GE
Digital Energy

Kelman TAPTRANS™

On-line DGA & moisture for transformers and on-load tap changers

Product Overview

Knowledge of the condition of transformers is essential for all electrical networks and on-line monitoring of transformers is an increasingly vital component of successful asset management program. The information provided by multi-gas-online DGA allows valuable asset capabilities to be maximised and expensive failures to be avoided.

Dissolved Gas Analysis (DGA) and moisture measurement of the insulation oil are recognised as the most important tests for condition assessment of transformers. Traditionally performed in a laboratory environment, TAPTRANS uniquely provides the capability as a single device to perform full on-line multi-gas DGA and moisture monitoring of a transformer main tank and on-load tap changer (OLTC), including both the selector and diverter tanks.

Key Benefits

- Remote insight into both transformer and OLTC condition
- Faults can be detected in their infancy
- Transformer load and output can be optimised safely
- Discrete measurement of all fault gases facilitates full diagnostics
- Transformer ageing can be calculated
- Fault type can be classified from results
- OLTC diverter oil completely segregated from transformer main tank and OLTC selector oil circuits
- Aids condition based and predictive maintenance strategies

Applications

Multi-gas DGA has traditionally been confined to infrequent off-line laboratory analysis, forming part of time based maintenance strategies. Globally the average age of transformers continues to increase, whilst in comparison to historical experience a larger percentage of new transformers encounter faults in their early years of operation. This means the possibilities of rapid aging, unplanned outages and even catastrophic failure between off-line tests also increase, leading many asset owners to adopt on-line DGA monitoring equipment more suited to condition based / predictive maintenance strategies.

The TAPTRANS is designed for transformers with on-load tap changers (OLTC), which are recognised as being one of the most vulnerable parts of a transformer and which account for a large portion of unplanned outages and catastrophic failures. Full 9 gas DGA sampling can be performed as often as every hour on a single tank and up to once every three hours if all three possible oil tanks are connected. This includes monitoring of the 7 key gases employed in all common diagnostic methods and TAPTRANS offers full gas in oil trending, analysis and diagnostic capabilities through its close integration with GE's powerful Perception software suite and/or users own software, historian and SCADA systems. Therefore TAPTRANS uniquely provides asset managers with powerful insight into not only main transformer tank condition but also key OLTC parameters such as moisture level, current conductive system condition, mechanism timing characteristics, contact wear and insulation condition. The TAPTRANS is suitable for monitoring any oil filled transformer which has an OLTC, whether in-tank or on-tank, oil or vacuum tap, with a view to extending asset life, preventing unexpected failure and operating on a condition based / predictive maintenance schedule.

- GSU transformers
- Electric arc furnace (EAF) transformers
- HVDC station transformers
- Transmission transformers

GE imagination at work

Integrated Solution

- Key element of GE's integrated transformer monitoring portfolio
- Operates as standalone DGA monitor or can be integrated with bushing monitoring and transformer modelling modules
- Integrated load monitoring allows DGA results to be analysed against the loading of the transformer
- Can be controlled and configured by GE's Perception™ software – single platform advanced asset management suite providing sophisticated graphical trending & diagnostic analysis of results
- Additional inputs for up to five other analogue sensors

Cutting Edge Technology

- Nine gas DGA plus moisture monitoring of transformer main tank and OLTC in a single device
- Based on the same platform as GE's highly successful Kelman TRANSFIX™ single tank monitor
- Automated headspace gas extraction
- State of the art photo-acoustic spectroscopy (PAS) measurement technology
- No carrier or calibration gases required
- Long service life with minimal maintenance
- Capable of sampling frequency up to once per hour between oil sources

Ease of Use

- Easy installation
- No consumables and minimal maintenance requirements reduces running costs and site visits
- Extensive local and remote communications options available
- Sampling frequency is user-configurable, versatile and flexible, including prioritisation of individual tanks
- LCD display provides up to date information on site

Configurable Alerts

- Two sunlight visible front panel LED arrays (Red & Yellow)
- Six user configurable alarm relay contacts
- Alarms can be set or changed locally or remotely using Perception software
- Caution and alarm modes can be used to increase the sampling rate on each tank individually

