LUMASENSE™
TECHNOLOGIES

LumaSHIELD

GaAs-Based Winding Hot Spot Temperature Sensor for Transmission and Distribution Transformers

Extend the Life of Your Transformer with a High Quality, Cost Effective System

- Ideal for transmission and distribution transformers
- Quality performance with flexible installation options
- Helps prevent transformer failure
- Facilitates cooling management
- Improves real-time transformer load optimization and maintenance
- Allows validation of transformer design

Exceptional Value in Winding Hot Spot Temperature Monitoring

LumaSense Technologies' LumaSHIELD fiber optic temperature measurement system is a high value, cost-effective alternative to LumaSense's rugged Fluoroptic® monitoring systems. Based on field-proven Gallium Arsenide (GaAs) crystal technology used in transformers since the 1990s, the LumaSHIELD's direct, real-time temperature measurement addresses the critical issues encountered by transformer and electric utility managers: ease of installation, long-term reliability and easy integration into existing infrastructures.

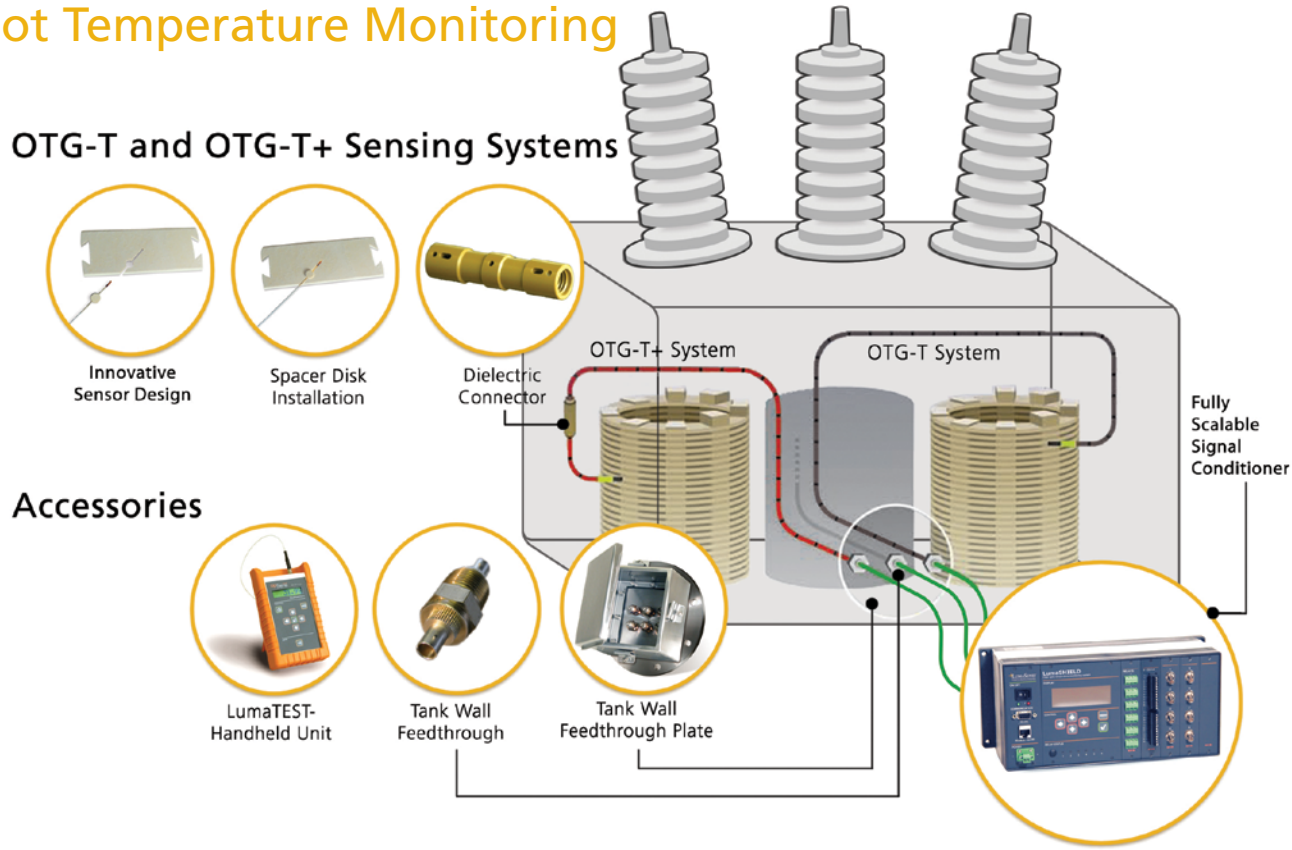
The sensors and the innovative connectivity system are immune and transparent to electromagnetic fields (EMF) and can be directly installed in transformer windings, providing crucial temperature data that enables users to optimize transformer loading, maintain maximum capacity and manage transformer life-span.

