# 3. SITRAM Multisense 9 (1/2)


Customer Services for Transformers

## SITRAM Multisense 9

Monitoring and Diagnostic

### Introduction

In their average lifetime of 40 years, transformers endure various stresses that can contribute to a multiplicity of failures (electrical, thermal, chemical or mechanical). Transformer failures may cause e.g. costly damages of 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 upcoming faults by analyzing the concentration of eight dissolved gases in transformer insulating oil (mineral and ester oil), besides 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, galvanized parts, stainless steel, sunlight by Monitoring $H_2$
- Low & medium temperature thermal faults by monitoring $CH_4$
- Thermal fault involving cellulose, slowly 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 over heating 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 diagnostic
- Optional: Various communication options, 13 digital outputs, 5 digital optocoupler outputs
- Optional: 10 analog outputs, 10 analog inputs
- Ambient humidity: 0-95%
- Monitoring functions:
  - Voltage and current monitoring (via voltage and current transformers / transducer)
  - Temperature monitoring: bottom and top oil temperature, ambient temperature (via additional temperature sensors)
  - Cooling stage / tap changer position monitoring (e.g. via current transducer)
  - Free configuration of analog inputs, free allocated to any additional sensor
  - Calculation of Hot-Spot (acc. IEC 60076), Loss-of-Life, Ageing Rate

### Benefits

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

# 3. SITRAM Multisense 9 (2/2)

### 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)
- Diagnostic 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 proprietary
- proprietary oil sampling system
- Near-infrared (NDIR) gas sensor

| Gas/Moisture-in-Oil Measurement | | |
|---|---|---|
| Measuring Quantity | Range | Accuracy* |
| Hydrogen $H_2$ | 5 ... 10.000 ppm | ±5% or ± LDL (whichever is greater) |
| Carbon Monoxide CO | 20 ... 10.000 ppm | ±5% or ± LDL (whichever is greater) |
| Carbon Dioxide $CO_2$ | 20 ... 20.000 ppm | ±5% or ± LDL (whichever is greater) |
| Methane $CH_4$ | 1 ... 5.000 ppm | ±5% or ± LDL (whichever is greater) |
| Acetylene $C_2H_2$ | 1 ... 10.000 ppm | ±5% or ± LDL (whichever is greater) |
| Ethylene $C_2H_4$ | 1 ... 10.000 ppm | ±5% or ± LDL (whichever is greater) |
| Ethane $C_2H_6$ | 1 ... 10.000 ppm | ±5% or ± LDL (whichever is greater) |
| Oxygen $O_2$ | 1000 ... 50.000 ppm | ±10% or ± LDL** (whichever is greater) |
| Moisture | 1 ... 100 % | ±3% or ± LDL (whichever is greater) |

* Accuracy quoted is the accuracy of the detectors during calibration

** LDL for O2 is 100 ppm for special cases

- Temperature sensors (for oil and gas temperature)
- Optional nominal voltages of auxiliary supply: 120 V -20% +15% AC 50/60 Hz or 230 V -20% +15% AC 50/60 Hz or 120 V -20% +15% DC or 230 V -20% +15% DC
- Power consumption: max. 350 VA
- Housing: aluminum: W 263 x H 263 x D 327.5 mm
- Weight: approx. 15 kg

Operation temperature (ambient): -55°C - +55°C (below -10°C display function locked)

- 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 61010-1:2001, Degree of protection: IP-55

#### Fault gas measurement

SITRAM Multisense 9 is executed in two steps: gas extraction (headspace technique) and gas detection (none-dispersive infrared radiation method). It measures the concentration of dissolved gases in the oil.

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



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*(Charges depending on provider)