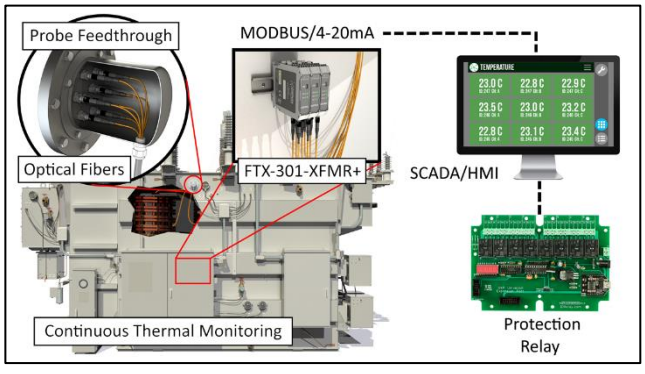
Thermal Protection for Oil-Filled Transformers

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 XFRM+ 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-001 Display and Control Module series, 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-001, HMI-001-RELAY
- Tank Wall Plate and Optical Feedthroughs – ACC-TWP-NN-316/CRS, ACC-FEEDTHRU-NPT-200

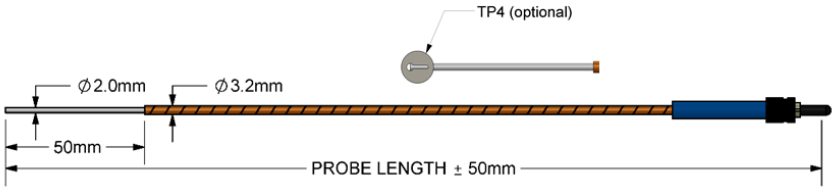
Temperature Transmitters (Signal Conditioners)

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 and HMI-001-RELAY touch panel displays provide remote ethernet connectivity, real-time display and data logging for numerous fiber optic channel inputs. OSENSA's HMI-001-RELAY touch panel additionally includes 8 standard user programmable form C relay outputs, one configurable fail-safe system relay, and 12 analog outputs. The intuitive touch interface enables easy configuration of the relays for alarms and hardware control.

Tank Wall Plate and Optical Feedthroughs

OSENSA's ACC-TWP-NN-316/CRS Tank Wall Plate allows for up to 25 optical feedthroughs to pass through an oil-filled transformer tank wall. The tank wall plate can be mounted to the transformer either by welding (CRS) or bolting (stainless steel with O-Ring). Optional mounting holes can be added for an IP rated junction box.

OSENSA's ACC-FEEDTHRU-NPT-200 Feedthrough is a hermetically sealed stainless steel ¼ inch male NPT fitting designed for use with OSENSA fiber optic temperature sensing systems. The feedthrough can provide a leak-free optical path between the tank walls of power transformers. The ST-to-ST connection provides a reliable, vibration resistant connection for OSENSA's fiber optic temperature sensing probes.

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