Relay Protection Time Selection



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 time is selected to ensure proper coordination, selectivity, and rapid fault clearance, typically using time-graded or inverse time characteristics.

Principles of Relay Timing

Relay protection time is primarily determined to achieve selectivity, meaning the relay closest to the fault operates first while upstream relays act as backup. This is achieved through time grading, where relays are set with progressively longer operating times as you move upstream in the network. Two main types of relay characteristics are used: Definite Time Relays: Operate after a fixed time regardless of fault current magnitude.

Inverse Time Relays: Operate faster for higher fault currents, making them suitable for radial networks with varying short-circuit currents. Time grading ensures that downstream faults are cleared quickly while minimizing unnecessary tripping of upstream devices.

Key Parameters for Timing Selection

Plug Setting Multiplier (PSM): Indicates how many times the actual current exceeds the relay pickup current.

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Higher PS

M results in faster relay operation. Time Setting Multiplier (TSM): Scales the base operating time from the relay's characteristic curve.

Lower TS

M results in faster tripping, and it is used to create time grading between relays. Zone Delays: For distance or impedance relays, zone 1 is typically instantaneous, while zones 2 and 3 include intentional delays to coordinate with downstream relays. Coordination Margins: A safety margin is added to ensure upstream relays do not operate before downstream relays clear the fault.

Practical Steps for Setting Relay Time

Identify the network configuration and fault current levels at each relay location. Select relay type (definite or inverse time) based on network characteristics.

Determine PS

M based on expected fault currents and relay pickup settings.

Calculate TS

M to achieve proper time grading between downstream and upstream relays. Verify coordination using relay curves and ensure that the total fault clearance time includes relay operating time plus breaker opening time. Adjust for special conditions, such as transformer inrush, motor starting, or varying line impedances.

Standards and Guidelines

Relay timing selection should comply with IEC 60255 standards for overcurrent relays and IEEE guides for protective relay coordination. Inverse, very inverse, and extremely inverse characteristics are commonly used to optimize speed and selectivity.

Summary

Selecting relay protection time involves balancing speed, selectivity, and reliability. By using time-graded or inverse time relays, adjusting PSM and TSM, and coordinating zones with appropriate delays, engineers ensure that faults are cleared efficiently while minimizing disruption to the rest of the system.

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Article Content

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

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Protection relay setting is the process of choosing the current threshold and time delay at which a relay trips a circuit breaker during a fault.

Relay Coordination Study: Selectivity Calculations | EEP

The scope of study involves calculating the settings for protective relays to achieve selectivity during faults ocurring in the electrical network for the 13.8 kV and 4.16 kV projects.

FEEDER PROTECTION CALCULATIONS & SETTINGS

Relay coordination is the process of selecting settings that will assure that the relays will operate in a reliable and selective way. In OC relays the coordination is based on the relay time-current

Basic protection relay knowledge

Definite time delay means that the protection operate time dose not change or depend on the fault type or the fault current magnitude. Inverse time delay, on the other hand, depends on the current

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In this method, an appropriate time setting is given to each of the relays controlling the circuit breakers in a power system to ensure that the breaker nearest to the fault opens first. A simple

Time Overcurrent Relay Calculator

Calculate time overcurrent relay settings with IEEE & IEC standards. Learn IDMT relay formulas, TMS/TD settings and protection coordination.

ETAP Relay Coordination Tutorial | Time-Current Curve Setup Guide ...

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ETAP relay coordination tutorial covering time-current curve setup, protective device settings, and system modeling for power protection studies.

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Distribution Automation Handbook

The operating time of definite time relays does not depend on the magnitude of the fault cur-rent, while the operating time of inverse time relays is shorter the higher the fault current magnitude is. The time

Power System Protective Relays: Principles & Practices

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

The fundamentals of protection relay co-ordination and time ...

Among the various possible methods used to achieve correct relay co-ordination are those using either time or overcurrent, or a combination of both.

Protective Relay Basics Part 2

Part 1: Protective relay compared to low voltage circuit breaker. Review fundamental concepts, components, and terminology using the electromechanical overcurrent relay as a foundation.

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The time classification and curve slopes are characteristic of the relay selected, although for some solid-state relays these may be adjustable to some degree. For each set of curves determined by the relay

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