Calculation of Factory Relay Protection Settings





Overview

Relay Settings CalculationsZero sequence compensation factor can be applied independently to all zones if required. The feature is useful where line impeda.

Key Takeaways

Factory relay protection settings are calculated by determining pickup currents, time delays, and coordination parameters based on system characteristics, motor data, and fault levels to ensure selective and reliable protection. Key Steps for Calculating Relay Settings1.

Collect System and Equipment Data

Record motor nameplate data: rated power, voltage, full-load amps (FLA), service factor, locked rotor current, and insulation class. Determine line and feeder parameters: line impedance, maximum and minimum fault currents, grounding method, and transformer ratings. Identify current transformer (CT) ratios and accuracy class (e.g., 5P20 or 10P20) and ensure all CTs in differential protection schemes have identical ratios.

2.

Determine Pickup Currents

For overcurrent relays (ANSI 50/51), set the instantaneous pickup above the locked rotor current to avoid nuisance trips, typically 1. 7–2 times LRA. For thermal overload protection (ANSI 49), set the pickup at 115–125% of motor full-load amps depending on service factor.

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For distance or line relays, calculate zone reaches based on line impedance: Zone 1 = 80–90% of line impedance, Zone 2 = 100% of protected line + 50% of adjacent line, Zone 3 = 100% + 120% of adjacent longest line. 3.

Set Time Delays and Coordination

Instantaneous elements should clear faults without tripping for normal load currents or downstream faults. Inverse time relays require calculation of operating time using the relay curve (Standard Inverse, Very Inverse, Extremely Inverse, or Long Time Inverse) and time multiplier settings (TMS),. Coordination time interval (CTI) or grading time ensures downstream relays operate first, with upstream relays providing backup.

Typical numerical relays use a margin of 0. 2–0. 3 s for selectivity.

4.

Verify Settings Against Fault Currents

Calculate the multiple of pickup (MOP) for each relay using the maximum short-circuit current and CT ratio. Determine the operating time for each relay and ensure proper coordination with upstream and downstream devices. Adjust settings iteratively to prevent nuisance trips while maintaining protection coverage.

5.

Special Considerations

Include resistive and arc contributions in line impedance for distance relays (e.g., tower footing resistance, arc resistance),. For ground fault protection, set reach and angle according to positive sequence impedance and system grounding method. For motors with RTDs, ensure thermal protection trips before hot stall limits.

6.

Use Tools and Calculators

Interactive calculators can simplify calculations for pickup current, TMS, operating time, and coordination intervals. Numerical relays often allow direct input of settings and automatic calculation of operating times based on IEC 60255 curves.

Summary

Calculating factory relay protection settings requires a systematic approach: gather accurate system and motor data, calculate pickup currents, set time delays and coordination intervals, verify against fault currents, and adjust for selectivity. Properly applied, these steps ensure reliable, selective, and safe operation of industrial electrical systems, minimizing downtime and equipment damage.

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Calculate thermal overload, overcurrent, ground fault, and differential relay settings with step-by-step examples. Covers CT ratios and common mistakes.

Distance Protection Relay Settings (Zone 1, Zone 2, Zone 3 ...

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Motor protection relay settings are calculated from motor nameplate data, current transformer ratios, and system grounding method. For thermal

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SID The calculated settings are tabulated in a schedule and co-ordination curves demonstrating grading for the over current protection and earth fault are dr together with th As a first step Fault calculations

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The document provides calculations for relay settings for different components in a power system network. It calculates the fault current, protective relay settings, and operating times for outgoing

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

SEL Relay Settings Calculation for 1 MW Generator

SEL Relay Settings Calculation for 1 MW Generator GEN 2 BU SEL-700GT+ Backup, Part No: SEL- 0700GT1A2X9X75850330 The following procedures guide the reader through the process of setting

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