Communication

- Two separate channels for remote communications, plus local USB connection and Ethernet connection
- Communications protocols supported include MODBUS®, MODBUS/TCP, DNP3.0, IEC®61850
- Modules available for communication via RS232, RS485, Ethernet, Fiber Optic, PSTN and cellular GSM/GPRS modems

Technical Features

- Uses photo-acoustic spectroscopy (PAS) to give highly reliable results. Field proven with over 8,000 Kelman PAS systems deployed in over ninety countries worldwide
- Nine target gases plus moisture measured
- Estimation of nitrogen and total gas content for free breathing transformers
- Fully embedded processor and internal data storage for 10,000 records - over eight years of data at default sampling rates
- Non-volatile memory storage to prevent loss of data
- Discrete sampling gives more rapid response to gas rises. No 'averaging' of DGA results

Alarms

- Two sunlight visible front panel LED arrays (Red & Yellow) and six alarm relay contacts, each user configurable
- All alarms can be set or changed locally or remotely using Perception software
- Six alarm setting screens or scenarios are available for each oil circuit, which can set alarms based on the level of any of the nine gases, TDCG and moisture, and rates of change for each gas
- Each alarm setting screen can activate one of six alarm relays, the red or yellow front panel indicator or send an SMS message if equipped with the optional cellular GSM modem
- Six dry alarm relay contacts (configurable). NO and: 5A 250VAC; 200mA 125VDC; 4A 30VDC
- Caution mode and alarm mode can be used to increase sampling frequency
- The alarm results of each screen are independent of the other circuits and alarm setting screens

Technical Specifications

PARAMETER (COMPOUND)	VALUE/MEETS (MEASUREMENT RANGE)
Hydrogen (H_2)	5 - 5,000 ppm
Carbon Monoxide (CO)	2 - 50,000 ppm
Carbon Dioxide (CO_2)	20 - 50,000 ppm
Methane (CH_4)	2 - 50,000 ppm
Acetylene (C_2H_2)	0.5 - 50,000 ppm
Ethane (C_2H_6)	2 - 50,000 ppm
Ethylene (C_2H_4)	2 - 50,000 ppm
Moisture (H_2O)	0 - 100% RS (given in ppm)
Accuracy*	±5% or ±LDL (whichever is greater)
Oxygen (O_2)	100 - 50,000 ppm, accuracy ±10%
Nitrogen (N_2)	10,000 - 100,000 ppm, accuracy ±15%

*Accuracy quoted is the accuracy of the detectors during calibration.
N^2 available on free-breathing transformers only

ENVIRONMENT	
Temperature	-40 to 55°C
Oil Temperature Range**	-20 to 120°C
Power Supply***	115/230VAC; 50/60Hz; 8A max
Operating Humidity	10 - 95% RH non-condensing
Enclosure	IP55
Weight	72 kg (159 lbs.)
Single Phase Alarm Relays	NO and NC provided: 5A 250VAC; 200mA 125VDC; 4A 30VDC
Measure Frequency	Variable - once per hour to once every 4 weeks

** 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

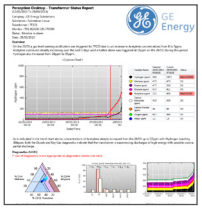
*** VDC power supply options may be available on request dependant on external supply configuration

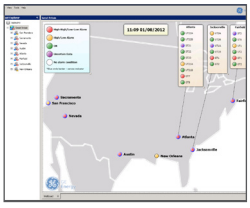
Perception - Transformer Fleet Management & Risk Software

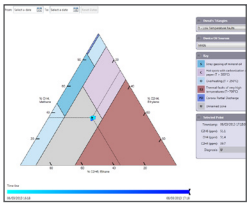
Providing critical insight on your transformers condition and overall fleet risk. Perception features data trending, condition diagnostics, customisable overview reports, wallboard fleet visualisation, alarm notification and visualisation. The smart and standards based logic used in Perceptions fleet ranking algorithms deliver a simplified yet concise overview of your transformers condition and risk. The customisable data import and export facility enhances Perceptions interoperability and the expert email notifications ensures the right person receives critical data should a transformers condition change.


Fleet health/risk overview


Transformer health/risk overview


Customisable reporting


Wallboard visualisation


Advanced Diagnostics

Note - exact feature will depend on Perception version purchased

GE imagination at work

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