GaAs-based temperature sensing technology is ideal for lower to medium voltage transformers found in the transmission and distribution side of the smart grid.

Measuring Hot Spot Winding Temperature

Transformers often take the brunt of an overload condition. **Monitoring the transformer winding hot spot is critical to safeguard your transformer from damage and extend its usage.** Transformer life is directly related to the life of the internal paper insulation. The insulating paper's life is directly affected by its exposure to higher temperature. The highest temperature on the windings is the Winding Hot Spot, where the insulating paper will deteriorate first. Conventional methods simulate or calculate this temperature, but do not accurately measure it. The only true way of knowing the actual temperature is through real-time fiber optic measurement. Our reliable, accurate monitors quickly detect and respond to hot spot conditions, triggering alarms and relays to protect your most valuable assets.

Smart Grid Transmission and Distribution Transformer Hot Spot Temperature Monitoring



The LumaSHIELD Monitor System Should Include:

- LumaSHIELD Monitor
- GaAs-Based Probes
  - OTG-T Probes
  - OTG-T+ Probes and OIC Internal Extensions plus Dielectric Connector
- Extension Cables
  - OEC External Extension
- Tank Wall Plate Assembly
  - Carbon Steel or Stainless Steel Plate
  - Welded or Bolted Plate Design
  - Optical Feedthroughs
- Optional Accessories
  - Tank Wall Cover Box
  - SD-Disk
  - LumaTEST Handheld Unit
  - NEMA 4 Enclosure

LumaSHIELD Monitor

The LumaSHIELD is a reliable, multi-channel signal conditioner built for smooth and easy field deployment. It distinguishes itself through innovation, simplicity and enhanced integration flexibility. This fully scalable signal conditioner provides reliable real-time temperature measurements and offers both direct on-screen and on-PC display of real-time winding temperature. Using its internal data logging capability, it can collect and store temperature data in memory over a selected period of time.

- 2 to 16 measurement channels
- ± 0.8 °C accuracy
- Internal reference to guarantee reliability
- No drift, no calibration required
- IEC 61850 compliant
- Light source lasts the life of the transformer
- Local and remote data acquisition
- RS-232, RS-485 and Ethernet output with SCPI, ModBus, DNP3 protocols
- Relays and analog output options available
- LCD display with user-definable description for each optical channel
- Compatible with LumaSense's SoftSHIELD Software

GaAs-Based Probes

LumaSense's GaAs-based probes feature proven technology and innovative installation solutions. The perforated PTFE tubing and spiral wrap protective sheathing allows easy cable handling and guarantees sensor and cable integrity The probe tip is encapsulated in uniform size protective tubing, ensuring full protection against mechanical stress and transformer oil damage.

- Sensing body encapsulated in uniform protective tubing provides a compact sensor
- Well-defined round openings for proper oil wetting
- Offered with 62.5 micron fiber
- SD spacer disk option for efficient and secure mounting of sensor in spacer

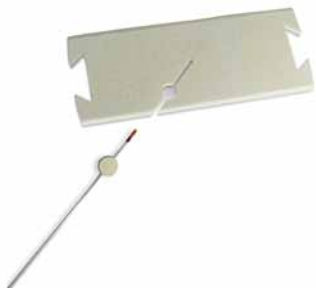
OTG-T+ Sensing System

Our innovative two-step fiber optic sensor winding installation process eliminates the need for handling long fiber optic cable during transformer assembly.

In step one, OTG-T+ sensors can be installed with the shortest cable length possible. In step two, using our all-dielectric TC winding connector, final connection to the transformer tank wall can be done with our internal fiber optic extension cable. This easy process reduces the cumbersome operation of cable spooling and handling, thus minimizing the risks of inadvertent cable crunching or pulling during transformer assembly.

