

Methods for Detecting the Status of Distribution Boxes



Overview

Methods for Detecting the Status of Distribution BoxesThe present invention relates to a diagnosis system and method for detecting an internal abnormality.

Key Takeaways

Distribution box status can be detected using sensor-based monitoring, remote IoT systems, AI-driven image recognition, and fuzzy decision-making models.Sensor-Based and Smart Monitoring

Modern distribution boxes often integrate sensors to measure voltage, current, power consumption, temperature, and other critical parameters in real time. These sensors enable operators to track load patterns, detect anomalies, and identify faults such as overloads, short circuits, or ground faults. Alerts can be sent automatically via SMS, email, or mobile apps, allowing rapid response to prevent damage or outages . Smart boxes can also interface with Building Management Systems (BMS) for centralized monitoring and energy optimization .

Remote and IoT-Based Monitoring



Intelligent remote monitoring solutions allow distribution boxes to transmit data over networks, enabling operators to collect electric meter readings and control safety remotely. Devices like rail-type networked communication modules (e.g., DR series) can convert RS485 ports to Ethernet or connect via Wi-Fi or 4G to cloud platforms. This approach reduces manual inspection, improves data reliability, and supports energy management and safety control. Cloud-based platforms can also facilitate remote diagnostics, firmware updates, and predictive maintenance.

AI and Image Recognition Methods

For distribution boxes with visual indicators such as switches and lights, AI-based image recognition can automatically detect operational status. Methods like improved Faster R-CNN models use deep learning with feature extraction networks (e.g., ResNet50) to identify multiple targets on cabinet panels efficiently. This approach reduces labor costs and improves accuracy compared to manual inspection.

Fuzzy Decision-Making and Data-Driven Assessment

Advanced methods use fuzzy decision-making combined with machine learning algorithms (e.g., XGBoost) to evaluate the operational status of distribution equipment. Key indices from multi-source data are mapped to status scores, allowing rapid and accurate assessment of transformers, circuit breakers, and other components. This method reduces subjective bias, handles dispersed monitoring data, and improves reliability in large-scale distribution networks.

Standards and High-Precision Instruments

Monitoring instruments like the WTYJ-PD type system comply with international standards (IEC 62053-21/22/23:2020) and provide high-precision measurements (error

Article Content

IoT-Ready Distribution Boxes: Remote Monitoring Benefits

Expert guide on IoT-ready distribution boxes: remote monitoring benefits, design patterns, connector selection, and

Intelligent Remote Distribution Box Monitoring Solution

The distribution box is embedded with the DTU distribution device, distribution device power module, and distribution device power

Underground Cable Fault Detection: Locating and Preventing Failures

Locating and preventing failures in underground cable systems for modern distribution networks using ground fault sensors, earth

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

