



Temperature and Gas  
Sensing Solutions



SOLUTIONS FOR  
**TRANSMISSION &  
DISTRIBUTION**

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# PROVIDING INSIGHT AND SOLUTIONS

to help our customers reduce waste and inefficiency in their most resource-intensive processes

LumaSense Technologies, Inc. is one of the world's most trusted providers of innovative temperature and gas sensing solutions for energy, industrial, and advanced technology markets. LumaSense designs and manufactures sensors for industrial, research, and

original equipment manufacturer (OEM) customers. These robust temperature and gas sensing solutions provide accurate information to optimize performance and extend the life of critical assets.

More than

**50**  
years of history

Customers from

**85+**  
countries

Representatives in

**46+**  
countries

## CORPORATE HISTORY

Through a series of strategic acquisitions starting in 2005, LumaSense set out to build a world-class temperature and gas sensing company. These companies make LumaSense what it is today and offer well over 50 years of history and experience in the industries we serve:

**1958**

Impac is founded to build state-of-the-art infrared pyrometers for non-contact temperature measurement.

**1969**

Founding of Andros, specializing in gas analyzers, and Mikron, the leader in thermal imaging and blackbody calibration.

**1978**

Luxtron is founded by pioneering new Fluoroptic® technology.

Innova formed with innovative high performance gas sensing technology.

**2005**

LumaSense is founded and acquires Luxtron.





### HEADQUARTERS

Santa Clara, California,  
United States

### PRIMARY INVESTORS

Oak Investment Partners  
and Element Partners

### WORLDWIDE REACH

Global and Regional centers in Silicon  
Valley, Germany, France, Denmark, India,  
and China.

Representatives in more than 46 countries.

Customers in more than 85 countries.

Since its founding, LumaSense Technologies has evolved into a leading producer of infrared imagers, pyrometers, fiber optic temperature sensors, calibration sources, and gas analyzers. With global headquarters in Santa Clara, California and factories in the US and Europe, LumaSense continues to supply a growing and diverse customer base spanning more than 85 countries.

**2006**

LumaSense acquires  
Innova.

**2007**

LumaSense acquires  
Andros, Mikron, and  
Impac.

**2010**

LumaSense acquires  
Opsens Energy division and  
InfraredVision Technology  
Corporation (ITC).

**2011**

LumaSense acquires  
Reliability Point for Service  
Offerings.



