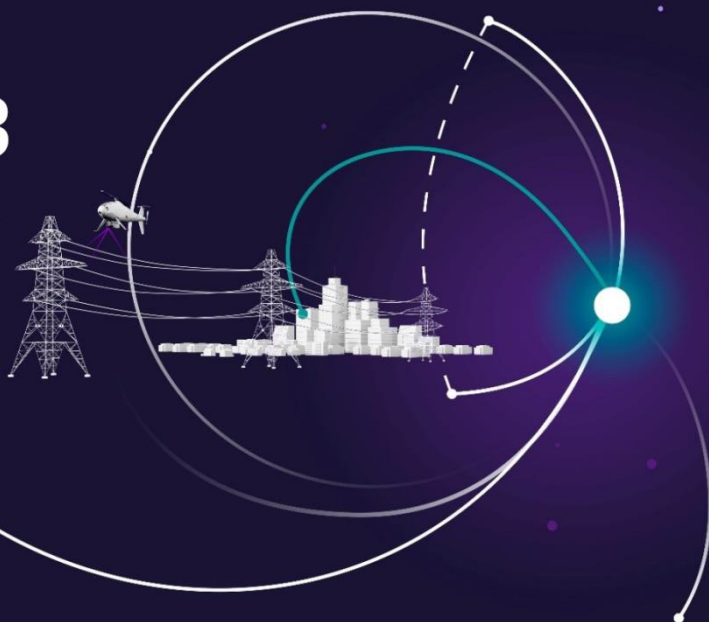# SITRAM Multisense 9-3

**SIEMENS energy**

Multi-Gas-in-Oil Analysis System for monitoring a bank of three single phase transformers located next to each other

siemens-energy.com/gt-service

## Introduction

The Multisense 9-3 is designed for multi-gas-in-oil analysis on a bank of three single phase transformers located next to each other. This new wall mounted system allows for the individual measurement of Moisture in Oil ($H_2O$) and the key gases Hydrogen ($H_2$), Carbon Monoxide (CO), Carbon Dioxide ($CO_2$), Methane ($CH_4$), Acetylene ($C_2H_2$), Ethylene ($C_2H_4$), Ethane ($C_2H_6$) and Oxygen ($O_2$) dissolved in transformer oil utilizing a sampling system that samples oil from each tank via three separate oil channels expertly engineered to provide negligible mixing of oil.

As Hydrogen ($H_2$) is involved in nearly every fault of the insulation system of power transformers and Carbon Monoxide (CO) is a sign of an involvement of the cellulosic / paper insulation the presence and increase of Acetylene ($C_2H_2$) and Ethylene ($C_2H_4$) further classifies the nature of a fault as overheating, partial discharge or high energy arcing.

It is further equipped with digital outputs for the transmission of alarms or the execution of control functions (e. g. control of a cooling system of a transformer):

- 10 digital relay outputs (optional)
- 5 digital opto-coupler outputs (optional)

## Key Advantages

- Hydrogen ($H_2$), Carbon Monoxide (CO), Carbon Dioxide ($CO_2$), Methane ($CH_4$), Acetylene ($C_2H_2$), Ethylene ($C_2H_4$), Ethane ($C_2H_6$) and Oxygen ($O_2$)
- Moisture-in-oil ($H_2O$) measurement
- Monitor three tanks with one Multisense 9-3
- Communication interfaces ETHERNET 10/100 Mbit/s (copper-wired / RJ 45 or fibre-optical / SC Duplex) and RS 485 to support MODBUS®RTU/ASCII, MODBUS®TCP
- Optional 2G/3G modem with external adhesive antenna
- Optional IEC 61850 modem for SCADA connection

## Technical data Multisense 9-3

### General

| | |
|---|---|
| Optional nominal voltages of auxiliary supply: | 120 V -20% +15% AC 50/60 Hz [1] or 230 V -20% +15% AC 50/60 Hz [1] or 120 V      +15% DC [1] or 230 V -20% +15% DC [1] Other nominal voltages on request! |
| Power consumption: | max. 900 VA |
| Housing: | Mild Steel |
| Dimensions: | W 600 x H 800 x D 400 mm |
| Weight: | approx. 80 kg |
| Operation temperature: (ambient) | -55°C ... +55°C (below -10°C display function locked) |
| Oil temperature: (in the transformer) | -20°C ... +105C |
| Storage temperature: (ambient) | -20°C ... +65°C |
| Connection to valve: | All Valves possible / pipe with diameter of 6mm connectable without adapters 2 valves necessary (in/out) / max. distance 30m |

