

Adjusting relay protection values in power systems



Overview

Protection relays employ a wide range of configurable parameters to identify defects & trip the breaker in a controlled & selected manner.

Key Takeaways

Relay protection values are adjusted by calculating fault currents, selecting appropriate pickup and time settings, and coordinating relays to ensure selective and reliable operation. Key Parameters for Relay Adjustment1. Plug Setting Multiplier (PSM): PSM defines how many times the actual current exceeds the relay's pickup current.

It is crucial for inverse definite minimum time (IDMT) relays, determining the basic operating time. A higher PSM results in faster tripping, while a lower PSM slows the relay response.

PS

M settings must comply with IEC 60255-151 standards to ensure proper relay performance under fault conditions. 2. Time Setting Multiplier (TSM): TSM scales the base operating time derived from the relay's characteristic curve.

It is used to achieve proper coordination between upstream and downstream relays, ensuring backup protection.



Lower TS

M values result in faster tripping, while higher values delay operation to allow downstream relays to clear faults first. 3. Overload and Earth Fault Settings: Overload (OL) and Earth Leakage (EL) settings define the relay's sensitivity to thermal overloads and ground faults.

These values are selected based on maximum load currents, minimum fault currents, and system voltage levels to maintain both sensitivity and selectivity.

Steps for Adjusting Relay Values

Fault Current Calculations: Determine maximum and minimum fault currents for all types of faults (single line-to-ground, line-to-line, three-phase). This ensures the relay can detect faults without tripping under normal load conditions. **Select Pickup Currents:** Set the relay pickup current slightly above the maximum load current to avoid nuisance tripping.

For overcurrent relays, typical settings are 120–125% of line current. **Time Coordination:** Use TSM to create a time grading scheme. Downstream relays should trip faster than upstream relays to maintain selectivity.

For distance relays, zone reach and impedance settings are calculated to cover the intended line segment without overreaching. **Transformer and Bus Protection:** For transformer differential relays, use per-unit scaling (TAP settings) to normalize currents from different windings. Ensure TAPmax/TAPmin ratios comply with manufacturer recommendations to maintain sensitivity and stability.

Validation and Testing: After setting values, perform relay coordination studies and simulation tests to verify that relays operate correctly under all fault scenarios. Adjust settings iteratively if necessary.

Best Practices

Always follow IEC standards for relay characteristics and coordination. Consider system changes such as new lines or transformers, which may require recalculating settings. Document all settings and maintain a relay setting record for future reference and maintenance.

Use digital or numerical relays where possible, as they allow easier adjustment, monitoring, and coordination analysis. By carefully calculating fault currents, selecting appropriate PSM/TSM values, and coordinating relays, power system engineers can ensure reliable, selective, and safe operation of the electrical network.

Article Content

Relay Protection Settings (PSM, TSM, EL, OL, MF)

Protection relays employ a wide range of configurable parameters to identify defects & trip the breaker in a controlled & selected manner. Understanding each setting facilitates proper relay

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Abstract: Protective relays and devices have been developed over 100 years ago to provide “last line” of defense for the electrical systems. They are intended to quickly identify a fault and isolate it so the

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Adaptive Protection During Changing System Conditions Adaptive protection aims to adjust settings of protective relaying to the prevailing conditions of a power system.

Practical handbook for relay protection engineers | EEP

Also principles of various protective relays and schemes including special protection schemes like differential, restricted, directional and distance relays are explained with sketches. The

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Relay Setting in Real Power System

Relay setting plays an important role in maintaining the reliability of a Power System. Read this blog to find out more about relay setting and how it is achieved in real power systems.

Pick Up Current | Current Setting | Plug Setting Multiplier and Time ...

The same model relays can be used in different systems, and their pickup current is adjusted based on system requirements. This adjustment is called the current setting of the relay.

PARAMETERIZATION OF PROTECTION RELAYS IN POWER

The teaching text describes complex procedures for parameterization of overcurrent, differential, and distance protection relays from the company SEL, a theoretical basis for protection relays,

Research on relay setting attack defense in power systems ...

The relay protection mechanism in power distribution systems relies on communication networks, firmware, and local access interfaces of devices. Vulnerabilities in these aspects provide

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Perform power system simulations of selected faults and observe how a given protection principle (overcurrent, impedance, and differential) works. Set the relays for a given power system. Verify by

A review on adaptive power system protection schemes for future

Protection devices such as fuses and protective relays are widely used to identify and isolate faulty areas from operational networks. These devices operate at a pre-defined protection

How to Determine Optimal Settings for Power System Protection Relays

Learn about the best methods and tools to choose the right settings for power system protection relays, and improve your network safety, reliability, and efficiency.

What to Know About Protective Relays | EC&M

The relays measure sensor output and cause the breaker to operate to protect the system when preset limits are exceeded, hence the name "protective relays." The availability of a variety of sensors,

Optimization of Multi level Relay Protection Adaptive ...

Introduction With the continuous adjustment of the global energy structure and the deepening of the concept of sustainable development, distributed generation (DG), as a new type of energy supply,

Fundamentals of Modern Protective Relaying

A primary motor protective element of the motor protection relay is the thermal overload element and this is accomplished through motor thermal image modeling. This model must account for thermal

Relay Coordination in Resilient and Sustainable Power Systems:

Abstract—This article presents a technical review of advanced relay coordination techniques in modern power systems. Focusing on directional overcurrent relays, the study

Societal and technology trend report

The crisis of traditional relay protection: A disruption of the technological paradigm
Using the high short-circuit currents and system inertia provided by synchronous
generators, traditional relay protection

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