Relay Protection Setting Recalculation Rules

Article Overview

Relay protection settings are recalculated using formulas for pickup current, plug setting multiplier (PSM), time multiplier (TMS), and zone reach, adjusted for CT ratios, line impedance, and system conditions.

Key Parameters and Formulas

1. Pickup Current (Ip): The pickup current is the minimum current at which the relay operates. For overcurrent relays, it is calculated as: Ip = I_load x Safety Factor where I_load is the maximum load current and the safety factor ensures selectivity and coordination with downstream relays . 2. Plug Setting Multiplier (PSM): PSM indicates how many times the relay secondary current exceeds the relay pickup current: PSM = Fault Current at Relay Secondary / Relay Pickup Current A higher PSM results in faster tripping according to the IDMT curve . 3. Time Multiplier Setting (TMS): TMS scales the base operating time from the relay's characteristic curve: Operating Time (t) = TMS x f(PSM) where f(PSM) is the time from the relay's inverse time-current characteristic (IEC 60255 standard). Lower TMS values produce faster trips, while higher TMS ensures coordination with downstream relays . 4. Distance Relay Zone Settings: For distance relays, the reach of each zone is set as a percentage of line impedance: Zone 1 Reach = 80-90% of line impedance Zone 2 Reach = 120-150% of line impedance (to cover remote faults) Adjustments include tower footing resistance and arc resistance for accurate impedance measurement . 5. Transformer Differential Relay (TAP) Scaling: For transformer differential relays (e.g., SEL-787), secondary currents are converted to per-unit values using TAP: TAPn = (Relay Setting x Rated Current) / CT Secondary Current The sum of incoming currents per TAP should equal 1.0 for full-load through-current conditions, ensuring proper differential protection .

Recalculation Procedure

o Measure actual system parameters: line currents, voltages, and impedances.
o Adjust CT ratios: recalculate secondary currents to match relay input.
o Recompute PSM: divide updated fault current by relay pickup.
o Update TMS: scale operating time to maintain coordination.
o Verify zone reach: ensure distance relays do not overreach or underreach.
o Check selectivity and coordination: confirm upstream relays provide backup without tripping for downstream faults .

Practical Notes

o Always follow IEC 60255 standards for IDMT relays.
o Include resistive and arc components in impedance calculations for distance relays.
o Use software tools or spreadsheets to maintain consistency and reduce errors during recalculation .
o Recalculation is essential after system changes, commissioning, or CT ratio adjustments to ensure reliable

protection. By applying these formulas and procedures, engineers can recalculate relay settings accurately, ensuring proper fault isolation, coordination, and system protection.

To avoid relay mal-operation, set Slope 2 as high as possible. Normally, a high Slope 2 setting causes slow tripping for evolving

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

OVERCURRENT COORDINATION GUIDELINES FOR INDUSTRIAL POWER SYSTEMS For industrial applications in the United

This document provides guidance on setting calculations for generator protection relays. It discusses voltage and current inputs,

With continuous development of distribution power network, the higher reliability of distribution system is required. Fault and its

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

With the continuous expansion of the power grid scale and the extensive integration of new energy, the operation mode of the

Motor Protection Relay Setting Calculation Guide: Avoid Costly Downtime and Ensure Optimal Performance Motor failures are a

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

Relay coordination is the process of selecting settings that will assure that the relays will operate in a reliable and selective way. In

The document provides information about calculating settings for generator protection relays. It includes sample calculations and

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

Relay Protection Setting Recalculation Rules

Power System Protection Setting Calculations The electrical grid is a vast and intricate system designed to ensure the

These curves can be used in conjunction with the motor time-current curve for a normal start to set protective relays and breakers for

SUBSTATIONS INTRODUCTION In addition to setting criteria guide lines prepared by Subcommittee on relay/protection under Task

Calculate thermal overload, overcurrent, ground fault, and differential relay settings with step-by-step examples.

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