

Article Overview

The current time limit in relay protection is determined by the relay's operating time, which depends on the fault current magnitude, pickup current, and time setting multiplier.

Key Concepts

Pickup Current: This is the minimum current at which a relay begins to operate, overcoming the controlling force of the relay mechanism. It is adjustable via the relay's current setting, expressed as a percentage of the CT's rated secondary current . **Plug Setting Multiplier (PSM):** PSM is the ratio of the actual fault current to the relay's pickup current. It determines how quickly the relay operates according to its inverse definite minimum time (IDMT) curve. A higher PSM results in faster relay operation . **Time Setting Multiplier (TSM):** TSM scales the base operating time derived from the relay's characteristic curve. By adjusting TSM, the relay's trip time can be fine-tuned to achieve proper coordination with upstream or downstream devices .

Time-Current Characteristics

Definite Time Relays: Operate after a fixed time delay regardless of fault current magnitude. The operating time is constant and set according to system coordination requirements . **Inverse Time Relays:** Operating time decreases as fault current increases. Variants include normal inverse, very inverse, and extremely inverse characteristics. These are particularly useful in radial networks where fault current varies along the feeder . **Time-Graded Protection:** Relays are coordinated so that the relay closest to the fault operates first. This is achieved by setting different operating times for relays along the network, ensuring selectivity and minimizing unnecessary outages .

Practical Application

- o For overcurrent protection, the relay should start when the energizing current exceeds a multiple of the set pickup current (e.g., 1.1-1.3 times for long-time inverse relays), .
 - o Instantaneous elements are set to clear high fault currents quickly, often using multiples of maximum load current, with a small margin time for numerical relays .
 - o Coordination studies use time-current curves to ensure relays operate reliably and selectively, considering maximum and minimum fault currents, load currents, and network configuration .
- Summary:** The current time limit in relay protection is not a fixed value but is determined by the relay's pickup current, PSM, TSM, and the chosen time-current characteristic. Proper setting ensures selective, reliable, and fast operation under fault conditions while avoiding unnecessary tripping.

Relay protection time and current

How Does Instantaneous and Time-Overcurrent Protection Work? Overcurrent protection prevents

An organized time-current study of protective devices from the utility to a device. A comparison of the time it takes protective devices

When studying electrical protective relays, we often use specific terms. To understand how different protective relays

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

What is the difference between instantaneous, definite time and inverse time over current protection relays (and maybe

Electromechanical protective relays operate by either magnetic attraction, or magnetic induction. : 14 Unlike switching type

A definite time over-current (DTOC) relay is a relay that operates after a definite period of time once the current exceeds the pickup

Introduction Using Log-Log Paper & TCCs Types of Fault Current Protective Devices & Characteristic Curves

OVERCURRENT PROTECTION FUNDAMENTALS Relay protection against high current was the earliest relay protection

Figure 1 shows how time-graded protection is achieved using overcurrent relays that have either inverse time or

The components used in the power system are usually dimensioned to withstand a short circuit current for one or three seconds but

Time Graded Overcurrent Protection protection of a radial feeder can be achieved by using Definite time relays and Inverse time

Introduction to Protective Relaying What are Protective Relays, or Protection Relays? Protective relays are used in industrial power

The pickup point is the current or voltage at which the plunger or armature begins to move and, in a switchgear relay, the pickup

Time-current coordination (also known as selective coordination) en-sures that protective devices, such as

fuses and

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

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