

New Standards for Relay Protection



Overview

Transformer protection relays are used for protection, control, measurement and supervision of power transformers.

Key Takeaways

Modern relay protection standards focus on reliability, speed, coordination, and adaptation to power-electronics dominated grids, guided by IEEE C37.113-2025 and IEC 60255-1:2022.

Key International Standards

IEEE C37.113-2025 provides guidance for AC transmission line protection, covering relay characteristics, coordination of settings, operating times, mutual line coupling, and communication channel use. It helps engineers select and apply relays effectively to protect transmission lines while ensuring system stability and reliability .

IEC 60255-1:2022 specifies common rules and requirements for measuring relays and protection equipment, including distributed protection schemes, control, monitoring, and process interface equipment. This standard ensures uniformity in testing, safety, and electromagnetic compatibility across modern relay technologies, including numerical and multifunctional devices .

Emerging Trends and Challenges



The global energy transition and integration of renewable sources have led to power-electronics dominated grids (PEDGs). Traditional relay protection may be less effective in these systems, increasing the risk of mis-operation. IEC trend reports highlight the need for advanced protection strategies, updates to IEC 61850, and development of AI-based verification standards to maintain grid stability .

Practical Guidance for Engineers

Practical handbooks emphasize:

- Relay selection and coordination for generators, transformers, lines, and capacitor banks.
- Testing and commissioning procedures, including station battery management and breaker trip circuits.
- Relay functional requirements: reliability, sensitivity, speed, and discrimination between fault and normal conditions.
- Types of relays: current, voltage, impedance, power, frequency, differential, directional, and distance relays, with definite-time, inverse-time, and logic-based characteristics .

Summary

Modern relay protection standards combine established principles with advanced numerical and multifunctional devices, ensuring fast, reliable, and coordinated fault isolation. Engineers must consider emerging grid architectures, renewable integration, and AI-assisted verification to maintain system stability and compliance with IEEE and IEC standards.

Article Content

IEC 60255-1:2022

This document covers the main technologies in use today; other emerging technologies present specific EMC and safety issues but

NOTICE OF NEW STANDARD PRODUCTS

Power System Relays Standards concentrate on the application, design, construction and operation of protective, regulating,

Installing and Maintaining Protective Relay Systems

NERC has developed Standard PRC-005, to ensure that all transmission and generation protection systems affecting the reliability of

PRC-023-6

Number: PRC-023-6 Purpose: Protective relay settings shall not limit transmission loadability; not interfere with system operators"

IEC 60255 1xx: Protection relay functional standards for all

The International Electrotechnical Commission (IEC) is currently working on a new series of standards that covers the

C37.90.1-2024

This standard specifies design tests for relays, relay systems, and control devices used for the protection and control of electric

Power System Protective Relays: Principles & Practices

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

IEC 60255 1xx: Protection relay functional standards for all

To meet this need, the IEC is currently working on the IEC 60255-1xx series of functional standards dedicated to

PC37.90/D1, Sept 2024

Service conditions, electrical ratings, thermal ratings, and testing requirements are defined for relays and relay systems used to

Basic protection relay knowledge

A fast and selective arc fault mitigation for air-insulated LV & MV switchgear and Relion protection and control relays and sensor

Microsoft PowerPoint

A primary motor protective element of the motor protection relay is the thermal overload element and this is accomplished through

Primary Protection Relays | ABB

The main purpose of a protection and control relay is to recognize any abnormal power system condition(s), or abnormally operating

IEEE Guide for Protective Relay Applications to Transmission Lines

The impact of different electrical parameters and system performance considerations on the selection of relays and protection

PROTECTIVE RELAY TESTING

A comprehensive testing program should simulate fault and normal operating conditions of the relay. Acceptance testing,

Protective Relaying Philosophy and Design Guidelines

SECTION 1: Introduction Introduction This document supplements PJM Manual 07 which contains the minimum design standards

IEEE Std C37.90 -2005, IEEE Standard for Relays and Relay

This standard specifies standard service conditions, standard ratings, performance requirements, and testing requirements for relays

Transformer protection and control

Transformer protection relays are used for protection, control, measurement and supervision of power transformers.

PC37.113/D3.5, Sept 2024

Scope: Concepts and applications of AC transmission line protection are presented in this guide. Many important issues, such as

IEC Trend Report Relay protection for PEDGs:2025 | IEC

Recognizing the dire need for advanced relay protection, this report presents a comprehensive analysis of the evolving landscape. It

C37.90.1-2024

Purpose: This standard establishes a common and reproducible basis for evaluating the performance of relays, relay systems, and

Protection Relay Testing

Reliably working protection relays are key in modern energy systems. Read on to learn about best

Practical handbook for relay protection engineers | EEP

Relay protection circuitry This handbook covers the code of practice in protection circuitry including standard lead and

Distribution Automation Handbook

8.2.2 Time-graded Protection A straightforward way of obtaining selective protection is to use time grading. The principle is to grade

Protection and Control Device Numbers and Functions

These numbers are based on a system that is adopted by a standard for automatic switchgear by Institute of Electrical and

C37.91-2021

Information to assist protection engineers in properly applying relays and other devices to protect transformers used in

Protection Relay Types and Testing Procedures

Introduction In modern electrical systems, protection relays are critical for ensuring safe and efficient operations.

