# Relay Protection Parameter Settings



## Overview

Protection relays employ a wide range of configurable parameters to identify defects & trip the breaker in a controlled & selected manner.

## Key Takeaways

Relay protection parameters are set to ensure fast, selective, and reliable fault detection, using key settings like PSM, TSM, zone reach, and earth fault pickup. Key Parameters in Relay Settings1. Plug Setting Multiplier (PSM) PSM defines how many times the actual current exceeds the relay's pickup current.

It is crucial for inverse definite minimum time (IDMT) relays, determining the operating speed: higher PSM results in faster tripping.

PS

M settings must comply with IEC 60255-151 to ensure proper relay performance under fault conditions. 2. Time Setting Multiplier (TSM) TSM scales the base operating time from the relay's characteristic curve.

It is used to achieve coordination between upstream and downstream relays, ensuring backup relays operate only if the primary relay fails.

### Lower TS

M values result in faster tripping, while higher values provide backup delay. 3. Earth Fault / Earth Leakage (EL) This setting determines the relay's sensitivity to ground faults.

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It is typically set based on expected fault currents and system grounding, ensuring detection of earth faults without nuisance tripping. 4. Overload (OL) and Multiplying Factor (MF) OL protects against thermal overloads, while MF adjusts relay readings for CT ratios or scaling factors, ensuring accurate current measurement and relay operation.

Distance and Zone Settings1. Zone 1, 2, 3 ReachZone 1: Main protection, no intentional delay, typically set to 80–100% of line impedance. Zone 2: Backup for adjacent lines, reach = 100% of protected line + 50% of shortest adjacent line, with a time delay coordinated with Zone 1 operation.

Zone 3: Extended backup, reach = 100% of protected line + 120% of longest adjacent line, with additional time delay for coordination. 2. Directional Settings Forward and reverse directional elements ensure the relay operates only for faults in the intended direction.

Ground reach settings are based on positive sequence impedance, with adjustments for CT/VT tolerances.

## Coordination and Selectivity

Selectivity ensures only the closest relay to the fault operates, minimizing system disruption. Stability prevents relay operation for faults outside the protected zone or during transient conditions. Time grading is applied using TSM to coordinate multiple relays along a feeder or transmission line.

## Practical Considerations

Collect network diagrams showing line lengths, voltage levels, transformer ratings, and fault contributions. Perform load flow and fault analysis to determine maximum load and fault currents. Document all relay settings, including unused functions (blocked/disabled), to prevent mal-operations.

Validate settings through simulation or field testing to ensure sensitivity, selectivity, and reliability. By carefully calculating and setting these parameters, relay protection systems can quickly isolate faults, protect equipment, and maintain system stability.

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## Article Content

Relay Protection Settings (PSM, TSM, EL, OL, MF)

Protection relays employ a wide range of configurable parameters to identify defects & trip the breaker in a controlled & selected manner. Understanding each setting facilitates proper relay

Relay Settings Calculations

During external faults, the relay changes to high-security mode and switches from Slope 1 to Slope 2 to avoid relay mal-operation resulting from CT saturation. In contrast to small CT errors for load current,

Relay Settings Calculations – Protection Relay

This technical report refers to the electrical protection of all 132kV switchgear. These settings may be re-evaluated during the commissioning, according to actual and measured values.

Relay Protection in HV/MV Substations: Calculations, Settings ...

This comprehensive article delves into the key aspects of relay protection in HV/MV substations, including calculations, settings, coordination, selection, and validation, which are all...

Practical handbook for relay protection engineers | EEP

Also principles of various protective relays and schemes including special protection schemes like differential, restricted, directional and distance relays are explained with sketches. The

Distribution Automation Handbook

When the protection is implemented using a voltage relay, the selected setting must be equal to or exceed the calculated stabilizing voltage. The value of the stabilizing resistor is determined according

Protection Relay Setting Interactive Calculator | FIRGELLI

Use this Protection Relay Setting Calculator to calculate pickup current, time multiplier settings (TMS), operating time, coordination time interval (CTI), and plug setting multiplier (PSM)

Line protection calculations and setting guidelines for relays ...

Line protection calculations and setting guidelines for relays installed at 765kV, 400kV, 220kV transmission systems (photo credit: Edvard CSANYI)

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Pick Up Current | Current Setting | Plug Setting Multiplier and Time ...

When studying electrical protective relays, we often use specific terms. To understand how different protective relays work, it''s essential to know these terms. Key terms include: Pick up

Phase Failure Relay (Voltage Monitoring Relay): Complete Guide for ...

Phase Failure Relay (Voltage Monitoring Relay) working diagram with correct wiring, applications and protection logic. Learn how phase sequence, under-voltage, over-voltage and

ABB Protection Relay Configuration and Commissioning

On-site Protection Relay Configuration & Commissioning Today, I had the opportunity to configure and program an ABB Protection Relay, a critical component in modern power systems that provides ...

e series protective relay troubleshooting guide

Use the online E-Series protective relays troubleshooting guide to diagnosis and correct issues with Eaton''s motor relay, generator relay, distributor relay, transmission relay and bus differential relay.

Relay Settings Calculations – Electrical Engineering

This technical report refers to the electrical protection of all 132kV switchgear. These settings may be re-evaluated during the commissioning, according to actual and measured values. Protection selectivity

Relay Settings Calculations

Introduction This technical report refers to the electrical protections of all 132kV switchgear. All calculations are based on the available documentation/ information. These settings may be

Line protection calculations and setting guidelines for relays ...

Protection Settings The documents presented should serve as a model to various utilities in preparing similar documents for setting protection relays installed installed at 220kV, 400kV and

RELAY SETTING CALCULATION

2.2 115/13.8KV Transformer LV Restircted Earth Fault Protection Relay Setting Circuit Ref : Aux.

SEL-351 Protection System | Schweitzer Engineering Laboratories

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The SEL-351 Relay has built-in Ethernet and IEEE C37.118 synchrophasors, and is ideal for directional overcurrent applications. Optional Mirrored Bits® communications and power quality monitoring add

How to Determine Optimal Settings for Power System Protection Relays

Learn about the best methods and tools to choose the right settings for power system protection relays, and improve your network safety, reliability, and efficiency.

Related Video Reference

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

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