pinaxa

Fiber Optic Temperature Measurement System

PNX-FOTMS

The Pinaxa FOTMS delivers accurate, real-time hot-spot monitoring for transformers in box-type substations. Featuring complete electro--magnetic immunity and a 30-year lifespan, this multi-channel system provides safe, spark-free contact tracking of critical low-voltage contacts and cable joints to prevent catastrophic insulation failure.

Modbus RoHS COMPLIANT IEC

The Pinaxa Fiber Optic Temperature Measurement System utilizes cutting-edge fluorescent lifetime decay technology to deliver precise, online temperature monitoring for critical high-voltage assets. Specifically engineered for box-type substations, this multi-channel system ensures non-intrusive contact monitoring of low-voltage circuit breaker contacts and cable joints. Completely immune to intense electromagnetic fields (EMI/RFI), it provides utility operators with continuous 24/7 real-time tracking, multi-level over-temperature alarms, and automated asset-health reports enabling smooth transitions to condition-based predictive maintenance.

The system operates on the principle of fluorescence lifetime decay. The probe tip contains a customized fluorescent material stimulated by a specific light wavelength via a multimode quartz fiber optic cable. Upon revoking the stimulus, the persistence of the fluorescence afterglow decays exponentially. Because this decay time constant (fluorescence lifetime) is a precise mathematical function of the surrounding ambient temperature, the system accurately tracks thermal changes in real time without any electrical components at the measurement point.

System Advantages & Operational Features

- Complete Galvanic Isolation: Contact measurement method provides superior electrical insulation, preventing any compromise to the box-type substation's dielectric performance.
- Total EMI/RFI Immunity: Built entirely from quartz fiber optic material, the system operates completely unaffected by the extreme electromagnetic environments inherent to high-voltage equipment.
- Rapid Thermal Dynamics: Delivers real-time temperature updates, capturing sudden hot-spot rises and compiling instantaneous thermal-rate anomaly reports.
- Intelligent Alarm Management: Features user-configurable, multi-level temperature thresholds alongside automated rate-of-rise thermal alerts.
- Robust Data Logging: Integrated memory layer saves long-term temperature trends, maximum peak thresholds, and chronological alarm logs.
- Unmanned Operation Capability: Built-in automated intelligence facilitates continuous 24/7 remote substation surveillance.

Applications

- IEC 61850 Substation Automation: Directly integrates FOTMS data into digital substations, enabling high-speed GOOSE messaging and MMS communication with intelligent electronic devices (IEDs).

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- Grid-Edge & Distributed Energy Resources (DER): Utilizes IEC 60870-5-104 (TCP/IP) and 101(Serial) protocols to stream remote thermal telemetry from wind, solar, and energy storage step-up substations.
- Modern Utility SCADA & Control Centers: Connects via Modbus TCP to provide real-time, high bandwidth temperature logging, diagnostic visualization, and automated remote alarms on plant dashboards.
- Legacy PLC & Industrial Automation: Maps critical point temperatures to hardware loops using multi channel 4-20mA analog outputs, allowing direct wire connection to existing RTUs and emergency trip systems.
- Smart Grid Transformer Fleet Management: Feeds comprehensive thermal profile data across wide-area communication networks, driving predictive maintenance algorithms and active transformer cooling controls.

Technical Specification

Sensing Technology Type	Fluorescent Lifetime Decay / Quartz Fiber Optic
Temperature Measurement Range	-80°C to +200°C
Substation Standard Operating Window	-20°C to +150°C
Measurement Accuracy	±1.0 °C
Resolution / Resolving Power	0.1 °C
Channel Capacity	1 to 64 Channels
High-Voltage Isolation Resistance	100 KV (Fiber Optic Probe)
Fiber Optic Probe Diameter	3 mm
Fluorescent Fiber Length	0 to 20 Meters
Expected Sensor Probe Lifespan	≥ 30 Years
System Power Supply	AC/DC 220V
Communication Protocols	IEC61850, Modbus, TCP/IP, DNP3, MQTT

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