LUMASENSE®
TECHNOLOGIES

SmartDGA® Monitoring Solutions

Cost-effective and accurate gas detection solutions based on Non-Dispersive Infrared (NDIR) sensor technology to measure fault gases in transformers or load tap changers (LTC's)

- Identify potential faults prior to failures (reducing unplanned outages and associated costs)

- Reduce the number and frequency of LTC maintenance cycles, thereby increasing uptime and maximum efficiency of the LTC

- Proactively investigate the cause of faults or premature aging of a transformer

Protect critical assets through comprehensive analysis of transformer fault conditions with online SmartDGA® monitors

SmartDGA® Instruments

The SmartDGA® family of instruments is the industry's most cost effective Dissolved Gas Analysis (DGA) solution, designed to be the most flexible and to provide the best user experience available. Each model has been designed using state-of-the-art Non-Dispersive Infrared (NDIR) technology. The SmartDGA® instrument provides DGA values in order to develop a comprehensive analysis of potential fault conditions through specific key gases being monitored.

- **SmartDGA Gauge™** is the industry's first dedicated online Load Tap Changer (LTC) condition monitor. The Gauge measures and records Methane, Acetylene, and Ethylene plus moisture to assess potential LTC coking or other failure conditions.

- **SmartDGA Guard™** provides a cost effective early warning monitoring system of potential transformer failures. The Guard measures and records Hydrogen, Acetylene, Carbon Dioxide, and Carbon Monoxide plus moisture to provide an early diagnostics tool.

- **SmartDGA Guide™** provides comprehensive online DGA results that enable diagnostic techniques. The Guide measures and reports nine (9) DGA gases plus moisture in an instrument that vastly reduces total cost of ownership of an on-line monitoring system.

Key Functional Features

- Each SmartDGA® package includes the instrument, mounting hardware, connection cable, the SmartDGA EZHub™ unit, and SmartDGA Viewer Software.

- Versatile mounting configurations – including single and dual valve mount. Inline mounting is available for LTC filter system or non-valve mounting for a transformer. The SmartDGA® instrument can be mounted in a vertical or horizontal position.

- Extremely cost effective – total cost of ownership is a fraction of the cost of other instruments and installation can be accomplished in just hours.

- No consumables, carrier gases, or scheduled calibration required.

- Corrective action triggered by using sunlight visible indicators for Caution, Warning, and Alarm condition. Has Status Relay notification and functions to ensure optimal system operations.

- Diagnostic software* available that provides condition codes to monitor the LTC condition using recent advances in IEEE C57.139 and CIGRE WG D1.31 (including Duval's Triangle for LTC).

- Communications supported via all major protocols common in the electric power industry such as Modbus RTU, DNP 3.0, and IEC 61850.

*Available April 2014.

SmartDGA EZHub™

The SmartDGA EZHub™ unit is the central intelligence for the SmartDGA® system. A fully configured unit is capable of handling the power and communication needs for the SmartDGA® system. The EZHub can support a Gauge instrument for the LTC and a Guard or Guide instrument for the transformer. All interface functions and interconnects are provided in the EZHub device as well as internal memory (up to 2 years), four (4) relays and bright LED indicators to indicate Caution, Warning, and Alarm conditions. The fourth relay and indicator is a system status relay to notify of a SmartDGA system abnormality.

LumaSMART iCore™ (Optional)

The LumaSmart iCore™ controller provides a local interactive touch screen display of DGA data collected from the SmartDGA EZHub™ using the DGA Viewer™ software . The DGA Viewer™ software allows for on site viewing of DGA data collected from the SmartDGA® instruments. Additionally, the software provides a local means to set and create operational levels for caution, warning and alarm conditions. Additionally, the LumaSmart iCore™ device provides communications to external systems using RS485 or ethernet. Each LumaSmart iCore™ device enables connectivity to multiple EZHub™ units (up to a maximum of 32 using the ethernet connection – or up to 127 using the RS485 multi-drop, dependent on configuration).

40+ Years of Experience with NDIR

LumaSense is the industry leader in the use of Non-Dispersive Infrared (NDIR) technologies and has deployed thousands of systems in the field. With over 40 years of experience, LumaSense is redefining the way gases are measured.

Non-Dispersive Infrared (NDIR) quantifies known gases. While the technology has long existed, LumaSense Technologies' ANDROS® brand pioneered NDIR gas analysis for automotive emissions and patient monitoring. NDIR is the heart of our suite of SmartDGA® products designed for the Energy industry for Dissolved Gas Analysis (DGA) of transformers and load tap changers (LTCs). In addition, we developed a unique single path approach. With ANDROS® NDIR modules, the cost of gas measurement is greatly reduced because our modules can measure multiple gases and field calibration is not needed.
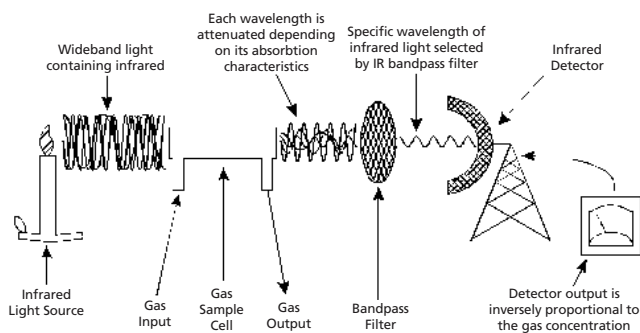
Single Beam Gas Analyzer Diagram

DGA Viewer™ software

The DGA Viewer™ software allows users to configure systems using various set-up tools and view data being captured by the SmartDGA® instrument.

Device Configuration
Customized gas detection levels of Caution, Warning, and Alarm values. Also included are user-configurable settings for each gas Rate of Change (ROC) detection levels. Ratio setpoint activation is also available.

