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Transforming analysis into reliability.

SITRAM® GAS-Guard 8 from TLM™ – Transformer Lifecycle Management™

Answers for energy.

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SITRAM® GAS-Guard 8: continuous gas-in-oil analysis of critical gases directly on the transformer

## For reliable operation of transformers: Analyze fault gases – promptly detect faults

Electricity has to flow reliably. As one of the most valuable components in your network, transformers play a key role in ensuring that it does. That's why it's so important to know their precise status – so you can prevent unplanned downtimes, optimally schedule planned downtimes, reduce maintenance costs, and ultimately use your investment in the best possible way.

Fault gases are an important indicator of increased risk of a transformer fault. Every typical fault – whether it's the formation of electric arcs, partial discharges, local hot spots or generally inadequate cooling – generates specific dissolved gas in various concentrations. That's why continuous monitoring and assessment of gas development are so important. They allow an early response – so that more extensive damage can be reliably prevented.

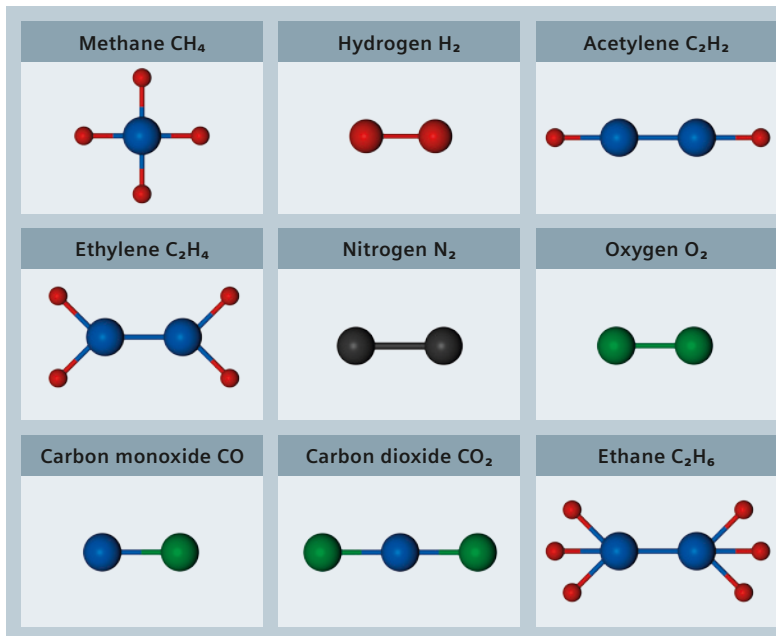
Dissolved gas analysis, or DGA, is a modern yet proven method for doing this. Its goals are:

- Monitoring known faults along with the early detection of faults – continuous trend analysis of critical gases detects incipient fault conditions at an early stage and monitors them as they develop.
- Reducing maintenance costs – with condition-based maintenance using online monitoring.
- Estimating the remaining service life – measuring oil moisture, oxygen, CO<sub>2</sub>, and CO supports the calculation of thermal aging.

*Siemens brings the DGA lab to your transformer – continuously, precisely, and reproducibly. With the SITRAM® GAS-Guard 8.*

Overview of the gases in the transformer oil that are relevant for making a meaningful diagnosis

SITRAM® GAS-Guard 8 during operation



## SITRAM® GAS-Guard 8: A guard right on your transformer



### All critical gases always under control

SITRAM® GAS-Guard 8 (GG 8) provides comprehensive online fault gas analysis using gas chromatography. Located directly on the transformer, it generates continuous information about all key gases – to help you keep your transformer fleet in top shape.

For decades, gas chromatography (GC) has been the reference standard and scientifically accepted lab method for measuring gas-in-oil levels. The SITRAM® GG 8 brings the DGA laboratory to your transformer with its rugged gas chromatograph. It operates continuously in a self-calibrating manner and has an adjustable measuring interval.

It measures the gases dissolved in the transformer oil at regular intervals, even hourly if need be. In addition, SITRAM® GG 8 provides measurements of the oil temperature, moisture, and the load.