## TECHNOLOGY OVERVIEW

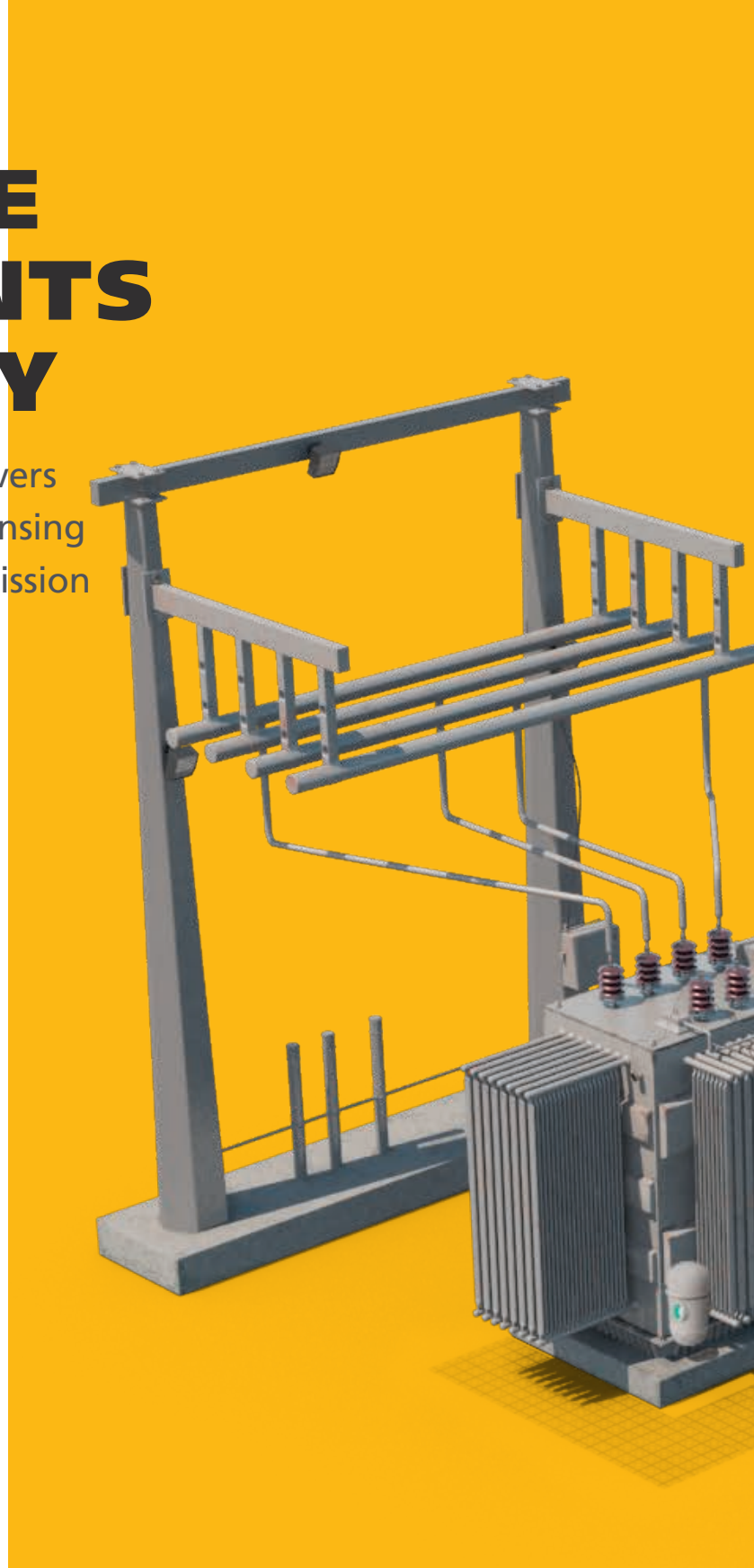
# INNOVATIVE INSTRUMENTS FOR ENERGY

LumaSense Technologies, Inc., delivers innovative temperature and gas sensing instruments for monitoring transmission and distribution assets.

With a 50-year history of creating efficiencies through light-based measurement, LumaSense Technologies, Inc., delivers innovative temperature and gas sensing instruments for the Global Energy market. As the global demand for energy increases, energy generators and providers need asset monitoring to implement “smart” electric grids to allow for production of electricity in a more technologically advanced way.

To maintain a smart grid with aging equipment, energy professionals need to implement gas and temperature sensing solutions to understand how their equipment is performing and detect developing failures. Our gas portfolio offers superior sensitivity over other gas detection techniques and our gas modules and instruments are particularly beneficial when the environment and human safety are involved. Our temperature solutions provide highly accurate data to help professionals realize condition-based maintenance with continuous and remote monitoring.

Our unrivaled passion for excellence is why we have become the one of the world’s most trusted sensing solution providers. Beyond providing precision engineered instruments, our customers turn to us knowing our commitment to their success comes first. With expert application understanding and a growing portfolio of products, LumaSense can combine several technologies together into novel solutions even for the most complex environments.



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## OUR SOLUTIONS

Fiber Optic  
Temperature  
Measurements

Dissolved Gas  
Analysis for Trans-  
formers & LTCs

SF<sub>6</sub> Leak Detection  
for Indoor GIS  
Substations

Thermal Imaging  
& Pyrometry for  
Power Substations

## FIBER OPTIC TEMPERATURE MEASUREMENTS



LumaSense Technologies' LUXTRON® brand pioneered the field of fiber optic winding temperature measurement more than 25 years ago and is a premier provider of direct, real time hot spot monitoring and control systems for the power utility industry.

## ONLINE NDIR GAS ANALYSIS

Using proven Non-Dispersive Infrared (NDIR) gas analysis pioneered by our ANDROS® brand, LumaSense offers a cost-effective, accurate online dissolved gas analysis (DGA) monitoring solution for LTCs and transformers known as SmartDGA.



