

PAS DGA

Transformer Condition Monitoring · DGA & Partial Discharge

TPD-400

Transformer Partial Discharge (PD) On-line Monitoring System

Multi-sensor UHF · RF · AE · HF (HFCT) | Model: TPD-400

1 Product Overview

The TPD-400 is a multi-sensor, on-line partial-discharge (PD) monitoring system for the insulation-condition monitoring of 110 kV and above oil-immersed power transformers. It continuously acquires PD activity using four complementary sensing techniques: UHF (300–1500 MHz) and RF electromagnetic sensing, acoustic emission (AE / ultrasonic, 80–200 kHz) and high-frequency pulse-current sensing via clamp-on HF current transformer (0.3–30 MHz). Minimum detectable discharge is 5 pC; the acquisition unit withstands a 600 kV flashover impulse without damage or data loss.

The system is designed for energized (live) installation: sensors are fitted to the transformer tank, drain valve / hand-hole, core-clamp earth and radiator areas without changing the transformer's internal structure, sealing or insulation. A rack-mount PD acquisition unit (IED) digitises and phase-synchronises the sensor signals; a host server with browser-based analysis software presents PD trends and phase-resolved maps (PRPD / PRPS / phase-linear / ellipse), compares patterns against an expert discharge library and issues alarms. The TPD-400 reports PD as a trend quantity (dBm / mV / event rate) consistent with non-conventional PD measurement practice (IEC TS 62478 / GB/T 42287) and complements DGA in transformer condition monitoring.

Key Features

- **Multi-method sensing** — UHF, RF, AE and HF (HFCT) in one system.
- **High sensitivity** — minimum detectable discharge 5 pC; UHF range –80 ... –10 dBm, dynamic range ≥60 dB.
- **High-speed synchronous acquisition** — 125 MS/s, 14-bit, multi-channel, common-trigger skew <100 ns.
- **Rugged for substations** — withstands 600 kV flashover impulse; –30 °C ... +60 °C, RH ≤95%.
- **Live installation** — oil-valve / hand-hole UHF, tank-wall AE, clamp-on HFCT; no transformer outage.
- **Expert diagnostics** — discharge-pattern & neural-network fault library; PRPD / PRPS / trend displays.
- **Flexible communications** — fibre, wired network, RS-485, 4G; IEC 61850 (DL/T 860) integration (†, option).

2 Sensing Methods

Method	Band	Key parameters	Mounting
UHF (built-in / external)	300 – 1500 MHz	Avg. effective height ≥10 mm; range –80 ... –10 dBm; res. 0.1 dBm; ≥60 dB; 50 Ω coax	Internal (oil-valve / hand-hole / tank fitment) or external
RF (broadband)	300 – 1500 MHz	0.1 dBm resolution; ≥60 dB dynamic range; –80 ... –10 dBm; 50 Ω coax	External antenna / sensor head
AE (contact ultrasonic)	80 – 200 kHz (centre 150 kHz)	Piezo element, 67 dB; gain 20–60 dB; >40 dB dynamic; linearity <±20%; 50 Ω coax	Magnetic mount on tank wall — 2 per side on the three non-HV-bushing sides
HF (HFCT)	0.3 – 30 MHz	Transfer impedance ≥10 mV/mA; input 50 Ω; gain 0–30 dB; filter 3 M / 300 k / 100 k–30 MHz	Clamp-on around core-clamp earth, tank earth, cable screen/armour



Interconnection to the IED is 50 Ω coaxial — UHF/RF N–N, AE N–M5, HF N–BNC. IED $\leftrightarrow$ server by fibre / network / RS-485 / 4G per site distance.

3 Technical Specifications

Item	Specification
Application	On-line PD monitoring of 110 kV+ oil-immersed power transformers (UHF, RF, HF & AE), no outage
Minimum detectable discharge	5 pC
Impulse withstand	600 kV flashover — unit not damaged, data not lost
Operating temperature / RH	–30 °C ... +60 °C / $\leq 95\%$
Power supply	External AC 220 V
Sampling / resolution	125 MS/s / 14 bit
Channels / synchronisation	Multi-channel synchronous (16-channel platform, configured per project); external-voltage or internal sync; common-trigger skew <100 ns
Acquisition window	Statistical processing over ~50 power-frequency cycles
Data handling	Local storage + edge processing; peak/RMS + time-stamp per cycle; on-demand upload
Communications	Optical fibre / wired network / RS-485 / 4G; IEC 61850 (DL/T 860) integration (†, option)
Software	Browser-based; trend / PRPD / PRPS / phase-linear (Q- ϕ , N- ϕ) / ellipse; thresholds & ranges per sensor; expert & neural-network diagnostics
Mounting	Sensors: tank / valve / hand-hole / clamp; IED: rack-mount in local (marshalling) cabinet

Compliance orientation: engineered per IEC TS 62478 / GB/T 42287 non-conventional PD measurement, IEC 60270 (Ed.4), IEEE C57.127 / C57.113, DL/T 1498.1 and DL/T 1694.1 design context. Formal third-party type/EMC test reports, where evidenced, are supplied with the controlled datasheet (†).

4 Configuration & Ordering Information

Order Code	Configuration
TPD-400-U	UHF/RF PD monitoring — IED + internal (oil-valve/hand-hole) or external UHF/RF sensors, cabling kit.
TPD-400-H	HF (HFCT) PD monitoring — IED + clamp-on HF sensors (core-clamp / tank earth).
TPD-400-A	AE (ultrasonic) PD monitoring — IED + contact AE sensors + magnetic mounts.
TPD-400-C	Combined (recommended) — UHF + HF (+ AE option) multi-method package.
TPD-400-OEM	Sensor + acquisition core for OEMs / system integrators, private-label ready.