

AMPERIS E3

Transformer monitoring



Monitoring, control and communication for the whole transformer in one modular system

E3

Power transformer monitor

amperis

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Detection and diagnosis of problems in bushings, windings, OLTC, cooling system and insulation of power transformers.

Product overview



Modular assembly with CPU, I/O modules and power supply

Complete transformer monitoring

The AMPERIS E3 is a modular monitoring, control and communication system engineered to order for each power transformer. On top of the thermal base — top oil temperature, ambient temperature, load current, calculated winding hot spot and insulation aging — it supervises up to 12 bushings through capacitance-tap sensors, the on-load tap changer (OLTC), the cooling system, partial discharges, dissolved gases and moisture in oil, fiber optic winding probes, harmonics, through-fault counting and geomagnetically induced currents.

Detection and diagnosis

Built-in analytics turn data into diagnosis: the bushing sensors measure capacitance and power factor, learn the behaviour with load, humidity and temperature and alarm on any deviation; the partial discharge monitor acquires 15 simultaneous channels with noise cancellation; and the OLTC functions calculate the arcing wear of each contact, the motor current, the Delta T temperature difference and excessive tap changes. A fuzzy-logic moisture model assesses the active water in the paper insulation.

Main features

- Up to 12 bushing sensors with capacitance and power factor measurement.
- 15-channel partial discharge monitor with tap sensors, RFCTs and Rogowski coils.
- Serial integration of multi-gas DGA analysers and moisture-in-oil sensors.
- Fiber optic probes: 4 per module and up to 3 modules (12 probes), -30 to +200 °C.
- Thermal model to IEC 60076-7 / IEEE C57 with dynamic rating of the transformer.
- Harmonics, through-fault counting and geomagnetically induced current (GIC) detection.



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Control and communications

Predictive SMART cooling

The cooling control supports more than four discrete stages, dual-speed fans, parallel pumps with running-hour balancing and variable speed drives. The predictive SMART function starts the coolers ahead of the predicted ultimate oil and winding temperatures, reducing insulation loss of life and reserving overload capacity, with periodic exercising of the cooling system and a low-temperature pump inhibit.

Voltage control and paralleling

As primary or backup voltage regulator, the E3 provides line drop compensation, definite or inverse time delays and paralleling by circulating current, master-follower, VAR sharing or reverse reactance. Undervoltage, overvoltage, overcurrent and circulating-current blockings, the verification of every tap change (positive feedback) and the automatic cleaning of the reversing switch protect the tap changer.

Communications and integration

- Simultaneous master/slave protocols: IEC 61850, DNP 3.0, Modbus and TCP/IP (HTTPS, SFTP, SSH).
- RS-232, RS-485, copper and fiber Ethernet and serial fiber optic ports; radio and powerline communication.
- Pass-thru communication with DGA analysers and other IEDs, consolidated into a single SCADA link.
- Built-in web pages with no software licenses, including a virtual copy of the user display for remote support.



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Data logging, alarms and interface

Data logging

A 1-gigabyte industrial flash card stores data at user-defined intervals — by default one year of history at 1-minute intervals with up to 200 data points per minute, and up to five years — in CSV format, together with time-stamped alarm logs and configurable event logs. A self-maintained internal clock, synchronised via NTP, DNP or Modbus, stamps every record.

Consolidated alarms

The alarms of the whole transformer are grouped into common, major and minor sets — or into unlimited user-defined groups — with diagnostics of the number of occurrences, last occurrence and duration, and recommended operator actions with safety warnings and troubleshooting instructions.

Local interface and hardware

- Graphical display with historical trends, status LEDs, full numerical keypad and smart menu keys.
- Weather-resistant swing-panel mounting; display operates from -20 to +70 °C (withstands -40 to +85 °C).
- Multi-level password management per user group; optional remote display for the control room.
- I/O modules isolated to 2.5 kV AC and 5 kV impulse; 6 A form C relay outputs.
- Universal 48-275 V DC or 60-275 V AC, 50/60 Hz power supply with a typical consumption of 50 W.
- Safety to IEC 61010-1 and electromagnetic compatibility to EN 60870-2-1.



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AMPERIS E3 – TECHNICAL SPECIFICATIONS

Functions	Monitoring, control and communication; problem detection and diagnosis
Thermal monitoring	Top oil, ambient, main tank, load current, calculated winding hot spot, insulation aging
Bushing monitoring	Up to 12 capacitance-tap sensors (HV and LV); capacitance and power factor; self-learning
Partial discharge	15 simultaneous channels; tap sensors, RFCTs and Rogowski coils; 2 years of data
DGA and moisture	Serial integration of multi-gas analysers and moisture sensors; water-in-paper analytics
Fiber optics	4 probes per module, up to 3 modules (12 probes); -30 to +200 °C; ±2 °C or 1 %
OLTC	Position and per-tap counter, contact wear, motor current, Delta T, hunting detection
Network and events	Harmonics, through-fault counting, geomagnetically induced currents (GIC)
Thermal model	IEC 60076-7 / IEEE C57; dynamic rating: time remaining, maximum safe load, what-if calculations
Cooling control	Predictive SMART; more than 4 stages, dual speed, parallel pumps, VSD; periodic exercising
Voltage control	Primary or backup AVR; paralleling by circulating current, master-follower, VAR sharing and reverse reactance
Communications	IEC 61850, DNP 3.0, Modbus, TCP/IP; RS-232, RS-485, copper/fiber Ethernet, serial fiber, radio, powerline
Data logging	1-minute intervals with up to 200 data points; up to 5 years; 1 GB non-volatile; CSV export
Alarms	Common, major and minor groups; time-stamped log; occurrence and duration diagnostics
Interface	Graphical display, status LEDs, numerical keypad, weather-resistant swing panel; built-in web (HTTPS)
Inputs/outputs	12-input digital and 8-output form C 6 A modules; analog 0-1 mA, 4-20 mA, 0-10 V DC; 2.5 kV AC / 5 kV impulse isolation
Power supply	48-275 V DC or 60-275 V AC, 50/60 Hz; typical consumption 50 W
Standards and options	IEC 61010-1; EN 60870-2-1; hydrogen and moisture sensor, DGA, PD, GIC and remote display options



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