Spacer Disk

Our sensor tips are supplied with a Nomex™ spacer disk. The spacer disk allows easy mounting in the spacer key, facilitating optimal probe position for the best hot spot readings and sensor protection, which are crucial during winding compression. This technique eliminates installer variability, which can lead to issues.



Accessories

Transformer Wall Optical Interface

Installing the solder glass design OFT-N38 feedthroughs on the bolted stainless steel FWP-N38 tank wall plate will guarantee a transformer optical interface withstanding up to 20 BAR / 290 PSI of oil pressure.

A PCO-55 stainless steel protective cover can be attached to the outside of the FWP-N38 tank wall plate to safely guard the transformer optical interface assembly.

OFT-N38 Feedthrough

FWP-N38 Tank Wall Plate

LumaTEST

The LumaTEST is a rugged, handheld 50 Hz system designed for field test applications. Its large visible display makes measurements simple and easy. The LumaTEST allows for quick, easy validation of sensor integrity throughout all steps of transformer assembly.

Technical Data

Performance	
Number of Channels	3 to 16
Temperature Range	-40 to +230°C (other ranges available upon request)
Accuracy	± 0.8°C (Total system accuracy at typical transformer temperatures including both signal conditioner and sensor errors)
Response Time	0.5 s Typical
Measurement Resolution	0.1 °C
Light Source Life Span	Life of the transformer
EMI/RFI Susceptibility	Complete Immunity

Interface	
Display	LCD screen display standard
Probe Signal Strength Readout	User-definable description for each optical channel
Calibration	Fully Traceable

Environmental Specifications	
Operating Temperature	-40 to +75 °C
Operating Humidity	0 to 100% non condensing

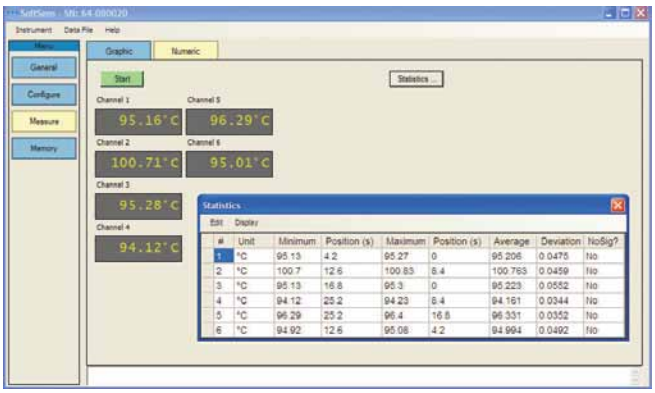
Communication	
Analog Output	4-20 mA or 0-1 mA
Serial Output	RS-232 and RS-485 standard, Ethernet optional
Relays	6 C-Form SPDT relays, 5 A @ 250 VAC or 30 VDC, 6 relay status indicators
Communications	SCPI and Modbus standard, DNP3 and IEC61850 optional
Probes	OTG-T, OTG-T+ and OTG-A fiber optic sensors
T° Data Storage	> 2,000,000 temperature measurement points

Electrical	
Input Power	12 to 24 VDC
Surge Protection	3000V (1EEE C37.90.1-2002)
Consumption	2.5 W typical

LumaTEST (Optional)	
Number of Channels	One
Compatibility	OTG-T, OTG-T+ and OTG-A fiber optic sensors
Accuracy	± 0.8 °C
Resolution	0.1 °C
Reliability	Internal reference validation
Sampling Rate	50 Hz standard
Consumption	1.8 W Typical
Storage Temperature	-40 to +70 °C
Operating Temperature	0 to 45 °C
Humidity	95% non condensing
Light Source Life Span	Life of the Transformer
Dimensions (Without Rubber Boot Protection)	45 x 105 x 165 mm (1.77 x 4.13 x 6.49 in)
Battery	9V
Output Interface	± 5 V and RS-232 standard
Input Power	9 to 24 VDC

SoftSHIELD Software

Use LumaSense's SoftSHIELD application to remotely view real-time winding temperature displays and configure data logging for user-selected periods of time from your PC. SoftSHIELD allows you to control, display, acquire and save data in the same way as with the local LumaSHIELD interface.



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