

Examples of Relay Protection Setting and Calculation

Article Overview

Relay protection settings are calculated using system parameters to determine pickup currents, time delays, and coordination for overcurrent, differential, and line protection relays.

Key Relay Setting Calculations

o Pickup Current (I_p)

o Defines the minimum fault current at which the relay operates.

o Calculated using load current, CT ratio, and plug setting multiplier (PSM): $I_p = I_{load} \times PSM$

o Example: For a load current of 150 A and PSM of 125%, the pickup current is 187.5 A, rounded to the nearest standard setting, e.g., 200 A .

o Time Multiplier Setting (TMS)

o Determines the operating time of the relay based on the fault current.

o Used with standard inverse, very inverse, extremely inverse, or long-time inverse curves.

o Operating time formula: $t = TMS \times t_f(I_{fault}/I_p)$

o Ensures proper coordination with downstream relays .

o Plug Setting Multiplier (PSM)

o Ratio of fault current to relay pickup current: $PSM = I_{fault}/I_p$

o Helps in adjusting relay sensitivity for different fault levels .

o Coordination Time Interval (CTI)

o Time difference between upstream and downstream relay operation to ensure selectivity.

o Typically 0.2-0.5 seconds for distribution systems.

o Calculated using relay operating times and system fault levels .

o Transformer Differential Relay Settings (e.g., SEL-787)

o Uses per-unit TAP scaling to normalize secondary currents from multiple windings.

o TAP_n is set for each winding to ensure full-load through-current sums to 1.0 per unit.

o Maximum ratio constraint: $TAP_{max}/TAP_{min} \leq 7.5$, .

o Line Protection IED Settings

o Includes overcurrent, distance, and directional elements.

o Calculations based on system parameters: line impedance, fault current, CT ratios, and relay curve type.

o Default settings may be adjusted according to manufacturer manuals and CBIP guidelines .

o Other Protection Elements

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- o Busbar, reactor, and generator protection relays may require:
- o Overcurrent and earth fault pickup currents
- o Time delays for backup protection
- o Supervision functions (e.g., breaker failure, voltage supervision)
- o Calculations follow similar principles: determine fault current, select pickup, apply TMS, and ensure coordination .

Practical Notes

- o Always verify relay settings during commissioning with actual measured values.
- o Consider selectivity and coordination to prevent unnecessary tripping.
- o Document all settings, including unused functions, for future reference and troubleshooting.
- o Use interactive calculators or software tools to simplify calculations and reduce errors . This structured approach ensures reliable protection, selectivity, and minimal disruption in power systems.

This document discusses distance protection relay setting calculations. It provides the following key points: 1. Distance protection

Then, the electrical engineering software is used to perform a more accurate setting calculation and protection coordination. Also, the

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

Calculate thermal overload, overcurrent, ground fault, and differential relay settings with

These values are core to everyday tasks like setting up industrial distribution panels, utility feeders, or backup

Abstract. The conventional relay protection setting calculation method considers the internal interference of the transformer and

The document discusses overcurrent protection calculations and settings for a power system network. It provides a single line

Traditionally, protective relays were electromechanical devices utilizing induction disk, coils, contacts, and solenoid elements to

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In this post, we have learn about transformer relay setting calculation. Like Differential, IDMT, overcurrent, REF, Earth fault E/F, Over

When the protection is implemented using a voltage relay, the selected setting must be equal to or exceed the calculated stabilizing

Protection Settings The documents presented should serve as a model to various utilities in preparing similar

This comprehensive article delves into the key aspects of relay protection in HV/MV substations, including calculations,

In this video we have explained calculation for IDMT over current relay setting

With this Protection Relay Setting Calculator, you'll be able to work out pickup current, time multiplier settings (TMS),

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

Protection System Elements Protective relays Circuit breakers CTs and VTs (instrument transformers) Communications channels

Web: <https://bssoda.pl>