## AUTOMATED & REMOTE THERMAL IMAGING

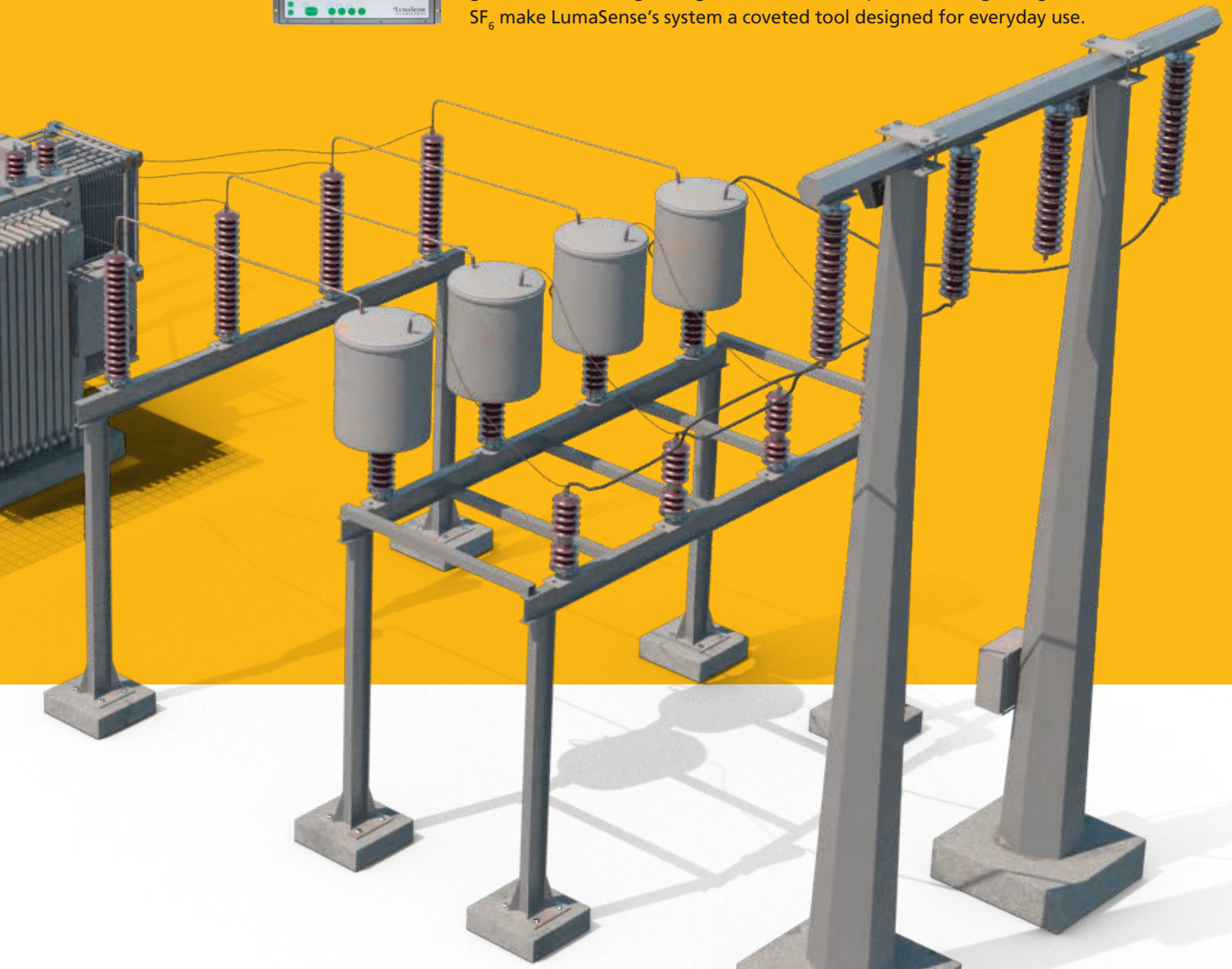
LumaSense offers an automated, continuous thermal imaging system for remote and automated early fault detection in substations and industrial sites. Thermal-Spection 724 is the first system to allow remote monitoring of temperatures in real time via image data obtained from one or more cameras and sent to a monitoring and diagnostics center.



## SF<sub>6</sub> LEAK DETECTION



The SF<sub>6</sub> Leak Detection System from LumaSense Technologies offers unmatched performance and convenience. Based on Photoacoustic Spectroscopy (PAS) technology, the system offers highly accurate, reliable and stable quantitative gas detection. The growing environmental requirements regarding the use of SF<sub>6</sub> make LumaSense's system a coveted tool designed for everyday use.



## WINDING HOT SPOT MONITORING

# LumaSMART Fluoroptic Thermometry Fiber Optic Temperature Sensing System

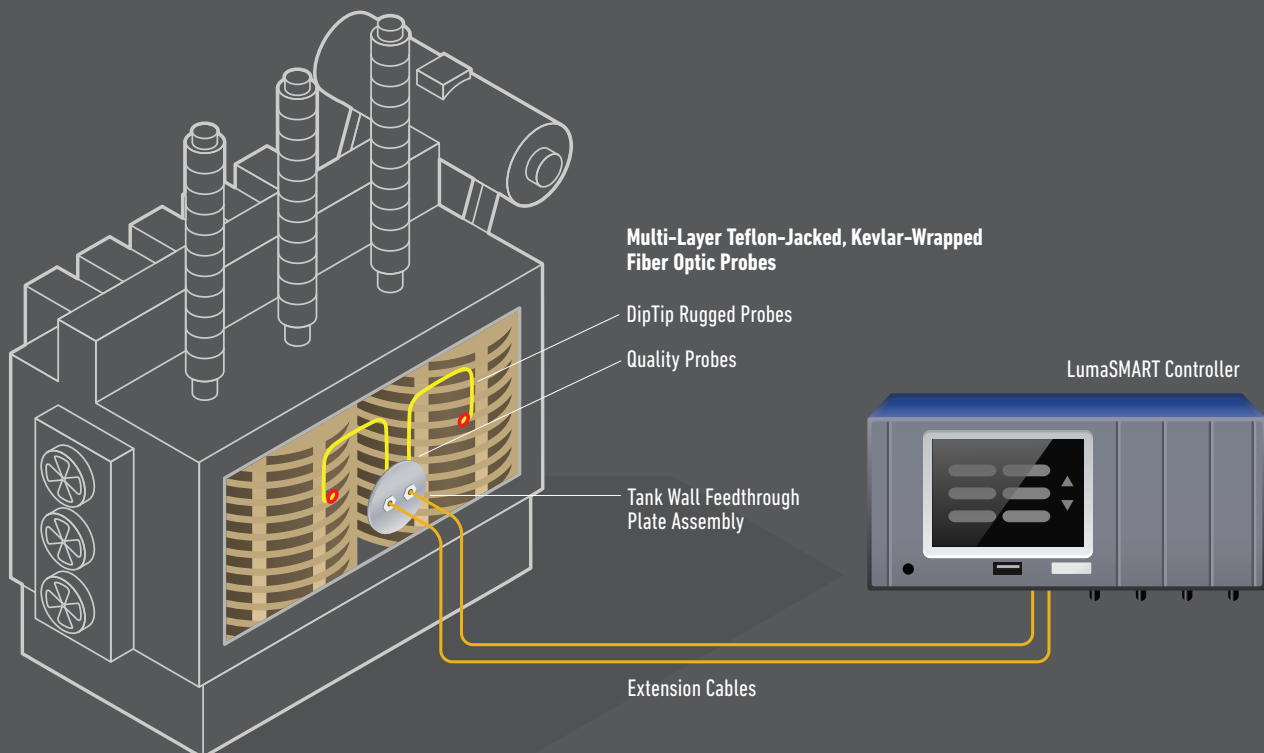
## Best-in-Class Fluoroptic-Based Solutions for Winding Hot Spots

