

TRANSFIX™ DGA 500

Monitoring and recognised initial diagnostic



Product Overview

Transformers are key and expensive components of the electrical grid and knowledge of their health condition is essential to having a reliable network. Monitoring transformers is an increasingly vital tool of successful asset managers to enable them to gauge and address the risk in their network, but also to build a fact based asset replacement strategy.

When a transformer's insulation system is overstressed, gases are produced that dissolve in the transformer's insulating oil. Dissolved Gas-in-oil Analysis (DGA) and moisture measurements are recognized as the most important tests for condition assessment of transformers and the best early indicators of developing faults.

Through the work of groups like IEEE®, IEC® and Cigré®, several diagnostics methods are now available which can help user interpret the various levels of gases reported by on-line DGA monitors. The more gases are available, the wider the pallet of diagnostics tools made available and therefore the richer the diagnostic obtained.

The TRANSFIX DGA 500 is a new on-line monitoring unit that measures individual dissolved gas and moisture and provides both on-line monitoring and key exploratory diagnostics. It uses the now well known PAS technology (Photo Acoustic Spectroscopy) made popular due to its accuracy, repeatability and lack of consumable through its bigger brother the Kelman™ TRANSFIX.

All types of incipient faults are covered by the monitoring of hydrogen gas levels. Slowly eroding paper faults can be exposed through the monitoring of carbon monoxide. Various degrees of thermal faults, including arcing, can be detected and identified, often leading to a transformer repair rather than a much more costly transformer rebuild.

In particular, the TRANSFIX DGA 500 enables the well known Duval's triangle DGA diagnostic described in Appendix B of IEC Standard 60599. It uses the value of 3 gases (Acetylene, Ethylene and Methane) and is suitable for identifying various degrees/temperature of thermal faults as well as the presence of high-energy electrical discharge faults.

Key Benefits

- Automated multi-gas plus moisture on-line monitoring
- Can specifically identify early arcing issues
- Ability to perform Duval's triangle DGA diagnostic
- Easily replaceable with a full nine gas unit
- Communicates data to allow remote diagnostic
- No carrier or calibration consumable gases required
- Available with AC or AC/DC power supply

Applications



Power Utilities

- Middle of the road solution for medium-criticality transformers
- Monitoring together with remote exploratory diagnostic



Industrial Plants

- Reduces the risk of process interruption due to power failure
- Minimizes costly production downtime

Cutting Edge Technology

- Five gases plus moisture in a single monitor
- Automated headspace gas extraction
- State of the art photo-acoustic spectroscopy (PAS) measurement technology
- No carrier or consumable calibration gases required
- Long service life with minimal maintenance
- Capable of sampling frequency up to once per hour

Ease Of Use

- Easy installation: no outages required, reducing expense and inconvenience for user
- Easily swappable for a high end Kelman TRANSFIX nine gas monitor, once serious issues are detected
- Sampling frequency is user-configurable
- Over two year's worth of data stored internally at six-hourly sampling rate

Configurable Alerts

- Sunlight visible front panel LED arrays
- Six user configurable alarm relay contacts
- Alarms can be set on gas or moisture ppm levels or on rate of change (ROC)
- Alarms can be set or changed locally or remotely using Perception™ software
- Caution and alarm modes can be used to automatically increase sampling frequency

Integrated Solution

- Integrated load CT allows DGA results to be analysed against the loading of the transformer
- Extensive remote communications options
- Data can be downloaded into GE's Perception software suite, providing sophisticated graphical trending and diagnostic analysis of results, as part of a complete fleet assessment



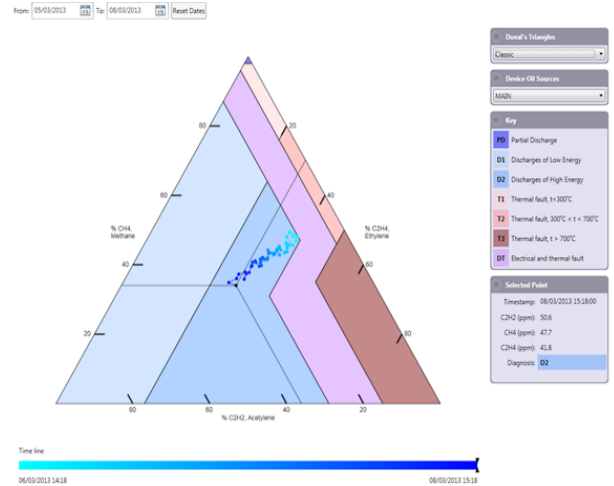
Duval's Triangle & Perception Software

The Duval Triangle diagnostic method for transformer DGA results was developed by Michel Duval, and is described in IEC standard 60599.

