

Relay Protection Performance Verification GB



Overview

Table 2 captures recommendations for availability and delay performance for each function of a protection system.

Key Takeaways

Relay protection performance verification ensures that protective relays operate correctly under fault conditions, safeguarding equipment and maintaining power system reliability.

Relay protection performance verification is a critical process in power systems to confirm that protective relays respond accurately to abnormal conditions such as short circuits, overloads, or ground faults. The verification process ensures system reliability, safety, and compliance with national and international standards (IEC 60255, IEEE C37.90, and relevant GB standards) and typically involves type testing, commissioning tests, and periodic functional testing .

Key Verification Methods



1. **Type Testing** Type tests are conducted at the manufacturer's facility to confirm that a relay meets its specifications and standards. These tests simulate abnormal operating conditions to ensure the relay functions correctly under fault scenarios. Digital and numerical relays undergo both hardware and software testing, which is more complex than electromechanical relays . 2. **Commissioning Tests** Performed on-site before the relay is put into service, commissioning tests verify that the relay configuration, wiring, and settings are correct. This includes functional tests, relay settings verification, and complete system operation checks . 3. **Functional Testing** Functional tests simulate fault conditions to verify relay operation. This includes:

- Pickup and dropout testing (activation and deactivation points)
 - Time delay verification for time-dependent functions
 - Directional feature testing for directional relays
 - Trip testing to ensure breakers respond correctly
 - Stability and sensitivity testing for differential protection
4. **Secondary Injection Testing** This method injects controlled currents or voltages into the relay's secondary circuits to simulate faults without energizing the primary system. It is widely used for accurate, safe, and repeatable verification of relay performance and settings . 5. **Primary Current Injection Testing** High-current injection tests simulate real fault currents through the primary circuit, verifying the relay and associated equipment under actual operating conditions. This method is essential for ground fault and high-current protection systems .

Additional Considerations

- **CT Matching and Inverse Time Characteristics:** Ensures current transformers are properly matched and relays follow the correct time-current curves .
- **Documentation:** Maintain written records of all tests, including settings, results, and any corrective actions.
- **Qualified Personnel:** Testing should be performed by trained engineers or certified testing organizations to ensure safety and accuracy .
- **Software Tools:** Modern relay test sets, such as Megger FREJA and SMRT, provide automated testing, IEC 61850 network access, and asset management capabilities, enhancing verification efficiency and cybersecurity .

Summary

Relay protection performance verification under GB standards involves a combination of type testing, commissioning, functional testing, and both secondary and primary injection methods. These procedures ensure that relays operate correctly under fault conditions, maintain system stability, and comply with safety and reliability standards. Using advanced test equipment and maintaining proper documentation are essential for effective verification and long-term system performance.

Article Content

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The testing and verification of relay protection devices can be divided into four groups: Type tests are needed to prove that a

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