GE
Grid Solutions

Kelman DGA 900 TAPTRANS

9 gas on-line OLTC DGA expandable with add-ons to a Transformer Monitoring System (TMS)

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 programs. The comprehensive information provided by the Kelman™ DGA 900 TAPTRANS not only allows expensive failures to be avoided but enables asset capabilities to be maximized.

The Kelman DGA 900 TAPTRANS is a patented designed specifically for transformers with an On-Load Tap Changer (OLTC), which is recognised as one of the most vulnerable parts of the transformer and which accounts for a large portion of unplanned outages. It offers discrete multigas on-line DGA and moisture monitoring, separating the main and selector tanks from the diverter tank to avoid any risk of contamination. Utilizing photo-acoustic spectroscopy (PAS) measurement technology, well suited to field application, it provides laboratory challenging levels of precision and repeatability. Full 9 gas oil sampling and analysis 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.

Key Benefits

- Modular and retrofittable architecture using selectable standard add-on cards
- Provides extensive remote insight into transformer condition and safe operation
- Enables correlation of data for validation and in-depth fault analysis
- Graphical presentation using built-in web-page based HMI and local color screen
- Full integration with GE's acclaimed Perception™ Fleet asset management software
- From the only vendor with 15 years PAS experience and installed base of >15,000 units

Applications

While on-line DGA is now widely accepted as the most effective method of assessing the condition of a transformer, it does not cover all the possible sources of issues. Sub-systems like the tap changer, the cooling system or the bushings can generate their own problems if they are left unmonitored.

It is most suited for monitoring large, mission critical transformers or compromised transformers with a view to extending their life and preventing any unexpected failure.

Industrial processes where an OLTC Transformer is seen as a manufacturing tool, often dependent on an uninterruptible power supply as part of the process.

Preventing unplanned outages is vital to maintain the manufacturing process output, where failure would result in costly downtime or waste. The OLTC transformer is often used within renewable power generation where varying output needs to be compensated.

Transformer Failure Modes

30%
15%
5%
15%
35%

Main Tank | OLTC | Bushing | Cooling | Other
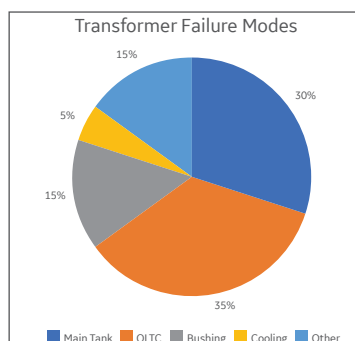
Cutting Edge DGA

- Laboratory challenging field measurement of nine gases plus moisture on 3 oil sources
- Individual oil manifolds for the main and OLTC Diverter tank
- 4th generation of GE's PAS technology delivering improved measurement accuracy with lower detection limits
- No carrier or calibration gas consumables
- Complete analysis up to once per hour and new "Rapid Mode" for critical gases in ~30 min

Applications

- Industrial OLTC applications such as arc furnaces, foundry's, and paper mills
- Power transmission networks
- Renewable applications such as windfarms and solar plants

Bushing & PD Monitoring

- Measures the change in Capacitance C1 and/or Power Factor (Tan delta) caused by the deterioration of the bushing
- Avoid widespread collateral damage and even total loss of transformer
- Detects electrical PD events inside the transformer using the same bushing adaptors
- Multiple noise rejection methods and graphical PRPD analysis

OLTC Monitoring

- Supervision of a key mechanical component of the transformer
- OLTC tap position recorder
- Temperature difference between tanks
- Torque used by tap changing motor

Technical Specifications

Technology

Automated head-space gas extraction.

Photo-acoustic spectroscopy (PAS) gas measurement.

Thin film capacitive moisture sensor.

Immersed fiber optic oxygen sensor.

Frequency

Configurable from once per hour to once every 4 weeks.

Faster sampling automatically triggered upon alert level reached.

"Rapid Mode" provides a rapid indication of the evolution of the gasses indicated below in ~30 minutes.