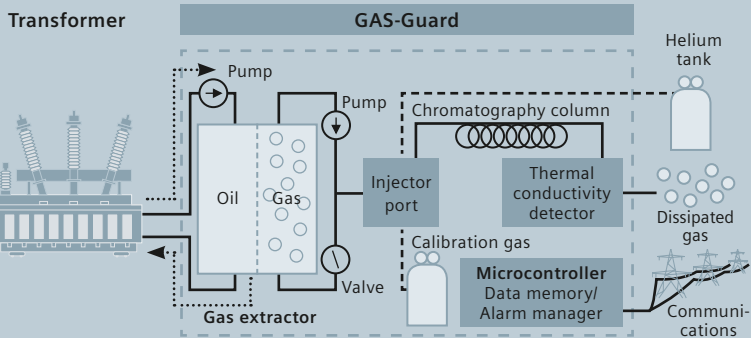
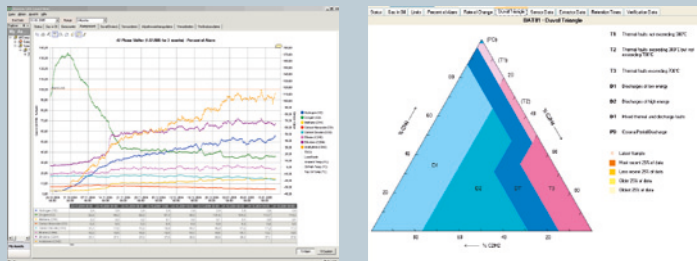
Attached in a compact manner directly on the transformer and field-proven, SITRAM® GG 8 is the most capable instrument in the field worldwide. There are many good reasons for its high reliability and low lifecycle costs – after all, it has the largest installed base of all comparable products.

SITRAM® GG 8 allows correlations to be drawn between fault gases, moisture-in-oil, oil temperature, and ambient temperature. The instrument supports all IEEE and IEC diagnostic tools, thus allowing rapid warning and diagnosis of developing faults.

### SITRAM® GAS-Guard 8 – factors for the success of the largest internationally installed base

- Rugged and field-capable: gas chromatography optimized for use in the field
- Analysis of individual gases without cross-sensitivities
- Reproducibility by automatically calibrating to the reference gas
- GC is the methodology used in oil labs (IEC-/IEEE-tested)
- Moisture sensor included with the system
- Indication of load-dependent gas development
- Quick and variable installation

SITRAM® GAS-Guard 8 is part of our SITRAM® MONITORING family. This modular set of solutions helps ensure high availability and service life for your transformers. We'll work with you to define exactly the right solutions for your needs.



Everything on your screen, everything under control – with powerful tools and with the same analysis technology as an oil lab

With SITRAM® MONITORING Service, you won't have to deal with the measured values on your own

### Measuring principle of the gas chromatograph

The transformer oil to be analyzed circulates in a loop over an extraction unit containing two different volumes – oil and gas. A gas-permeable membrane separates the two volumes from one another. The gas dissolved in oil diffuses through the permeable membrane into the gas phase.

A defined amount of this gas is removed in the injection unit and pressed with helium – the mobile phase – through the chromatography column.

Depending on their specific properties, the gases have different run times during transport through the column. A thermal conductivity detector is used at the end of the column to determine the exit time of individual gas components. Along with analyzing the amplitude, it's possible to qualitatively and quantitatively determine the gases dissolved in oil.

### Powerful tools – comprehensive service

SITRAM® GG 8 and MONITORING Service – sophisticated technology combined with an expert service partnership give you a solid basis for making asset management decisions.

The GAS-Guard View software allows the SITRAM® GG 8 to be controlled both on-site and remotely, and data to be accessed and displayed on a user-friendly interface. Naturally, in case of doubt, you can also make your measured data available to us online. Our DGA oil lab experts provide everything you need to be sure you're making the right decision.

These tools and services are a part of the modular TLM™ portfolio and can be supplemented with additional SITRAM® MONITORING solutions.

# SITRAM® GAS-Guard 8: Data sheet

## DGA method: Laboratory-grade gas chromatography

Gas		Accuracy <sup>1</sup>	Repeat-ability <sup>2</sup>	Range <sup>3</sup>
Hydrogen	H <sub>2</sub>	±5 % or ±3 ppm	<2 %	3 – 3,000 ppm
Oxygen	O <sub>2</sub>	±5 % or +30/-0 ppm	<1 %	30 – 25,000 ppm
Methane	CH <sub>4</sub>	±5 % or ±5 ppm	<1 %	5 – 7,000 ppm
Carbon monoxide	CO	±5 % or ±5 ppm	<2 %	5 – 10,000 ppm
Carbon dioxide	CO <sub>2</sub>	±5 % or ±5 ppm	<1 %	5 – 30,000 ppm
Ethylene	C <sub>2</sub> H <sub>4</sub>	±5 % or ±3 ppm	<1 %	3 – 5,000 ppm
Ethane	C <sub>2</sub> H <sub>6</sub>	±5 % or ±5 ppm	<1 %	5 – 5,000 ppm
Acetylene	C <sub>2</sub> H <sub>2</sub>	±5 % or ±1 ppm	<2 %	1 – 3,000 ppm
Nitrogen	N <sub>2</sub>	±10 % or ±5,000 ppm	<20 %	5,000 – 100,000 ppm

## Notes

All specifications are independent of oil temperature and gas pressure levels.

