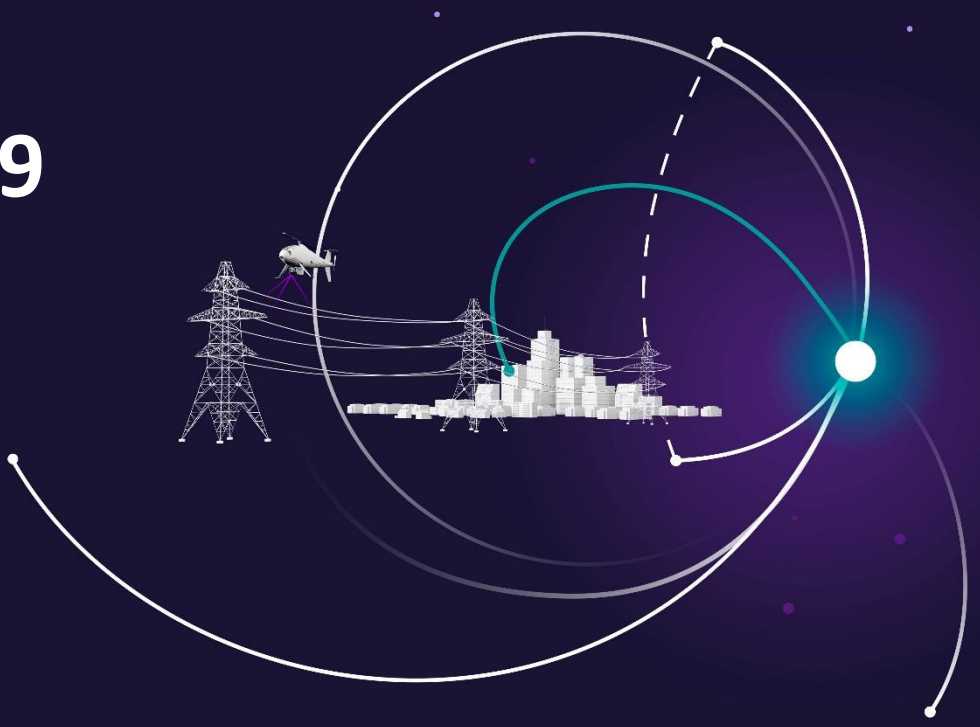
SITRAM Multisense 9

Monitoring and Diagnostics



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Introduction

In their average lifetime of 40 years, transformers endure various forms of stresses that can result in different kinds 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 prevent transformer failures.

SITRAM Multisense 9 indicates deviations and evolving 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 fault types such as:

- 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

Key Advantages

- Measurement technology with no consumables (e.g., reference gas) or regular maintenance effort
- Display and keypad enabling comprehensive configuration and setup without additional computer
- Directly mounted to transformer; no piping, no frame / stand; One-man work
- Only one free transformer valve required (G1½ DIN ISO 228-1 or 1½" NPT ANSI B 1.20.1)
- No operational interruption of the transformer during installation and commissioning
- Robust, NDIR measurement technology without moving parts or reference gas
- Compact design, no moving parts
- Advanced software (on the unit and via PC)

Summary

Prevention of Transformer Failures
Early fault detection and diagnosis with online dissolved gas analysis (DGA) by monitoring 8 Fault Gases and Moisture

Easy Installation

- Directly mounted to Transformer
- Only 1 free flange required
- No additional piping, frames or stands required

Easy Operation

- No consumables
- No periodic maintenance

Technical Details

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 -20% +15% DC [1] or 230 V -20% +15% DC [1] Other nominal voltages on request
Power Consumption:	max. 600 VA
Housing:	Aluminum – IP55
Dimensions:	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: (in the transformer)	-20°C … +90°C
Storage Temperature (ambient)	-20°C … +65°C
Oil Pressure:	0 – 800 kPa
Supported Fluids	Mineral Oil synthetic Ester on request
Connection to valve:	G1½ DIN ISO 228-1 or 1½" NPT ANSI B 1.20.1

Safety

Insulation protection:	IEC 61010-1:2002
Degree of protection	IP-55 CE Certified

Operation Principal

- 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)

Measurements

Gas	Range	Accuracy[3]	Expected Operational LDL and Accuracy [4]
H_2	5 … 10,000 ppm	±5% ±5ppm[2]	±15% ±25ppm
C_2H_2	1 … 10,000 ppm	±5% ±1ppm[2]	±20% ±5ppm
CO	20 … 10,000 ppm	±5% ±20ppm[2]	±20% ±25ppm
CO_2	20 … 20,000 ppm	±5% ±20ppm[2]	±20% ±25ppm
CH_4	1 … 5,000 ppm	±5% ±1ppm[2]	±20% ±25ppm
C_2H_4	1 … 10,000 ppm	±5% ±1ppm[2]	±20% ±10ppm
C_2H_6	1 … 10,000 ppm	±5% ±1ppm[2]	±20% ±15ppm
O_2	1,000 … 50,000 ppm	±10% ±1000ppm[2]	±10% ±1000ppm
H_2O	1 … 100 %	±3% ±1ppm[2]	±3% ±3ppm

Input / Output

Quantity	Type	Range / Control Voltage
10 x	Analogue Outputs	0/4 … 20 mADC
10 x	Digital Outputs	12 VDC

Communication

- Ethernet 10/100 Mbit/s copper-wired / RJ45 or fiber-optical /SC Duplex (proprietary or MODBUS® TCP protocol)
- RS 485 (proprietary or MODBUS® RTU/ASCII protocol)
- Optional: GSM, DNP3, IEC 61850

Notes

[1] 120 V → 120 V -20% = 96 Vmin 120 V + 15% = 138 Vmax
230 V → 230 V -20% = 184 Vmin 230 V + 15% = 264 Vmax

[2] According to Headspace extraction method described in IEC 60567:2011

[3] Accuracy of the detectors during calibration process under controlled laboratorial conditions

[4] Related to temperatures ambient +20°C and oil + 55°C, considering mineral oil type without ageing factors and additives

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