SELECTION GUIDE

SELECTION GUIDE TE Connectivity (TE) is your components provider for relays that help increase reliability and enhance

Protection Relay Testing and Commissioning

Since type testing of a digital or numerical protection relay includes software and hardware testing, the type testing procedure is very

Relay Maintenance and Testing

Ensure optimum system performance, efficiency, and safety with preventive relay maintenance and testing Today's challenges in

Basic protection relay knowledge

A fast and selective arc fault mitigation for air-insulated LV & MV switchgear and Relion protection and control relays and sensor

Microsoft PowerPoint

A primary motor protective element of the motor protection relay is the thermal overload element and this is accomplished through

Primary Protection Relays | ABB

The main purpose of a protection and control relay is to recognize any abnormal power system condition(s), or abnormally operating

IEEE Guide for Protective Relay Applications to Transmission Lines

The impact of different electrical parameters and system performance considerations on the selection of relays and protection

PROTECTIVE RELAY TESTING

A comprehensive testing program should simulate fault and normal operating conditions of the relay. Acceptance testing,

Protective Relaying Philosophy and Design Guidelines

SECTION 1: Introduction Introduction This document supplements PJM Manual 07 which contains the minimum design standards

Operation, maintenance, and field test procedures for protective relays

One approach to test the total protection system is to use primary injection techniques (see appendix H) that trigger

Collection_vuSpec

This powerful collection contains over 184 IEEE Standards, Guides, and Recommended Practices, including Errata & Interpretations

C37.230-2020

C37.230-2020 - IEEE Guide for Protective Relay Applications to Distribution Lines
Abstract: A review of generally accepted

IEC 60255 1xx: Protection relay functional standards for all

The new protection relay functional standards are designated as the IEC 60255-1xx series. The standardisation of

IEEE Std C37.90 -2005, IEEE Standard for Relays and Relay

This standard specifies standard service conditions, standard ratings, performance requirements, and testing requirements for relays

Transformer protection and control

Transformer protection relays are used for protection, control, measurement and supervision of power transformers.

PC37.113/D3.5, Sept 2024

Scope: Concepts and applications of AC transmission line protection are presented in this guide. Many important issues, such as

IEC Trend Report Relay protection for PEDGs:2025 | IEC

Recognizing the dire need for advanced relay protection, this report presents a comprehensive analysis of the evolving landscape. It

IEC 60255-1:2022

This document covers the main technologies in use today; other emerging technologies present specific EMC and safety issues but

NOTICE OF NEW STANDARD PRODUCTS

Power System Relays Standards concentrate on the application, design, construction and operation of protective, regulating,

Installing and Maintaining Protective Relay Systems

NERC has developed Standard PRC-005, to ensure that all transmission and generation protection systems affecting the reliability of

PRC-023-6

Number: PRC-023-6 Purpose: Protective relay settings shall not limit transmission loadability; not interfere with system operators"

IEC 60255 1xx: Protection relay functional standards for all

The International Electrotechnical Commission (IEC) is currently working on a new series of standards that covers the

C37.90.1-2024

This standard specifies design tests for relays, relay systems, and control devices used for the protection and control of electric

Power System Protective Relays: Principles & Practices

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

IEC 60255 1xx: Protection relay functional standards for all

To meet this need, the IEC is currently working on the IEC 60255-1xx series of functional standards dedicated to

PC37.90/D1, Sept 2024

Service conditions, electrical ratings, thermal ratings, and testing requirements are defined for relays and relay systems used to

IEC 60255-1:2022

This document covers the main technologies in use today; other emerging technologies present specific EMC and safety issues but

NOTICE OF NEW STANDARD PRODUCTS

Power System Relays Standards concentrate on the application, design, construction and operation of protective, regulating,

Installing and Maintaining Protective Relay Systems

NERC has developed Standard PRC-005, to ensure that all transmission and generation protection systems affecting the reliability of

PRC-023-6

Number: PRC-023-6 Purpose: Protective relay settings shall not limit transmission loadability; not interfere with system operators"

IEC 60255 1xx: Protection relay functional standards for all

The International Electrotechnical Commission (IEC) is currently working on a new series of standards that covers the

C37.90.1-2024

This standard specifies design tests for relays, relay systems, and control devices used for the protection and control of electric

Power System Protective Relays: Principles & Practices

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

IEC 60255 1xx: Protection relay functional standards for all

To meet this need, the IEC is currently working on the IEC 60255-1xx series of functional standards dedicated to

PC37.90/D1, Sept 2024

Service conditions, electrical ratings, thermal ratings, and testing requirements are defined for relays and relay systems used to

Contact Us

Continue your research online:

Website: <https://thegalleryselfcatering.co.za>

Technical inquiry: <https://thegalleryselfcatering.co.za/contact.html>

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