<sup>1</sup> Percent or PPM – whichever is greater

<sup>2</sup> At the calibration level

<sup>3</sup> Gas-in-oil

## Moisture-in-oil and oil temperature option

Parameter	Accuracy <sup>4</sup>	Range
Moisture-in-oil	±2 %	0 – 100 % RS
	<10 % of reading for oil temperature >30 °C	0 to 80 <sup>5</sup> ppm
	<18 % of reading for oil temperature <30 °C	0 to 80 <sup>5</sup> ppm
Oil temperature	±0.1 °C (typically)	-40 °C to +180 °C

<sup>4</sup> Includes nonlinearity and repeatability

<sup>5</sup> Upper range limited to saturation

## Total dissolved gases

True Total Dissolved Combustible Gas (TDCG) output is available ( $\sum$ H<sub>2</sub>, CO, CH<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub> in ppm).

Each gas is measured at 100 % of detected level.

Total hydrocarbons (THC) output is available ( $\sum$ CH<sub>4</sub>, C<sub>2</sub>H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, C<sub>2</sub>H<sub>6</sub> in ppm).

Each gas is measured at 100 % of detected level.

## Gas analysis

Oil sampling is continuous and gas analysis intervals are user-selectable from 2 hours to 12 hours (default: 4 hours).

All data is date- and time-stamped.

Up to two years of data stored in memory.

Automatic schedule acceleration when rate of change alarm limit is exceeded (default: 1 hour).

System performs periodic auto-calibration to National Institute of Standards (NIST) traceable gas standard.

## Alarms

Two individually programmable relays – 50 VDC or 240 VAC at 3 A max. (125 VDC at 1 A max.).

Gas caution & alarm for level (ppm) and/or rate-of-change (ppm/day).

Power, service event or gas caution and alarm.

Relay contacts operate as normally open or normally closed.

## External sensor inputs

Three (3) analog 4 to 20 mA inputs

Sensors included are:

Transformer load guide

Ambient temperature

Optional moisture-in-oil and temperature probe (uses 2 inputs)

## Communications

Standard physical layer interfaces:

RS-232, RS-485, Ethernet fiber (100Base-FX), V.92 internal modem

Optional interfaces: GSM modem, Ethernet copper (10/100Base-TX), wireless radio

Protocols supported: TCP/IP, DNP3, Modbus RTU and ASCII, OPC and IEC 61850 upon request

## Environmental specifications

Operating temperature	-50 °C to +55 °C
Cold start temperature	-20 °C
Operating humidity	5 % to 95 % RH non-condensing
Oil inlet pressure	0 to 3 bar
Storage temperature	-40 °C to +75 °C
Storage humidity	5 % to 95 % RH non-condensing

## Input power requirements

Voltage	115 VAC or 230 VAC ±15 %
Frequency	50/60 Hz
Current	6 A maximum at 115 V 3 A maximum at 230 V

## Physical specifications and weights

Height	55.9 cm (22.0 in)
Width	50.8 cm (20.0 in)
Depth	28.4 cm (11.2 in)
Weight	29.5 kg (65 lb)
Enclosure rating	IP 66, NEMA 4X
Packaged dimensions	67 cm x 67 cm x 40.3 cm (26.4 in x 26.4 in x 15.9 in)
Shipping weight (monitor only)	31.8 kg (70 lb)

## Certifications/Standards

### Electromagnetic compatibility

Specification	Test method
EN 61326 Class A: 2002	EN 61326: 2002 Radiated emissions EN 61326: 2002 Conducted emissions
EN 61000-3-2: 2000	EN 61000-3-2: 2000 Current harmonics
EN 61000-3-3: 2001	EN 61000-3-3: 2001 Voltage fluctuations
EN 61326 Annex A: 2002	IEC 61000-4-2: 2001 ESD IEC 61000-4-3: 2002 Radiated immunity against HF field IEC 61000-4-4: 2004 EFT IEC 61000-4-5: 2001 Surge IEC 61000-4-6: 2004 Conducted RF immunity IEC 61000-4-8: 2001 Magnetic field immunity IEC 61000-4-11: 2004 Voltage dips and interrupts

### Safety

IEC 61010-1, IEC 61010-2-81

UL 61010-1 (2nd Edition), UL 60950-1 Clause 6.4

CSA-C22.2 No. 61010-1-04

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