LumaSense Technologies' LumaSMART winding hot spot temperature system is the most advanced and reliable real-time monitoring solution available today. LumaSense is the leader in Fluoroptic (FOT) Technology, with decades of proven expertise. The LumaSMART FOT hot spot monitoring systems provide accurate, real-time temperature readings for protection and control of your critical power transformer assets.

LumaSense Technologies' LUXTRON brand is the world leader in fiber optic temperature measurement in transformers. With more than 30 years of fiber optic experience, LumaSense continues to lead the way in innovation of new, robust technology.

### 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. 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. Our reliable, accurate Fiber Optic monitors quickly detect and respond to hot spot conditions, triggering alarms and relays to protect your most valuable assets.



# LumaSMART® CONTROLLER

Innovative  
touch screen



Extended  
channel

LumaSense Technologies' LumaSMART controller is the newest innovation from the leader in FOT technology. The LumaSmart Controller provides all of the capabilities of its predecessor, while adding smart grid capabilities, an innovative touch screen, and extended channel and relay capabilities.



## FLUOROPTIC® PROBES

The measurement performance of LUXTRON probes exceeds common temperature sensors in environments with high voltage, radio frequency interference (RFI), electromagnetic interference (EMI) or corrosive and above boiling point liquids.



## TANK WALL PLATE ASSEMBLY

LumaSense provides welded tank wall feedthrough plate assemblies. Each tank wall plate features our proprietary welded feedthroughs on a stainless steel plate, with a carbon steel backing ring and Viton O-ring for maximum protection against leaks.

## WINDING HOT SPOT MONITORING

# LumaSHIELD® Fiber Optic Temperature Sensors

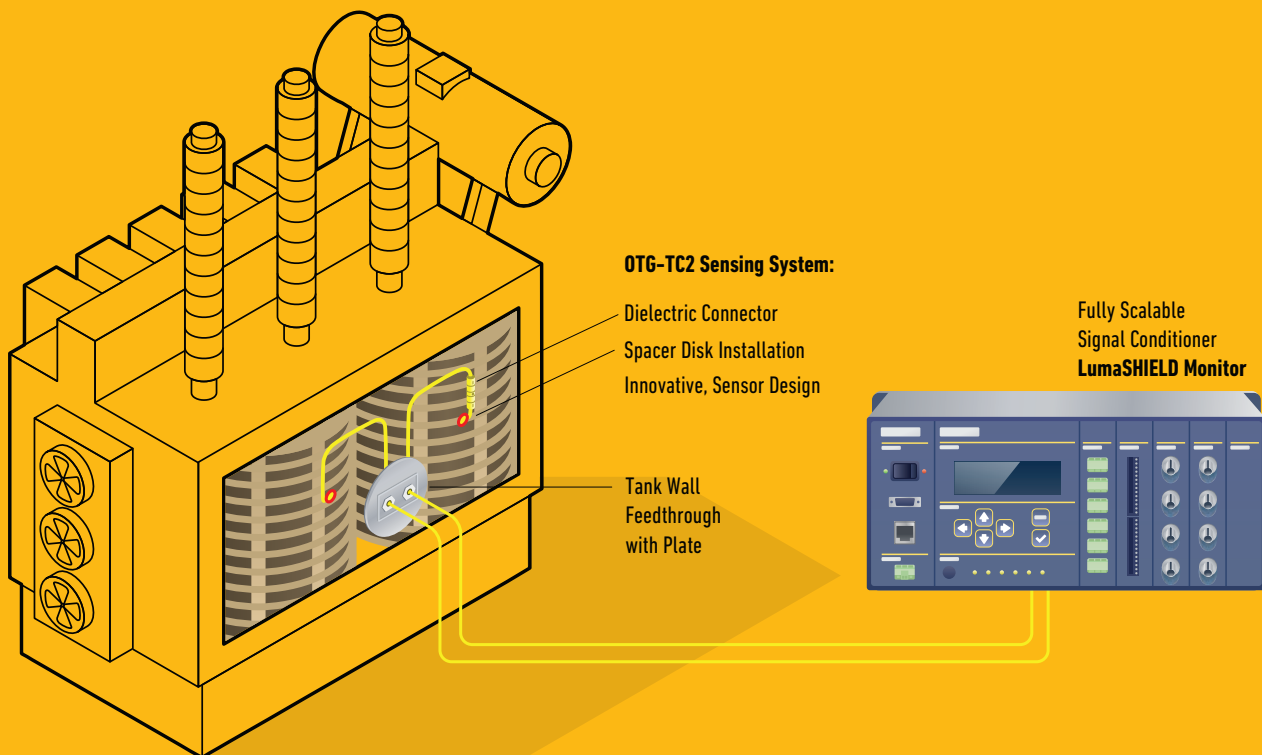
## Best-in-Class GaAs-Based Solutions for Winding Hot Spots

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.

