

Monitoring and  
diagnostics

# SITRAM Multisense 9

## Customer services for transformers

In their average lifetime of 40 years, transformers endure various forms of stresses that can contribute to a multiplicity of failures (electrical, thermal, chemical or mechanical). Transformer failures may cause costly damages to primary and secondary equipment, outages, environmental cleanup charges and a loss of reputation.

DGA (Dissolved Gas Analysis) monitoring with *SITRAM Multisense 9* helps utilities to avoid transformer failures.

*SITRAM Multisense 9* indicates deviations and imminent faults by analyzing the concentration of eight dissolved gases in transformer insulating oil (mineral and ester oil), and moisture. This helps to predict and prevent eight fault types:

- High temperature thermal faults, overheated oil by monitoring  $C_2H_4$
- Partial discharge, thermal faults, power discharges, rust, galvanized parts, stainless steel, sunlight by monitoring  $H_2$
- Corona partial discharge, low & medium temperature thermal faults by monitoring  $CH_4$
- Thermal fault involving cellulose, gradually from oil oxidation by monitoring  $CO$
- Normal aging, thermal fault involving cellulose by monitoring  $CO_2$

- Hot spot, low energy discharge, high energy discharge (arc) by monitoring  $C_2H_2$
- Low & medium temperature thermal faults, local overheating by monitoring  $C_2H_6$
- Exposure to atmosphere (air), leaky gasket (under vacuum), air breathing conservator, leaky bladder by monitoring  $O_2$

### Features

- Robust, NDIR measurement technology without moving parts or reference gas
- Easy installation directly at transformer – One man work
- Display and keypad enabling comprehensive configuration and setup without additional computer
- Easy to understand due to simple setup
- Compact, robust design (IP55)
- High accuracy enabling early diagnostics
- Optional: Various communication options, 13 digital outputs, 5 digital optocoupler outputs
- Optional: 10 analog outputs, 10 analog inputs
- Ambient humidity: 0-95%
- Monitoring functions:
  - o Voltage and current monitoring (via voltage and current transformers / transducer)

- o Temperature monitoring: lower and upper oil temperature, ambient temperature (via additional temperature sensors)
- o Cooling stage / tap changer position monitoring (e.g. via current transducer)
- o Free configuration of analog inputs, free allocation to any additional sensor
- o Calculation of hot-spot (acc. to IEC 60076), loss-of-life, ageing rate

### Benefits

- Monitoring of all diagnostic gases inside the transformer oil, enabling recognition of all potential failure types
- Avoidance of major costs due to failures or outages
- Cost savings thanks to scheduled and efficient transformer maintenance
- Uses advanced software (the unit and via PC)
- Maintenance-free system

### Scope of work

- Configuration and administration of each individual Multisense unit
- Data and configuration read-out of Multisense units
- Processing and visualization of data
- Read out (trend or table)
- Online functions (Status and process flow)
- Diagnostics functions (Duval triangle)
- Further processing of the data (Excel, CSV, clipboard and printing)

- Storage of the processed data and unit configuration
- Automatic data read-out and alerting by e-mail
- Standard electrical and mechanical connection kit, individual mechanical connection kit on request
- Installation flange (different ventilation sizes available)
- On-site training courses for operation and maintenance for our systems
- Optional: Turnkey installation and communications services
- Optional: Expert analysis of monitoring data and customer support



### Technical Details

#### Operation Principle

- Miniaturized gas sample production based on headspace principle
- No membrane, negative pressure proofed
- Patent-pending oil sampling system (EP 1 950 560 A1)
- Near-infrared gas sensor unit for CO<sub>2</sub>, CO, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>6</sub>, CH<sub>4</sub> and C<sub>2</sub>H<sub>4</sub>
- Micro-electronic gas sensor for H<sub>2</sub>
- Thin-film capacitive moisture sensor H<sub>2</sub>O
- Temperature sensors (for oil and gas temperature)
- Optional nominal voltages of auxiliary supply: 120 V AC 50/60 Hz or 230 V AC 50/60 Hz or 120 V DC or 230 V DC
- Housing: aluminum: W 263 x H 263 x D 327.5 mm
- Weight: approx. 15 kg
- Operating temperature (ambient): -55°C - +55°C (below -10°C display function locked)

	Range	Accuracy
H <sub>2</sub>	0-10000 ppm	± 5% or ± LDL (whichever is greater)
C <sub>2</sub> H <sub>2</sub>	0-10000 ppm	± 5% or ± LDL (whichever is greater)
CO	0-10000 ppm	± 5% or ± LDL (whichever is greater)
CO <sub>2</sub>	0-20000 ppm	± 5% or ± LDL (whichever is greater)
CH <sub>4</sub>	0-5000 ppm	± 5% or ± LDL (whichever is greater)
C <sub>2</sub> H <sub>4</sub>	0-10000 ppm	± 5% or ± LDL (whichever is greater)
C <sub>2</sub> H <sub>6</sub>	0-10000 ppm	± 5% or ± LDL (whichever is greater)
O <sub>2</sub>	0-50000 ppm	± 10% or ± LDL (whichever is greater)
H <sub>2</sub> O	0-100%	± 3% or ± LDL (whichever is greater)

\* Accuracy quoted is the accuracy of the detectors during calibration

- Oil temperature (inside transformer): -20°C - +90°C
  - Storage temperature (ambient): -20°C - +65°C
  - Oil pressure: up to 800 kpa (negative pressure allowed)
  - Safety: CE certified, Isolation protection: IEC 61010-1:2010/IEC 61010-2-081, Degree of protection: IP-55
- technique) and gas detection (non-dispersive infrared radiation method). It measures the concentration of dissolved gases in the oil.

Discover Siemens comprehensive transformer monitoring and sensor portfolio. For more information about Siemens comprehensive monitoring package for transformers, please contact your local partner or our Customer Support Center.

#### Fault gas measurement

SITRAM Multisense 9 is executed in two steps: gas extraction (headspace

#### Siemens Industry, Inc.

7000 Siemens Road  
Wendell, NC 27591

For more information, please contact our Customer Support Center.  
Phone: 1-800-333-7421

usa.siemens.com

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