

Article Overview

Sensitivity verification ensures that a relay protection device reliably detects internal faults within the protected zone while remaining stable for external faults.

Purpose of Sensitivity Verification

Sensitivity verification is performed to confirm that a relay protection device operates correctly for internal defects in the protected zone and does not respond to external faults. This is crucial for maintaining system reliability, safety, and selectivity in power networks .

Testing Principles

Relay protection, especially differential protection, relies on the current balancing principle between current transformers (CTs) at the boundaries of the protected zone. Sensitivity tests check whether the relay can detect minimal fault currents and operate as intended .

Equipment Required

- o Primary Injection Test Kit: Injects large currents directly into CT circuits to simulate real fault conditions.
- o Secondary Injection Test Kit: Simulates relay inputs with controlled currents and voltages.
- o Clamp Meter: Measures current non-intrusively.
- o Digital Multimeter: Measures voltage, resistance, and continuity .

Step-by-Step Sensitivity Test Procedure

- o Connect the CTs: Inject primary current via one set of CTs with one current flowing inward and the other outward. A zero differential current at the relay terminals indicates proper CT wiring and stability.
- o Reverse Polarity Test: Reverse the polarity of one CT and inject primary current through only one CT. The relay should operate, confirming sensitivity.
- o Determine Minimal Operating Current: Gradually increase the injected primary current until the relay operates. Record the minimal current required for operation.
- o High-Impedance Differential Relays: Apply test voltage to one transformer winding while short-circuiting the opposite winding, ensuring the relay responds correctly to internal faults .

Verification Cycle and Maintenance

- o For high-reliability systems (60 kV and above), relay protection devices should be verified annually.
- o For lower voltage systems (10 kV), calibration is typically performed every two years.
- o Regular verification ensures correct operation, intact circuits, and accurate settings, reducing maintenance

costs and improving system safety .

Benefits

- o Confirms proper relay operation for internal faults.
- o Ensures stability against external faults.
- o Supports safe and economic operation of the power system.
- o Provides reliable data for maintenance and commissioning decisions . Sensitivity verification is a critical part of relay protection testing, ensuring that protective devices respond accurately to faults, maintain system stability, and safeguard both equipment and personnel.

IEEE Power Systems Relays Standards Collection: VuSpec™ This VuSpec includes 47 active IEEE standards, guides,

Digital and numerical protection relays use software for relay protection and measurement functions. This software must be properly

Stability Test Stability testing is done to know that the relay can withstand in any faulty conditions or not. It will help in

Sensitivity Sensitivity refers to the characteristic of the relay to act when the actual fault conditions occur. Sensitivity is usually

How to Test Protective Relays Correctly Usually I try to keep my posts as simple and practical as possible. This post is a little

In order to make the verification and management of relay protection value more scientific and effective, an orderly check of the relay

This technical report refers to the electrical protection of all 132kV switchgear. These settings may be re-evaluated during the

The experimental results show that this method can effectively analyze the operation characteristics of power system

Based on simple examples of the generator-transformer unit protection from symmetrical short circuits, it was shown that the

Installation of protection relays Installation of protection relays at site creates a number of possibilities for

errors in the

Protective relays and monitoring relays detect or monitor for abnormal power system conditions. Protective relays detect defective

Abstract: Protective relays and devices have been developed over 100 years ago to provide "last line" of defense for the electrical

A fast and selective arc fault mitigation for air-insulated LV & MV switchgear and Relion protection and control relays and sensor

PROTECTION RELAY TESTING AND COMMISSIONING The testing and verification of protection devices and arrangements

Protection systems are made up of many different types and makes of relays however the relays can be grouped by the function they

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

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