Concentrations (ppm) of methane (CH₄), ethylene (C₂H₄), and acetylene (C₂H₂) are expressed as percentages of the total (CH₄ + C₂H₄ + C₂H₂) and plotted as a point (%CH₄, %C₂H₄, %C₂H₂) in a triangular coordinate system on a triangular chart which has been subdivided into fault zones. The fault zone in which the point is located designates the most likely fault type which produced that combination of gas concentrations.

The Duval Triangle method, like any other DGA diagnostic method, should be applied only when there is some suspicion of a fault, based on an abnormal increase in dissolved gases and H₂ in particular. It is part of the list of diagnostic methods available in GE's Perception software, depending on the various gas concentration data that are available.

The TRANSFIX DGA 500 integrates seamlessly with Perception to provide not only dashboard and risk information for the transformer monitored but also to compare that transformer's health with that of other similar assets and showcase its priority as part of the fleet management tool.



Technical Specifications

Measurements

Sensor

- Automated headspace gas extraction
- Photo-acoustic spectroscopy (PAS) gas measurement
- Thin film capacitive moisture sensor

Measurements

- Hydrogen (H₂): 5-5,000 ppm
- Carbon Monoxide (CO): 2-50,000 ppm
- Acetylene (C₂H₂): 0.5-50,000 ppm
- Ethylene (C₂H₄): 2-50,000 ppm
- Methane (CH₄): 2-50,000 ppm
- Moisture (H₂O): 0-100% RS (given in ppm)

Accuracy

- Gases*: $\pm 5\%$ or \pm LDL (Lower Detection Limit), whichever is greater
- Moisture: $\pm 2\%$ RH

Frequency

- Configurable from once per hour to once every 4 weeks
- Faster sampling automatically triggered upon alert level reached

Features

Display

- 3x sunlight visible LED arrays
- Internal backlit LCD, 4 lines x 20 characters

Digital Output

- USB port (type B connector) for local connection to laptop computer for configuring the system
- Ethernet (RJ45) is standard
- Serial output (RS-485) and fibre-optic LAN options
- PSTN Analogue or GSM/GPRS or CDMA/LTE modem options

Digital Protocols

- Modbus® is standard
- DNP3 or IEC 61850 options

Analogue Outputs

- 8 channel configurable analogue output, 4-20mA, available as an option

Alarms

- 6 alarm setting screens/scenarios available which can set alarms based on gas level, gas rate of change and moisture level
- 6 dry contact relays (type C, SPDT), NO/NC, 3A @250Vac, 3A @ 30Vdc, 200mA @ 125Vdc, 150mA@ 300Vdc
- Separate Service Alarm

Other options

- Mounting stand
- Cradle mount (for mounting on transformer)
- Sun canopy
- Optional external sampling port for glass syringe with Luer stop cock

Environmental

Conditions

- Operating ambient temperature**
-40°C to +55°C (-40°F to +131°F): AC version
-25°C to +55°C (-13°F to +131°F): AC/DC version
- Operating ambient humidity
0-95% RH, non-condensing
- Oil temperature at valve***
-20°C to +120°C (-4°F to +248°F)
- Oil pressure at valve 0-700KPa (0-100psi)

Enclosure

- IP55 certified
- 304 Stainless Steel, Powder Coated (RAL9002)

Power Requirements AC Version

- Nom: 115-230 Vac Range: 103-126/207-253 Vac, 47-63 Hz, 8A max

Power Requirements AC/DC Version**

- Nom: 100-230 Vac, Range: 90-253 Vac, 45-65Hz, 5A max
- Nom: 100-220 Vdc, Range: 90-242 Vdc, 45-65Hz, 5A max

Mechanical

- 760mm (30") x 560mm (22") x 352mm (14")
- Installed weight 72Kg (159lb)
- Shipping weight 78Kg (172lb)

*Gas accuracy quoted is accuracy of the sensor during calibration
**Operating temperature range reduced at -25°C to +55°C when using AC/DC version - PSU is type tested to -40 for startup
***Based on testing carried out using VOLTESSO™ 35 mineral oil, over a ¼" pipe run of 10 metres or less from oil supply or return valve to monitor connection point and on transformer oil supply valve volumes of 200ml or less. For oil temperatures colder than -20°C GE recommend the use of heat trace cabling on piping

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