### Safety

| | |
|---|---|
| | CE certified |
| Insulation protection: | IEC 61010-1:2011-07 |
| Degree of protection: | IP-65 |

### Measurements

| Gas/Moisture in oil Measurement | | Accuracy [2] [3] |
|---|---|---|
| Measuring quantity | Range | |
| Hydrogen $H_2$ | 5 ... 2.000 ppm | ± LDL, ± 5% |
| Carbon Monoxide CO | 1 ... 5.000 ppm | ± LDL, ± 5% |
| Carbon Dioxide $CO_2$ | 20... 10.000 ppm | ± LDL, ± 5% |
| Methane $CH_4$ | 2 ... 5.000 ppm | ± LDL, ± 5% |
| Acetylene $C_2H_2$ | 0.5... 5.000 ppm | ± LDL, ± 5% |
| Ethylene $C_2H_4$ | 1 ... 5.000 ppm | ± LDL, ± 5% |
| Ethane $C_2H_6$ | 1 ... 5.000 ppm | ± LDL, ± 5% |
| Oxygen $O_2$ | 0 ... 50.000 ppm | ± 10 %± 1000 ppm |
| Moisture $H_2O$ ($a_w$) | 0 ... 100 % | ± 3 % |
| Moisture in Mineral Oil | 0 ... 100 ppm | ± 3 %± 3 ppm |
| Moisture in synt. Esther [5] | 0 ... 2.000 ppm | ± 3 % of MSC [6] |

### 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, $C_2H_2$ and $C_2H_4$
- Near-infrared gas sensor unit for $CO_2$, $CH_4$ and $C_2H_6$
- Micro-electronic gas sensor for $H_2$ and $O_2$
- Thin-film capacitive moisture sensor $H_2O$
- Temperature sensors (for oil and gas temperature)

## Analog and digital outputs (optional)

| 12/24/36 x Analog DC outputs | | Default concentration (Free assignment) |
|---|---|---|
| Type | Range | |
| 1 x Current DC | 0/4 ... 20 mADC | Hydrogen $H_2$ |
| 1 x Current DC | 0/4 ... 20 mADC | Carbon Monoxide CO |
| 1 x Current DC | 0/4 ... 20 mADC | Carbon Dioxide $CO_2$ |
| 1 x Current DC | 0/4 ... 20 mADC | Methane $CH_4$ |
| 1 x Current DC | 0/4 ... 20 mADC | Acetylene $C_2H_2$ |
| 1 x Current DC | 0/4 ... 20 mADC | Ethylene $C_2H_4$ |
| 1 x Current DC | 0/4 ... 20 mADC | Ethane $C_2H_6$ |
| 1 x Current DC | 0/4 ... 20 mADC | Oxygen $O_2$ |
| 1 x Current DC | 0/4 ... 20 mADC | Moisture in Oil $H_2O$ |
| 1 x Current DC | 0/4 ... 20 mADC | Free programmable |

| 12/24/36 x Digital outputs | | Max. Switching capacity (Free assignment) |
|---|---|---|
| Type | Control voltage | |
| 12/24/36 x Relay | 12 VDC | 220 VDC/VAC / 2 A / 60 W |

### Communication

- RS 485 (proprietary or MODBUS® RTU/ASCII protocol)
- ETHERNET 10/100 Mbit/s copper-wired / RJ 45 or fibre-optical / SC Duplex (proprietary or MODBUS® TCP protocol)
- 2G/3G modem with external adhesive antenna (optional) (proprietary protocol
- IEC 61850 modem (Option)

### Notes

[1] **120 V** ⇨ 120 V      = **120 $V_{min}$**      120 V +15% = **138 $V_{max}$**
  **230 V** ⇨ 230 V -20% = **184 $V_{min}$**      230 V +15% = **264 $V_{max}$**

[2] Related to temperatures ambient +20°C and oil +55°C

[3] Accuracy for moisture in oil for mineral oil types and accuracy quoted is the accuracy of the detectors during calibration process, under controlled laboratorial conditions

[4] Default jumper configuration: Current