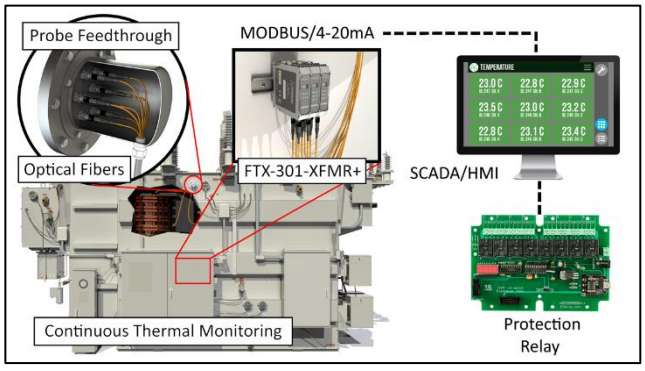
Thermal Protection for Oil-Filled Transformers

Winding Hot Spot Temperature Monitoring

Fiber optic temperature sensors have been installed in high-voltage oil-filled transformers for over twenty years and are now considered the preferred method of transformer monitoring. The benefit that fiber optic sensors offer transmission and distribution (T&D) companies is financially significant. By monitoring temperatures at each transformer winding hot spot, utilities are able to operate the transformer at peak capacity, without extending into overload conditions that can dramatically reduce the life of the transformer.

The insulation aging of transformers is directly related to the winding temperature during operation. Above the critical winding temperature (~105°C), the lifespan of the insulation deteriorates quickly. Simulating hot spot temperatures through top of oil measurements and thermal modeling has proven to underestimate insulation aging. As a result, the IEC recommends direct winding measurement for design, test, loading and maintenance. To assess and optimize oil-filled transformer for short term overloading and for failure detection, direct winding temperature sensing is a must have.

OSENSA's Oil-Filled Transformer Temperature Monitoring Solutions Meet the Challenge



OSENSA's PWR+ Temperature Monitoring Solutions provide continuous, real-time temperature monitoring of winding hot spots in oil-filled transformers. The rugged and inherently safe temperature probes accurately and instantaneously measure temperatures up to 230°C and will last the life of the transformer without replacement. Temperatures can be monitored and logged real-time with either the HMI-100 Display and Control Module, or with the TCU-300 Temperature Control Unit, with alarms for identifying temperature concerns and alerting appropriate personnel. Alternatively, the temperature transmitters can be embedded into an RTU, PLC or other control or monitoring system.

OSENSA's PWR+ solutions for oil-filled transformer include the following components:

- Temperature Transmitter - FTX-602/402/301-XFMR+
- Temperature Probes and Extension Cables – PRB-230, EXT-230
- Display and Control Module – HMI-100-PWR+, or
- Industrial PC – TCU-300

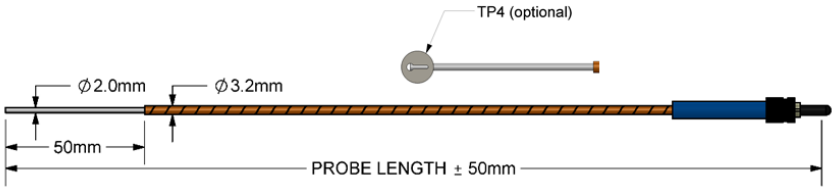
Temperature Transmitters (Signal Conditioners)

The FTX-602/402/301-XFMR+ are fiber optic temperature transmitters in a compact 35mm DIN-rail mountable format. Each transmitter accepts from one to six optical fiber sensor inputs. The FTX-602/402/301-XFMR+ transmitters are powered by 12-24V DC and include isolated RS-485 serial connectivity over industry standard Modbus RTU protocol. The FTX-301-XFMR+ model includes three isolated 4-20mA analog outputs. Multiple transmitters can be connected in series on a standard 35mm DIN rail with power and RS-485 communication supplied by the five-pin T-Bus connector.

Temperature Probes

OSENSA's PRB-230 fiber optic temperature probes are specifically designed for oil-filled transformer applications where long life and accuracy are paramount. Not only are these probes stable and repeatable over the life of the transformer (no calibration required), they also offer industry leading accuracy, precision, and reliability. The PRB-230 style probes are fully compatible with all transformer oil types and kerosene desorption processes. OSENSA's PRB-230 temperature probes, together with the EXT-230 extension cables, can support installation lengths up to 50m.

PRB-230-02M-ST-L



Display and Control Module

OSENSA's HMI-001-PWR+ touch panel display provides remote ethernet connectivity, real-time display and data logging for up to 27 fiber optic channel inputs. The intuitive touch interface enables easy configuration of external relays for alarms and hardware control. Plug in a USB stick for virtually unlimited data logging capability. An additional relay board is available to expand system control capabilities.

Industrial PC

OSENSA's TCU-300 is a small form-factor Industrial PC that easily integrates with OSENSA's FTX-series fiber optic temperature transmitters providing internet connectivity, alarms, data logging, and control. It supports up to 256GB of micro SD card storage, and a full-size HDMI connector for local HMI display. It also features 8 programmable outputs for driving external relays, in addition to three USB ports for removable storage, keyboard, or wireless LAN connectivity. There are also two isolated RS-485 ports for master and slave Modbus communications. Other protocols supported include DNP3 and Modbus over TCP/IP.

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