DGA Home Screen
The DGA Viewer™ software displays all current DGA values in a single display.

SmartDGA Diagnostics Software ™*

The optional SmartDGA Diagnostics Software™* allows users to diagnose the potential fault that could be occurring within the transformer being monitored.
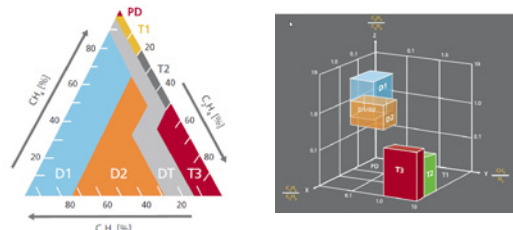
Trends
The Trends screen displays all detected gases via a trend graph over a user-selectable period of time. Each gas can be individually displayed or all 9 gases can be displayed at once.
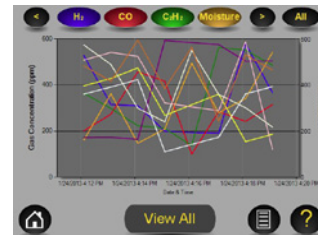
Analytical Tools
Graphic diagnostic tools such as Duval's Triangle and Rogers Ratio are available for analysis of DGA results.

Ratio Tools
Key gas and CO/CO_2 ratios, along with advanced analytics, are available for analysis of DGA results.

Statistics Screen
Displays the minimum and maximum values for a user-defined time period.

*Available April 2014.

SmartDGA™ System Technical Data

Instrument Specifications

Gas Accuracy	± 5% or ± LDL, whichever is greater
Sampling Time	Every 24 hours - default, user selectable from approximately 3 hours to 7 days. Sampling time is progressive based on alarm condition.
Moisture Accuracy	± 3 ppm or ± 2% RS
Automatic Schedule Acceleration	When user configurable Rate of Change (ROC) levels and ratio limits are exceeded
Oil Pressure	-14.7 to 20 psig (0 to 35 psia)
Enclosure rating	IP 55
Sunlight visible indicators for condition codes **Note:** Indicators normally flash on for 5 seconds, off for 15 seconds	• Green - Normal • Yellow - Caution • Blue - Warning • Red - Alarm • Red/Blue - System Status Error • Green/Yellow - Loss of Communication

Environmental

	SmartDGA® Instrument	SmartDGA EZHub™	LumaSMART iCore™
Operating Temperature	-50 to 65 °C	-50 to 65 °C	-40 to 70 °C
Storage Temperature	-50 to 70 °C	-50 to 70 °C	-40 to 75 °C
Storage Humidity (non-condensing)	10 – 93% RH	10 – 93% RH	10 – 95% RH
Dimensions (L x H x D)	16.4" x 8.6" dia.	10.3" x 5.7" x 6"	8.7" x 7.4" x 6.6"
Weight	18.74 lbs	6.61 lbs	11.02 lbs

Certifications and Standards (Instrument & SmartDGA EZHub™)

Emissions / Immunity	EN 61000-6-2 (2005) +C1 EN 61000-6-4 (2007) +A1 EN 61000-3-2 (2006) +A1 EN 61000-3-3 (2008)
Environmental / Vibration	ETSI EN 300 019-2-4
Surge Protection	4000V (IEEE C37.90.1-2002)

SmartDGA® Instrument Gas Measurements (Min-Max)

Gas	Gauge	Guard	Guide
Acetylene (C_2H_2)	50–50,000 ppm	0.5–10,000 ppm	0.5–10,000 ppm
Ethylene (C_2H_4)	50–50,000 ppm		2–50,000 ppm
Carbon Monoxide (CO)		10–10,000 ppm	10–10,000 ppm
Moisture (RS)	1–99%	1–99%	1–99 %
Hydrogen (H_2)		5–10,000 ppm	5–10,000 ppm
Carbon Dioxide (CO_2)		10–20,000 ppm	10–20,000 ppm
Methane (CH_4)	50–50,000 ppm		2–50,000 ppm
Ethane (C_2H_6)			2–20,000 ppm
Oxygen (O_2)			100–50,000 ppm
Nitrogen (N_2)			5,000–100,000 ppm

SmartDGA EZHub™ & LumaSMART iCore™ Specifications

Power Supplied to EZHub & iCore	90 ~ 264 VAC, 127 ~ 370 VDC, 47 ~ 63 Hz, 6.5 A max
Power Supplied to Instrument	48 VDC ~ 4.16 A max
Memory	2 years worth of data storage (including date and time stamp)
Optional Memory *(Available with iCore)*	40+ years worth of data storage (including date and time stamp)
Available Communications *(Available with EZHub)*	ASCII Protocol via RS485 and Ethernet connections
Optional Communications *(Available with iCore)*	Modbus, DNP3, Ethernet, TCP/IP, IEC61850, USB 2.0 for data import and export
Alarm Contacts — EZHub	Three (3) programmable relay outputs (Type C, NO/NC) for caution, warning, and alarm
EZHub & iCore	One (1) alarm relay output for system status (Type C, NO/NC)
Relay contact ratings	Single phase alarm relays (8 A, 250 VAC; 5 A, 30 VDC)

Standard Accessories (included in system order)

• Mounting Hardware - includes single valve, dual valve or inline installation kit and 2" or 1.5" to 1" reducers

• Connection Cable - 10 m standard

• DGA Viewer™ software

Optional Accessories

• LumaSMART iCore™

• SmartDGA Diagnostics Software™

• NEMA4x Enclosure (for the LumaSMART iCore™ controller and/or SmartDGA EZHub™ unit)

• "Cold Weather" Connection Cable - 10, 20, or 30 m length

• Longer Connection Cable - 20 or 30 m length