How to calculate the braking current of relay protection

Article Overview

The braking current of a relay is calculated based on the relay's pickup current, CT ratio, and plug setting multiplier (PSM), ensuring selective fault clearing and proper coordination with upstream and downstream relays.

Understanding Key Parameters

o Pickup Current (I_pickup): The minimum current at which the relay starts to operate. It is usually set above the maximum load current to avoid nuisance tripping. Formula: I_pickup = PSM x Rated CT secondary current ( ).

o Plug Setting Multiplier (PSM): Ratio of the desired pickup current to the rated CT current. It adjusts the relay sensitivity: PSM = I_pickup / I_rated ( ).

o Time Multiplier Setting (TMS): Determines the operating time of the relay according to the selected inverse time characteristic (Standard, Very Inverse, Extremely Inverse, or Long Time Inverse) defined in IEC 60255 ( ).

o Fault Current (I_fault): The prospective short-circuit current at the relay location, calculated using IEC 60909 or system analysis tools ( ).

Step-by-Step Calculation

o Determine the CT ratio: Identify the primary and secondary ratings of the current transformer (CT). For example, a 200/5 A CT converts 200 A primary current to 5 A secondary current.

o Set the Pickup Current: Decide the relay pickup current based on load current and safety margin. For instance, if the load current is 150 A and you choose 125% of load, the pickup current is 187.5 A. Round to the nearest standard plug setting, e.g., 200% -> 250 A ( ).

o Calculate PSM: PSM = I_pickup / I_CT_secondary. Using the example above, if CT secondary is 5 A, PSM = 250 / 5 = 50.

o Select Relay Curve and TMS: Choose the appropriate inverse time characteristic and calculate the operating time using: Operating Time = TMS x Time from relay curve for given PSM ( ).

o Determine Braking Current: The braking current is the minimum fault current at which the relay will operate within the desired time. It is calculated by comparing the fault current to the pickup current and applying the relay's time-current characteristic: I_braking >= I_pickup x Coordination Factor, where the coordination factor ensures downstream relays operate first ( ).

Practical Considerations

o Use time grading to ensure selectivity: the relay closest to the fault operates first, while upstream relays provide backup ( ).

o For inverse time relays, the operating time decreases as fault current increases, which helps in faster clearing

of high-magnitude faults.
o Always verify calculations against CT saturation limits, relay thermal ratings, and system short-circuit withstand capacities ( ). By following these steps, you can calculate the braking current accurately, ensuring reliable and selective protection of the electrical network.

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

Two measurements are applied to the input of a differential relay with braking: differential and braking currents. There are many

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

Free relay coordination and protection grading tool for power systems engineers. Visualize

Popularity: ??? Protective Relaying Calculation This calculator provides the calculation of short-circuit current and

When the protection is implemented using a current relay, the current value at which the relay should operate must be determined

TAP or PICKUP VALUE: o A value that defines the pickup current of the relay. Current values are expressed as multiples of this

The most important requisite of the protective relay is reliability since they supervise the

Calculation for Transformer Differential Protection 87T settings : ... Rated Current @ 67 MVA at Highest tap= MVA*1000/SQRT(3) x

The protection device should be able to operate in a maximum time to ensure people and circuit safety, for all short

The operating time of definite time relays does not depend on the magnitude of the fault cur-rent, while the operating time of inverse

In this post, you will find relay settings calculations that serve as a guide to developing your settings. Some important

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Braking Resistor Calculator You can use the following two calculators to help size your brake resistor. If you have all the mechanical

Protective relay functions and data This technical article will cover the gathering of information needed to calculate

This document provides instructions for calculating dynamic braking requirements for applications where a motor works in

Discussion Overview The discussion revolves around calculating the stabilizing resistor for a high impedance

Web: https://bssoda.pl