

Article Overview

Relay protection time measurement determines the response speed of protective relays from fault detection to breaker tripping, ensuring system stability and selective protection.

Importance of Time Measurement

The action time of a relay is the interval between receiving a fault signal and issuing a tripping command. Accurate measurement is critical because too long a response can allow fault currents to propagate, affecting grid stability, while too short a response may cause false tripping and unnecessary outages. Measuring relay operating time ensures reliability, sensitivity, and proper coordination with other protective devices.

Testing Procedure

- o Connection Setup: Connect the relay protection tester to the relay's input terminals (current or voltage) and the action output terminal to capture the tripping signal.
- o Signal Parameter Settings: Configure the tester with appropriate analog signal parameters, including current amplitude, frequency, and phase, simulating real fault conditions.
- o Time Measurement: The tester's internal clock records the time from fault signal input to relay action output, calculating the operating time with high precision.
- o Data Analysis: Evaluate the results to verify that the relay operates within expected time limits and adjust settings if necessary.

Calculation Using Relay Settings

Relay operating time can also be calculated using IDMT (Inverse Definite Minimum Time) curves and settings such as:

- o PSM (Plug Setting Multiplier): Ratio of actual current to relay pickup current; higher PSM results in faster tripping.
- o TSM (Time Setting Multiplier): Scales the base operating time from the relay's characteristic curve; lower TSM leads to faster operation.
- o OL, EL, MF: Additional settings for overload, earth leakage, and scaling factors that influence timing. For overcurrent relays, the operating time depends on the time-current characteristic:
- o Definite time relays: Operating time is fixed, independent of fault current magnitude.
- o Inverse time relays: Operating time decreases as fault current increases, providing faster response for higher currents.

Coordination and Standards

Relay protection time measurement

Time measurement ensures selective protection, where the relay closest to the fault operates first. Coordination is achieved by grading operating times across relays using TSM and PSM settings. Standards such as IEC 60255-3 and IEEE C37.112 define time-current characteristics and testing requirements to maintain reliable protection.

Summary

Relay protection time measurement combines testing with relay testers, calculation using IDMT curves, and coordination principles to ensure relays respond accurately and selectively. Proper measurement and adjustment prevent cascading failures, protect equipment, and maintain power system stability.

The CMC 356 is the universal six-phase testing solution for all generations and types of protection relays,

The selectivity diagram is a set of specific time/current curves which shows all the time/current curves, that is, the operating

Definite time delay means that the protection operate time does not change or depend on the fault type or the fault current

Protective relays compare measured electrical quantities against settings, characteristic

(of a relay) The extent of the protection afforded by a relay in terms of the impedance or circuit length as measured from the relay

The Siemens SICAM 8 substation automation platform offers versatile remote control & automation along the entire energy supply

Distance (21) Protection What Is a Distance Protection Relay? Distance relaying is used to detect faults on long-distance lines,

Relay timing tests verify that protective devices operate within specified time-current characteristics. The calculator

The SEL-351 Relay has built-in Ethernet and IEEE C37.118 synchrophasors, and is ideal for directional overcurrent applications.

GE Vernova's Protection, Control, and Metering solutions deliver precise, high-performance automation for

IEC 60255-1:2022 specifies common rules and requirements applicable to measuring relays and protection

equipment, including any

REF relay is nothing but an over-current relay that is connected in parallel with the three-phase CTs and one neutral

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

Essential protection principles The aim of this technical article is to cover the most important principles of four

Configurable Distance Protection-- Apply up to four zones of phase and ground distance protection, using mho or quadrilateral

Product benefits Provide continuity of power to consumers Protection of network assets Protection against life-threatening electrical

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