GaAs-based Fiber Optic temperature sensing technology is ideal for smaller, lower voltage transformers found in the 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. 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. Our reliable, accurate Fiber Optic monitors quickly detect and respond to hot spot conditions, triggering alarms and relays to protect your most valuable assets.





# LumaSHIELD MONITOR

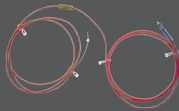
The LumaSHIELD is a reliable multi-channel signal conditioner built for smooth and easy field deployment. It distinguishes itself through innovation, simplicity, and enhanced integration flexibility. This fully scalable signal conditioner, provides reliable real-time temperature measurements and offers 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.

## GaAs-BASED PROBES

LumaSense's GaAs-based probes feature proven technology and innovative installation solutions. The perforated PTFE tubing and spiral wrap protective sheathing allow 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.

### OTG-TC2 Sensing System

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

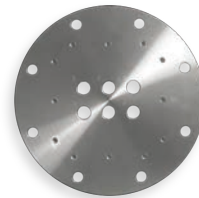


### Spacer Disk

Our sensor tips can be supplied with a factory fitted Nomex™ spacer disk. The spacer allows easy, adhesive-free mounting in the spacer key, facilitating optimal probe position.



## ACCESSORIES



### Transformer Wall Optical Interface

Installing the OFT-N38 feedthroughs on the bolted stainless steel tank wall plate ensures a transformer optical interface withstands up to 20 BAR / 290 PSI of oil pressure. A stainless steel protective cover can be attached to guard the assembly.

### LumaTEST

The LumaTEST is a rugged, handheld system designed for field test applications. The LumaTEST allows for quick, easy validation of the sensor.



## GAS SENSING

# DISSOLVED GAS ANALYSIS FOR TRANSFORMER MONITORING

LumaSense's online DGA solution is designed for easy installation, accurate performance, and helps utilities achieve fleet-wide usage on transformer and load tap changer (LTC) monitoring. Using our field proven Non-Dispersive Infrared (NDIR) solution, utilities can consistently measure the gas levels, rates, and ratios in real-time and get an accurate picture of transformer or LTC health.



## GAUGE

### 3 GAS + MOISTURE

The **SmartDGA Gauge™** is the industry's first dedicated online load tap changer (LTC) condition monitor. With the ability to monitor ethylene ( $C_2H_4$ ), acetylene ( $C_2H_2$ ), Methane ( $CH_4$ ), and moisture without maintenance and routine calibration, it offers the best value to assess LTC health.

## GUARD

### 4 GAS + MOISTURE

The **SmartDGA Guard™** provides reliable early warning diagnostics to prevent transformer failures. It measures and reports Hydrogen ( $H_2$ ), Carbon monoxide (CO), Carbon Dioxide ( $CO_2$ ), acetylene ( $C_2H_2$ ), and moisture for incipient fault detection without routine maintenance, calibration, or need for carrier gas.

## GUIDE

### 9 GAS + MOISTURE

The **SmartDGA Guide™** provides comprehensive online Dissolved Gas Analysis (DGA) monitoring and diagnostics to prevent transformer failures. It measures and reports all DGA gases at half the cost of other 9 gas DGA monitors. Furthermore, the Guide vastly reduces total cost of ownership due to its differentiated design and installation scheme.

Each SmartDGA instrument is connected to the **SmartDGA EZHub™**, which functions as the power supply and initial data storage location. For transformers with external LTCs a single EZHub can serve both SmartDGA Gauge on the LTC as well as a Guard or Guide on the main tank. The EZHub connects to a PC or *iCore* using RS485 or Ethernet which uses the DGA Viewer software for data visualization as well as additional data storage.



The **LumaSMART iCore™** optional device provides Smart grid ready advanced communications like IEC 61850, DNP3, MODBUS. It also provides high-powered computerized display for viewing, trending, and diagnostics; as well as long-term memory storage.



The **DGA Viewer™** software allows users to configure systems using various set-up tools and view data being captured by the SmartDGA® instrument. The software also enables easy commissioning and local display of online DGA results.





### COST OF OWNERSHIP

Most DGA monitors are too expensive to support wide-scale deployment, thus limiting the ability to realize a Smart Grid and true condition-based maintenance. SmartDGA is affordable - sometimes half the cost of other monitors with no consumables or scheduled maintenance.



### FLEXIBILITY

Our SmartDGA solution offers flexibility and the ability to accurately identify and mitigate faults by using IEEE and industry recommended guidelines for automated fault identification and alert.



