

Sensitivity is a key characteristic of relay protection

Article Overview

Sensitivity in relay protection refers to the ability of a protective relay to detect and respond to the smallest fault current within its designated protection zone.

Definition and Importance

Sensitivity is a critical parameter in relay protection that ensures a relay can detect internal faults, even when the fault current is low due to high impedance or distance from the relay. A highly sensitive relay can operate correctly for minimal fault currents, preventing equipment damage and maintaining system stability. Insufficient sensitivity may result in undetected faults, leading to prolonged outages or cascading failures in the power system.

Factors Affecting Sensitivity

- o Relay Type and Settings: Differential relays, overcurrent relays, and distance relays have different sensitivity requirements. Proper calculation of current and voltage thresholds ensures the relay responds to all internal faults without false tripping.
- o Current Transformer (CT) Accuracy: CTs must accurately reproduce primary currents at the relay terminals. Incorrect CT connections or polarity can reduce sensitivity.
- o Fault Location and Impedance: Faults far from the relay or with high resistance may produce low currents. Sensitivity must be sufficient to detect these conditions.
- o System Coordination: Sensitivity must be balanced with selectivity and dependability to avoid unnecessary tripping of upstream or downstream relays.

Testing Sensitivity

Relay sensitivity is verified through primary and secondary injection tests:

- o Primary Injection Test: Large currents are injected into CT circuits to simulate real fault conditions. The minimal current required to operate the relay is determined.
- o Secondary Injection Test: Controlled currents and voltages are applied directly to the relay inputs to confirm proper operation and sensitivity.
- o Differential Relay Testing: Currents are injected with reversed CT polarity to ensure the relay responds only to internal faults and not to through-faults, confirming both sensitivity and stability.

Practical Considerations

- o High-Voltage Systems: In HV substations, sensitivity must be high enough to detect low-level faults without

Sensitivity is a key characteristic of relay protection

compromising selectivity or security .

- o Trade-offs: Increasing sensitivity may reduce security or selectivity. Modern microprocessor-based relays allow simultaneous high sensitivity, speed, and reliability, but careful design and coordination are still required .

- o Documentation and Calibration: All sensitivity tests and settings should be recorded and periodically verified to maintain protection reliability .

Summary

Sensitivity ensures that protective relays detect all internal faults within their zone, even under low-current conditions, while maintaining system stability and minimizing unnecessary outages. Proper calculation, CT accuracy, testing, and coordination are essential to achieve optimal sensitivity in HV and MV substations.

Characteristics of Protective Relay: Characteristics of Protective Relay elements using different operating

Electromechanical protective relays operate by either magnetic attraction, or magnetic induction. : 14 Unlike switching type

To examined whether the smallest faults can be detected within the protected zone, the relay protection sensitivity

An assessment of sensitivity of the measuring elements of relay protection was performed. Based on simple examples

The paper discusses the conditions for setting the overcurrent protection and how they determine the sensitivity and selectivity of

Protective Relaying Principles and Applications The article provides an overview of protective relaying principles and their

(3) Sensitivity: refers to the ability of relay protection devices to respond to faults or abnormal operating conditions that

Modern power systems demand that transmission line protection schemes be reliable (dependable and secure), fast, sensitive, and

It begins by outlining the four key characteristics of relay protection: selectivity, sensitivity, speedability, and reliability. It then

Sensitivity is a key characteristic of relay protection

ABB Protection relay and solution Objective Protection purpose and requirements Key terminology Selectivity Sensitivity

A relay is said to be dependable if it trips only when it is expected to trip. This happens either when the fault is in its primary

This article covers various types of protective relays, such as overcurrent, directional, and differential relays, highlighting their

Sensitivity of a Relay The relay in a protection system should be sensitive enough to operate when a fault occurs. A sensitive relay

Desirable Attributes of Protection The performance of an overcurrent relay was monitored over a period of one year. It was found that

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

Among the various possible methods used to achieve correct relay co-ordination are those using either time or

Web: <https://www.kremgroup.co.za>

