Current transformer in conjunction with relay protection



Overview

Practical guide on how current transformers support protection relays, differential, overcurrent, directional and busbar schemes in substations.

Key Takeaways

Relay protection uses current transformers (CTs) to detect abnormal currents and trigger protective actions, safeguarding transformers from faults and overloads. Role of Current Transformers (CTs)Current transformers are instrument transformers that step down high currents in power systems to measurable levels for relays and meters. They provide isolation and accurate current measurement, enabling protective relays to operate safely without being exposed to high voltages.

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Ts are critical for: Differential protection: CTs on all transformer windings must be matched in ratio and accuracy to detect internal faults reliably. Overcurrent protection: CTs feed relays that trip circuit breakers during overloads or external short circuits. Restricted Earth Fault (REF) protection: CTs detect sensitive earth faults within the transformer zone.

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T selection involves ratio, accuracy class, and burden considerations to ensure correct relay operation during both normal and fault conditions.

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Types of Relay Protection

Differential Protection (87): The most sensitive protection for internal transformer faults. It compares currents from primary and secondary windings via CTs; any imbalance indicates a fault. Overcurrent Protection (50/51): Protects against overloads and external short circuits.

Relays receive current signals from CTs and trip circuit breakers when thresholds are exceeded. Restricted Earth Fault (64R): Provides sensitive protection for earth faults within the transformer zone, using CTs on the star point or neutral. Buchholz Relay: Gas-actuated relay for oil-filled transformers, detecting internal faults by sensing gas accumulation.

Over-fluxing and Thermal Protection: Relays monitor core flux density and winding temperature to prevent insulation damage. Practical ConsiderationsCT Accuracy: High accuracy is essential for differential protection; errors can cause false trips or failure to detect faults. Relay Coordination: Time-current characteristics of relays must be coordinated with upstream and downstream protection to avoid unnecessary outages.

Modern Digital Relays: Combine multiple protection functions (differential, overcurrent, REF) in a single device, reducing wiring complexity and CT burden.

Summary

Current transformers and protective relays form the backbone of transformer protection systems.

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Ts provide accurate current measurement and isolation, while relays detect abnormal conditions and initiate tripping to prevent damage. Proper selection, coordination, and maintenance of CTs and relays are essential for reliable and safe operation of power transformers.

Article Content

CTs in Power System Protection

Practical guide on how current transformers support protection relays, differential, overcurrent, directional and busbar schemes in substations.

Four special connections of current transformers in relay protection ...

PDF file

Current Transformers for Protection Relays

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Current transformers for protection relays, as opposed to those use strictly for metering purposes, have an IEEE standard classification. There are two classifications, Class T CTs and Class C CTs.

C37.110-2023

This guide describes the characteristics and classification of current transformers (CTs) used for protective relaying. It also describes the conditions that cause the CT output to be distorted and the

Protection current transformers

Description: Protection current transformers with circular primary conductor conduit for primary nominal currents from 100 A to 300 A, secondary nominal current 5 A, 2 A or 1 A, in protection classes 5P5

Transformer Protection Application Guide

This guide focuses primarily on application of protective relays for the protection of power transformers, with an emphasis on the most prevalent protection schemes and transformers.

Power transformer protection relaying (overcurrent, restricted earth ...

Fuses may adequately protect small transformers, but larger ones require overcurrent protection using a relay and CB, as fuses do not have the required fault breaking capacity.

ABB Relay CT Requirements Overview | PDF | Transformer

It discusses CT classification, conditions tested, fault current levels, and specific rated secondary EMF requirements for different protection functions in ABB line distance, line differential, transformer,

Transformer protection and control

ABB''s transformer protection relays are used for protection, control, measurement and supervision of power transformers, unit and step-up transformers, including power generator-transformer blocks in

Current Transformer Relay Guide | PDF | Transformer | Inductance

#Relaying Current Transformer Application - Free download as PDF File (.pdf), Text File (.txt) or read online for free. This white paper discusses the characteristics and applications of current

Power System Protective Relays: Principles & Practices

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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

A Complete Guide to Current Transformers for Accurate Power

The current transformer remains a cornerstone of electrical engineering—essential for accurate measurement, control, and protection. From conventional core current transformers to

CT Sizing for Generator and Transformer Protective Relays

1 Introduction In the past, the use of current transformer (CT) models was promoted for CT selection, analysis, and the development of relay settings. But modern differential relays have advanced

Transformer protection and control

Transformer protection relays are used for protection, control, measurement and supervision of power transformers.

Power transformer protection relaying (overcurrent, restricted earth ...

The considerations for a transformer protection vary with the application and importance of the power transformer. It is normal for a modern relay to provide all of the required protection

Determining CT Requirements for Generator and Transformer Protective Relays

Subsequently, we present a methodology for evaluating CT requirements for generator and transformer protective relays. Finally, we use the CT models and methods in conjunction with sample generator

A REVIEW OF CURRENT TRANSFORMER BASED PROTECTION

Current transformers (CT) are plays a major role of maximum accuracy in power system protection such as meters and relays. CTs are employed in various instruments like power factor

Differential Protection of Transformer | Differential Relays

Current Transformers (CTs): CTs are crucial for differential protection, transforming primary and secondary currents to levels suitable for comparison by the relay. Fault Detection

Improved differential relay for bus bar protection scheme with ...

Bus bars are the connection points for a number of transmission lines and many electrical apparatus, so differential relays are used for bus bar protection as shown in Fig. 1. Bus bar protection

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

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