

Passive Wireless Temperature Monitoring

White Paper 2026 | From manual infrared spot checks to node-level real-time temperature sensing

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Why passive wireless temperature monitoring

Overheating is the most common and hidden precursor of electrical equipment failure. Switchgear contacts, cable terminations, busbar joints, transformer bushings and leads slowly heat under load and contact ageing - once beyond insulation tolerance, welding, fire and wide-area outages can follow.

Pain points: manual infrared spot checks have low coverage and cannot capture transient overheating at load peaks; live high-voltage nodes cannot take long-term powered probes (outage cost high); large-scale cabling is difficult in existing stations.

Passive wireless temperature sensing is designed exactly for 'no outage, no cabling, long-term online' scenarios, upgrading temperature from occasional measurement to node-level real-time awareness.

Technology architecture

HUWOR temperature monitoring shares the same four-layer end-to-end architecture as PD and arrester monitoring, deployable standalone or into one platform for multi-parameter fusion.

Passive wireless temperature sensors work by RFID inductive / electromagnetic energy harvesting - no external battery or power supply. They only measure temperature and transmit wirelessly for short periods, so they can be permanently mounted on live nodes - the fundamental difference from traditional powered probes.

Layers: sensing (RFID/energy-harvesting sensors on contacts, cable heads, busbars, transformer bodies) - edge acquisition (temperature data collector / concentrator node, RFID read/write, wireless reception, on-site pre-processing) - data transport (IoT concentrator, LoRa/433 MHz/2.4G aggregation, Ethernet/4G uplink) - platform application (B/S intelligent condition monitoring, temperature trends, limit alarms, thermal-defect grading, mobile push).

Core product family

Passive wireless temperature sensors (HMJ10xx series):

Range: -40 ~ +150 C; accuracy +/- 1 C.

Power: passive - RFID / inductive energy harvesting, no battery or external supply.

Communication: wireless (RFID / 433 MHz / 2.4G) via collector; no temperature cables.

Protection: IP67; design life > 10 years (meets and exceeds the >= 10-year grid requirement, Q/GDW 1535-2015 / DL/T 1498).

Mounting: tuning-fork / buckle / clip / nut / clamp / lashing types for contacts, cable heads, busbars, bushings and leads.

Edge devices: temperature data collector (RFID read/write, 433 MHz / 2.4G wireless acquisition); IoT concentrator HMJ1020-WJ series (AC 100-240 V; LoRa + RS485 + Ethernet downlink; RS485 + Ethernet + fibre + 4G uplink; IEC 61850; -148 dBm sensitivity).

Selection guide

Switchgear / RMU cable heads: passive wireless sensors (buckle / lashing) + temperature collector - outage-free mounting, in-cabinet wireless aggregation.

Box-type substations: passive wireless sensors (multi-mount) + concentrator - in/out lines and transformer-room hotspots.

Transformer bodies: passive wireless sensors (nut / clamp) + concentrator - bushings, leads and tap changers where cabling is impractical.

New builds (cabled): concentrator with RS485/fibre wired access, planned with the station monitoring network.

Retrofit: passive wireless preferred - no cabling, no outage, no maintenance.

Deployment & operation

Installation: sensors matched to node shapes (tuning-fork/buckle/clip/nut/clamp/lashing), no outage, no cabling.

Aggregation: collectors/concentrators deployed locally; multi-cabinet sites aggregated via concentrator to station control or platform.

Alarming: dual criteria of temperature-rise rate and absolute temperature with thermal-defect grading (general/major/critical), cross-checkable with infrared results.

Maintenance: passive, no periodic battery replacement, long-term online.

Software & multi-parameter fusion

Intelligent Condition Monitoring System: B/S, VUE + microservices, MySQL/SQLite + Redis, MQTT/HTTP, PRPS/PRPD, Modbus/IEC 61850, Android 4.2+ / HarmonyOS 2.0+.

Temperature data fuses with PD, arrester and SF6 data on one platform. Example: switchgear monitored for both temperature and PD (TEV/AE/UHF) can distinguish 'pure overheating' from 'discharge with overheating', significantly improving defect classification.

Trust evidence & track record

Design life > 10 years, meeting and exceeding grid standards Q/GDW 1535-2015 / DL/T 1498 (>= 10 years for online monitoring devices).

National high-tech enterprise since 2010, continuously serving State Grid and China Southern Power Grid.

39 granted patents (11 invention), 63 software copyrights; Guangdong famous high-tech product.

2026 State Grid Sichuan / Jiangxi framework awards and 2025 CSG consecutive framework awards (three-grid coverage).

Full service qualification chain: live-line testing, infrared testing, special operations (HV/LV/height), power installation (repair/test) - enabling a closed 'monitoring + testing' service loop.

About Huawang Technology (HUWOR)

Zhuhai Huawang Technology Co., Ltd. (HUWOR) is a national high-tech enterprise established in 2010, specialising in condition monitoring and assessment of power equipment. The company supplies smart sensors, testing instruments and online monitoring systems for partial discharge detection, with R&D; centres in Zhuhai and Xi'an, 39 granted patents (11 invention), 63 software copyrights and ISO 9001/14001/45001 certified manufacturing. HUWOR supports OEM and ODM projects for distributors and system integrators worldwide.