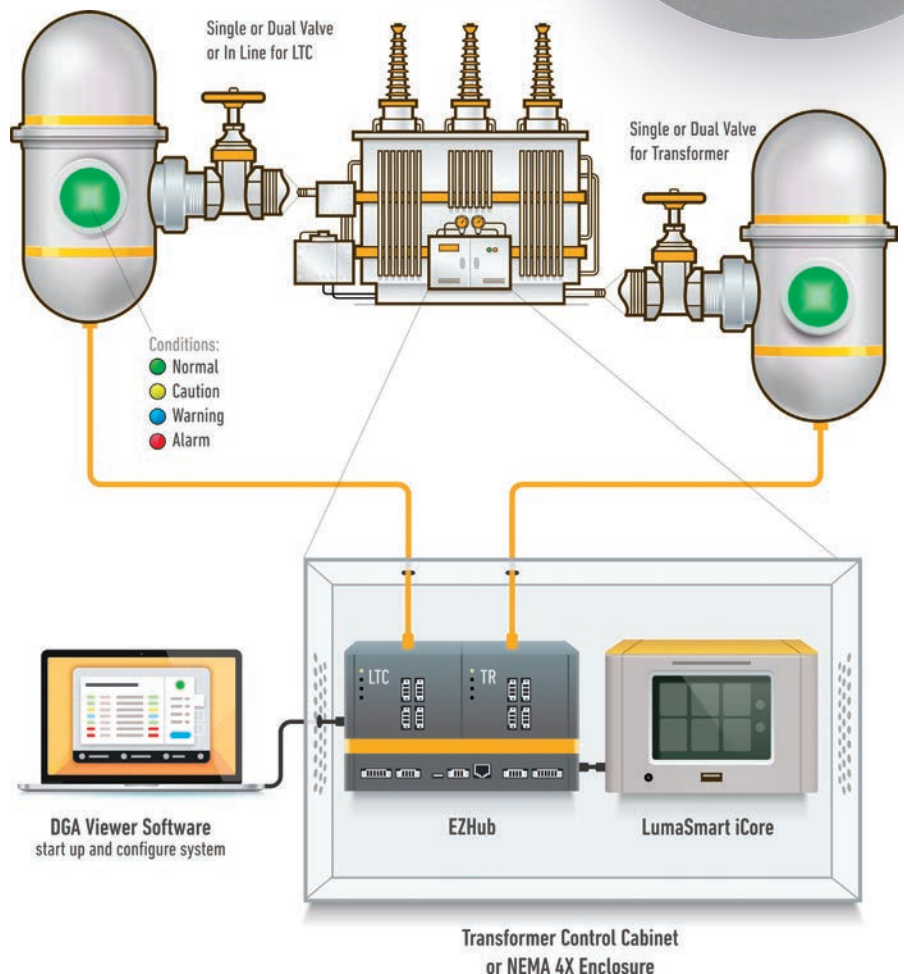
### EASE-OF-USE

Most monitoring technologies are cumbersome to install, maintain, and service, leading to a poor overall user experience. SmartDGA offers versatile monitoring configurations, including optional inline mounting.



### UP TO 9 GASES

Comprehensive online Dissolved Gas Analysis monitoring and diagnostics to prevent transformer failures. Available with 3, 4, and 9 gas instruments to best match needs and budgets.

