, and cross-training to handle complex relay systems efficiently .

Summary

A complete verification procedure for new relay protection includes:

- o Type testing at the manufacturer.
- o Factory acceptance and configuration verification.
- o Secondary injection testing for all protection functions.
- o Functional testing of communication and automation systems.
- o Documentation and staff competency checks. Following these steps ensures that the relay protection system operates reliably under fault conditions, complies with standards, and integrates effectively into modern substation automation systems.

Protection Function Testing Procedure: Step-by-step guide for stability, sensitivity & differential relay tests ensuring

Facilities need to perform installation tests, implement preventive maintenance programs, and perform comprehensive

Receiving Remove the relay from the transport case and perform a visual inspection for possible transport damages.

This document discusses testing procedures for protection relays, including type tests, routine factory production tests,

Plant protection system functional testing Protective circuit functional testing, including

Discover the types of protection relays, their applications, and essential testing procedures to ensure grid reliability

Explore the step-by-step LT protection relay testing procedure, including preparation, test setup, functional tests, &

Abstract: This paper introduces the importance of comprehensive relay protection device, the key role it plays in the

Ensure optimum system performance, efficiency, and safety with preventive relay maintenance and testing Today's challenges in

What started as a simple paper about protective relay logic for microprocessor based relays has blossomed into a comprehensive

A structured protection relay testing procedure helps engineers validate relay functionality before commissioning,

Initial tests of new protective relays must include operating characteristics checks for a representative range of available settings with

and commissioning procedure. 2. All outputs / indications to be tested. 3. Initial tests of new protective relays must

Ensure relay reliability with Wrindu's protection relay testing procedure. Step-by-step guide for OEMs, manufacturers,

Digital and numerical protection relays will have a self-test procedure that is presented in the relay manual. These tests should be

Protection relay testing and commissioning are essential procedures in the electrical power industry to ensure the reliable operation

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