

How to calculate the CT ratio of relay protection

Article Overview

The CT ratio for relay protection is calculated as the ratio of the primary current to the secondary current, considering maximum load and fault currents to ensure accurate relay operation.

Understanding CT Ratio

The CT ratio is expressed as: $\text{CT Ratio} = \text{Primary Current} / \text{Secondary Current}$ For example, a CT rated 200:5 means that 200 A in the primary circuit produces 5 A in the secondary circuit. This ratio ensures that the protective relay receives a manageable current proportional to the actual system current .

Steps to Calculate CT Ratio for Protection Relays

- o Determine Maximum Load Current Identify the maximum expected load current in the primary circuit. For protection purposes, it is common to include a safety factor (typically 1.2-1.25) to account for temporary overloads: $\text{Required Primary Current} = \text{Maximum Load} \times \text{Safety Factor}$
- o Select Secondary Current Standard secondary currents are usually 1 A or 5 A, depending on the relay and system design.
- o Calculate CT Ratio Divide the adjusted primary current by the chosen secondary current: $\text{CT Ratio} = (\text{Maximum Load} \times \text{Safety Factor}) / \text{Secondary Current}$ Example: If the maximum load is 180 A and the secondary current is 5 A: $180 \times 1.25 = 225 \text{ A}$ -> select the next standard CT ratio, 250:5, to maintain accuracy .
- o Consider Short-Circuit Current Ensure the CT can handle the maximum fault current without saturating. The CT ratio should allow the secondary current to remain within the CT's accuracy limit factor (ALF) during faults .
- o Check Accuracy Class Protective relays require CTs with appropriate accuracy class (e.g., 5P10, 10P20) to ensure correct operation under both normal and fault conditions. The selected CT ratio should keep the operating current within the CT's rated accuracy range.
- o Optional Multi-Ratio CTs If the system has variable loads or future expansion, consider multi-ratio CTs for flexibility in field adjustments .

Practical Example

- o Maximum load current: 180 A
- o Safety factor: 1.25 -> $180 \times 1.25 = 225 \text{ A}$
- o Secondary current: 5 A
- o Calculated CT ratio: $225 / 5 = 45$ -> choose 250:5 as the standard CT ratio
- o Verify that the CT can handle the expected short-circuit current without saturation.

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Key Considerations

- o Avoid undersized CTs: They may saturate during faults, causing relay misoperation.
- o Avoid oversized CTs: They may reduce measurement resolution, affecting relay sensitivity.
- o Include burden calculation: Total burden (cables, relay input) affects CT performance.
- o Follow standards: IEC 60044-1 and IEC 61869-2 provide guidelines for CT selection and accuracy . By following these steps, you can select a CT ratio that ensures accurate current measurement for protective relays while maintaining reliability during both normal operation and fault conditions.

Protection class/performance: choose based on relay needs and fault level. If the actual burden exceeds the CT rating,

Protective Device Coordination Calculation This calculator helps in coordinating protective devices like overcurrent

Metering and protection CTs As you should already know, current transformers are used for

This article focuses on the calculation of CT sizing specifically for dual power overcurrent

Accurate current transformer (CT) sizing keeps protection relays, meters, and advanced analytics operating within

The principal function of a current transformer is to produce a manageable level of voltage and current, proportional to

It discusses CT classification, conditions tested, fault current levels, and specific rated secondary EMF requirements for different

The CT ratio determines the range of primary current values that can be selected on the relay. Guidelines are provided for selecting

Secondary current of CT shall be 5A or 1A 3.1.2 Selection for Ratio of CT for Relay Protection Rated primary current of CT should be

Learn CT ratio calculation with step-by-step formula, standard ratio chart (5/5 to 6000/5), and

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

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The correct sizing of current transformers is required to ensure satisfactory operation of

A CT Ratio Calculator helps engineers, electricians, and power system operators determine the current transformer

Master the CT ratio calculation and selection process for electrical systems. Learn how current transformer ratios

As we know that in differential protection, phasor sum of CT secondary current are considered for calculation of differential current. In

Complete CT ratio chart with standard ratios for metering and protection CTs. Includes primary current ranges, accuracy class

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