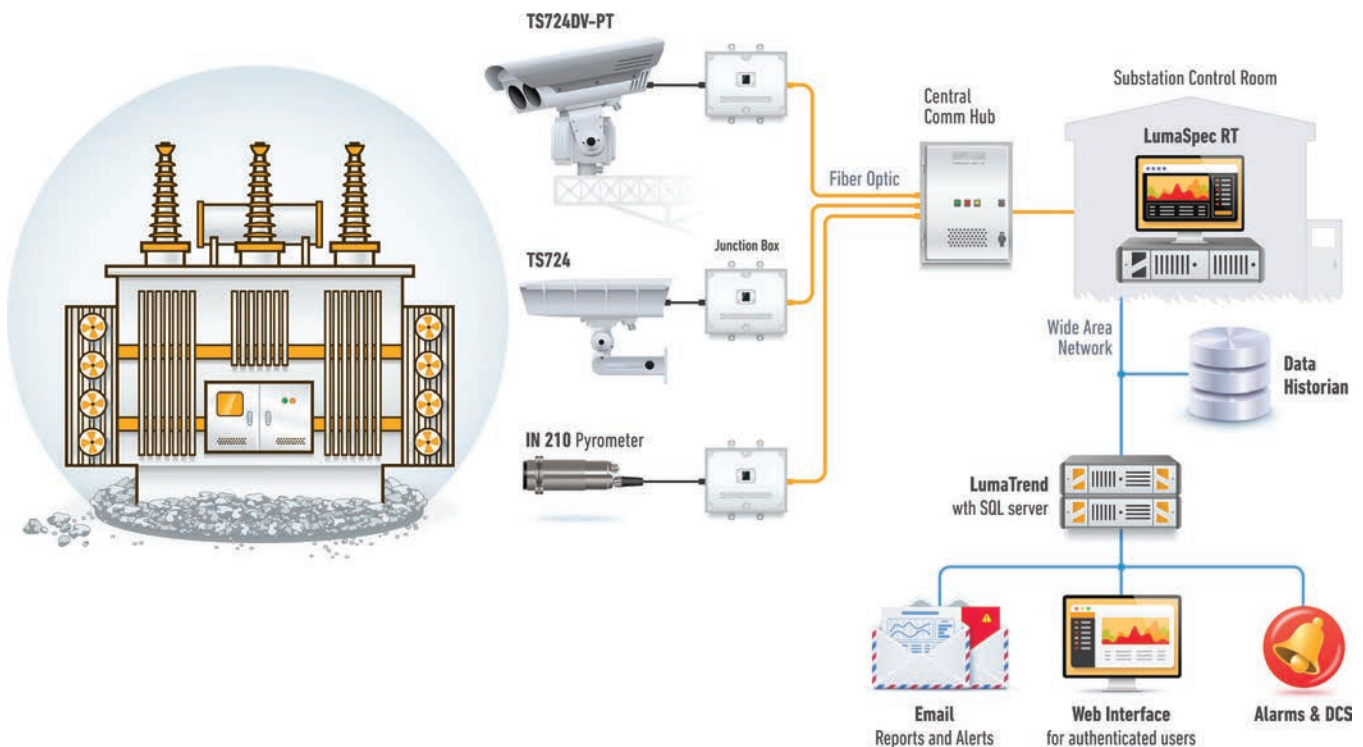
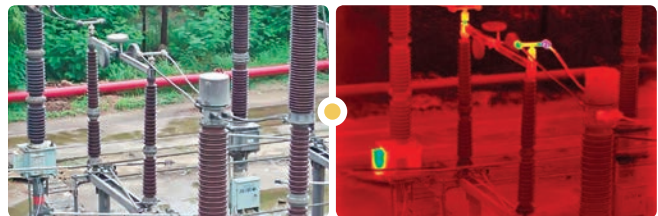
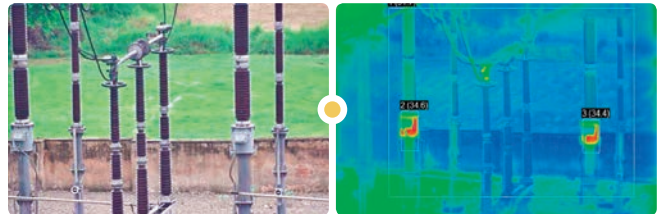


# THERMAL IMAGING FOR SUBSTATION ASSETS

Automated, continuous thermal and visual imaging to identify thermal abnormalities within electrical substations and other process control systems

The ThermalSpection 724 Remote Thermal Monitoring solution represents another milestone in innovative infrared thermometry. With its multiple camera system functionality, it is the first system to allow remote monitoring of temperatures in real time via image data obtained from one or more cameras and sent to a single central controller.

Designed with advanced maintenance-free electronics and industrial protective packaging, the ThermalSpection 724 solution offers a high degree of accuracy for demanding industrial and electric utility settings, while quickly measuring temperature without contact in even the most adverse environments.





## TS724DV-PT: Pan-Tilt Thermal Imager

Real-Time, Remote Monitoring/Control with Full Range Pan-and-Tilt Capability.

- High resolution infrared camera and strong telephoto lens accurately measures even small components at a distance
- Temperature measurement between -40 °C and 500 °C
- Alarm communication via OPC/Modbus or standard alarm feedback (Relay, 4-20mA, 0-10V, etc.)
- Multi-Spot temperature measurement with independent emissivity settings at each "tour" location

## TS724: Fixed Mount Thermal Imager

Stationary Mount High Performance Infrared Camera in a Weatherized Enclosure.

- High performance, cost-effective complete monitoring solution
- Precise targeting of small objects in a wider field of view
- Multiple wide viewing angles (12°, 25°, 42°, and 70°) allow for complete customization for different site layouts and applications
- IP66 enclosure designed for long-term use in all weather environments

## IN 210: Pyrometer Temperature Sensor

Small, stationary infrared thermometer for non-contact temperature measurement of coated metal and non-metallic surfaces.

- Measure temperature of objects between -32 °C and 900 °C hidden from view of imagers
- Small stainless steel housing dimensions suitable for use in confined spaces
- Easy electrical and mechanical installation
- Ambient temperature up to 70 °C without cooling

GAS SENSING

# SF<sub>6</sub> LEAK MEASUREMENT SOLUTION



**Sulfur Hexafluoride (SF<sub>6</sub>)** is one of the most potent greenhouse gases, with a Global Warming potential of more than 22,000 times than that of CO<sub>2</sub>. Over the past decades, manufacturers have replaced oil high-voltage switch gears with SF<sub>6</sub>-insulated units. Today, the power utility industry uses roughly 80% of all SF<sub>6</sub> produced worldwide.

## SF<sub>6</sub> FILLED EQUIPMENT TESTING

Photoacoustic infrared spectroscopy is actually listed as the state-of-the-art and most sensitive technique for quantitative tightness test by the reference document in the industry: SF<sub>6</sub> Tightness Guide, CIGRE Technical Brochure 430 – WG B3.18.

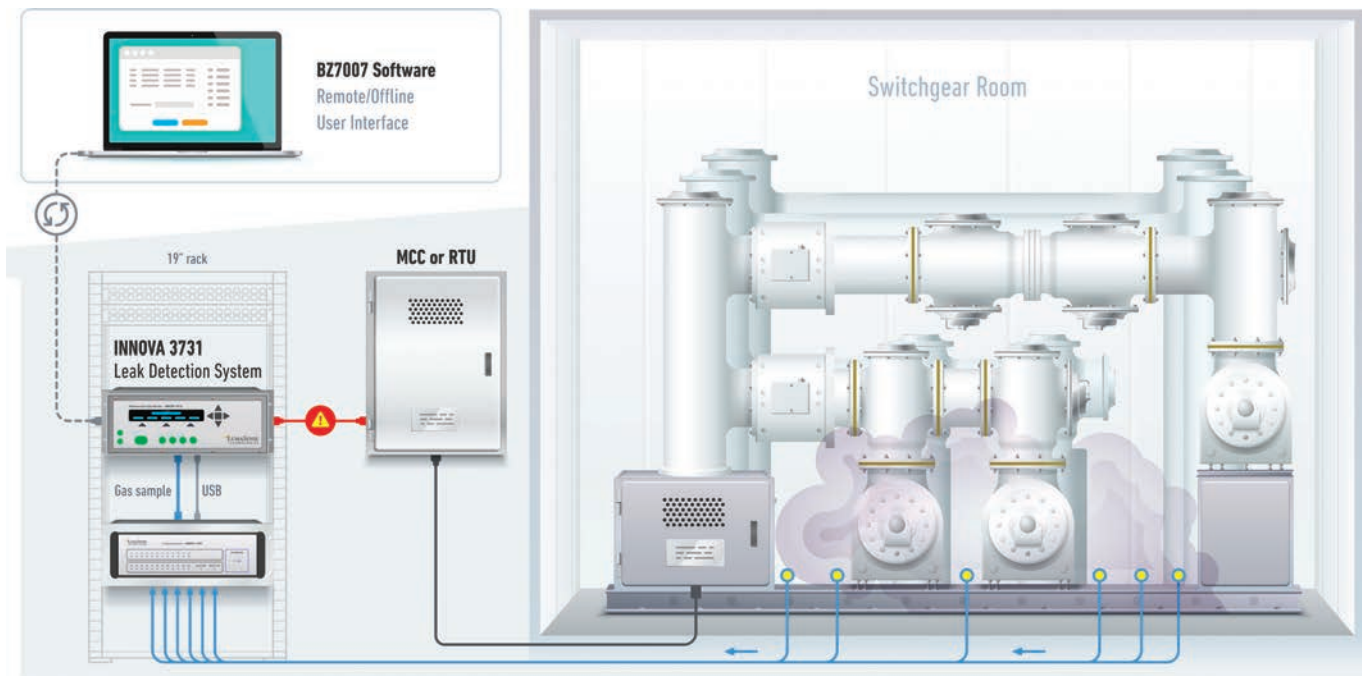
The low detection limit and high accuracy of our SF<sub>6</sub> Leak Detector enables manufacturers to complete their quality tests more efficiently, in a shorter time, and with great precision, while complying with the most stringent design standards for SF<sub>6</sub> tightness.

## SF<sub>6</sub> LEAK MONITORING IN SUBSTATIONS

Leverage the same inherent measurement capabilities and benefit from the highly stable and low maintenance rate of the PAS instrument with the reliable SF<sub>6</sub> leak monitoring solutions for enclosed substations.

The ultra-sensitive SF<sub>6</sub> Leak Detector has a low detection limit of 0.006 ppm and is bundled with a multi-point sampler and monitors up to 24 different locations that can be distributed across the substation. This is the only solution sensitive enough to automatically identify leaks of 0.1% per year as required by the European F-gas directive and other regional industry targets.





## SF<sub>6</sub> Leak Detection System – 3731

- Stationary standalone multipoint monitoring for direct leak detection in large enclosed volume
- Ultra-sensitive, with a limit of detection at 6 ppb
- High reliability with self-test routines
- Available in 12 or 24 channels, with sampling lines that can extend to 75 m.
- Exceptional accuracy with auto-compensation for temperature and pressure fluctuations, and for water vapor interference
- Measurements stored in internal memory, with easy export to remote PC via user-friendly BZ7007 software

## LumaSoft Gas Multi Point 7870

- Synchronizes the sampling functions of the sampler units to the measurement cycle of the Photoacoustic Gas-Monitors
- Displays measurement data in either a table or a graphical window; data can be displayed in a Channel or Gas view mode
- Alarm reporting for each gas at each measurement location
- Measurement data stored in SQL Server 2005 database
- Online access to the measurement data via built in OPC Server
- Login-secured access to measurement data



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