Range

	LDL	UDL	Accuracy*	Repeatability	Response Time***	Rapid Mode
Hydrogen (H_2)	5	5,000 ppm	± LDL or ±5 %	< 3 %	> 90 %	•
Carb. Monox. (CO)	1	50,000 ppm	± LDL or ±3 %	< 2 %	> 95 %	•
Methane (CH_4)	2	50,000 ppm	± LDL or ±3 %	< 2 %	> 95 %	
Acetylene (C_2H_2)	0.5	50,000 ppm	± LDL or ±3 %	< 2 %	> 95 %	•
Ethylene (C_2H_4)	1	50,000 ppm	± LDL or ±3 %	< 2 %	> 95 %	
Carb. Diox. (CO_2)	20	50,000 ppm	± LDL or ±3 %	< 3 %	> 95 %	•
Ethane (C_2H_6)	1	50,000 ppm	± LDL or ±3 %	< 2 %	> 95 %	
Oxygen (O_2)	100	50,000 ppm	± LDL or ±5 %	< 2 %		
Nitrogen (N_2) **	10,000	100,000 ppm	± LDL or ±15 %			
Moisture (H_2O)	0	100 % RS (in ppm)	± 3 % ppm	< 3 %		•

*Whichever is greater. Accuracy quoted is the accuracy of the detectors during calibration. Gas-in-oil measurement may be affected by oil type and condition. Repeatability as measured from final production test data.

** N_2 value is calculated and available on free-breathing transformers only.

*** Time Response (typical): % of value after 1 measurement cycle.
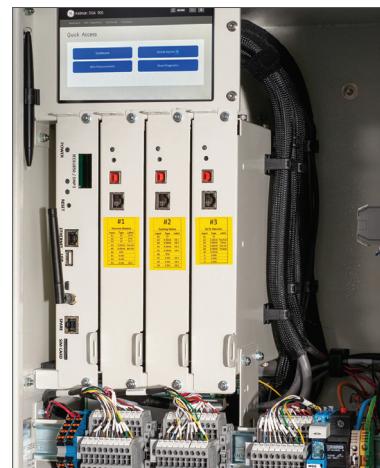
Location of maximum 3 x add-on cards

FEATURES

Display

4 x Sunlight visible LED arrays

Backlit 7" inch color resistive touch screen (800 x 480)

Embedded secure webserver (https)

Analogue Input

1 x Standard for split core load CT sensor

Digital Output

6 x Standard customer programmable dry contact relays (type C, SPDT), NO/NC, 10A@ 250Vac resistive load, 10A@ 30Vdc resistive load

1 x Standard service alarm relay

1 x Standard watchdog relay

Digital Communications / Protocols

1 x Modbus® over RS485 / TCP/IP as standard

1 x Standard 1Gb Ethernet (RJ45)

Option: DNP3.0 over RS485 or TCP/IP

Option: IEC 61850 Edition 2

Option: ST/SC Multi-mode fiber converters

Option: GPRS/UMTS/HSPA+ modem

ADD-ONS †

Option – OLTC Monitoring †

Standard: Motor torque sensor

Standard: 2 x Magnetic mounted temperature sensor

Standard: 4 – 20mA or Resistive OLTC position input (sensor not supplied)

Option – Bushing Monitoring 3 Phase Transformers

Up to 6 x Bushing adaptors ordered separately

Standard: Bushing HV (3 Bushings)

Option: Bushings HV & LV (6 Bushings)

Option: Inputs for phase to ground reference voltage

All sensors supplied unless noted

MECHANICAL

	Analysis Unit	Hub Unit
Dimensions	600 x 484 x 330 mm	600 x 380 x 330 mm
	23.6 x 19.1 x 13.0 in	23.6 x 15.0 x 13.0 in
Weight	37 kg / 81.6 lb	18.5 kg / 40.8 lb

POWER REQUIREMENTS

AC	Nominal 100-240 Vac (Range 85-264), 4A
DC	Nominal 100-250 Vdc (Range 90-300)

OPTIONS

Mounting stand and Sun canopy

Longer umbilical cable between units

ENVIRONMENT

Operating Conditions

Ambient temperature	-40 °C to +55 °C (-40 °F to +131 °F)
Ambient humidity	0-95 % RH, non-condensing
Oil temp at valve††	-20 °C to +120 °C (-4 °F to +248 °F)

Enclosure

IP56 certified

Standard: Powder coated marine grade 2 mm aluminium (RAL9002)

Option: Unpainted 316 Stainless Steel

†OLTC and Transformer models will be available 2022

††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 200 ml or less. For oil temperatures colder than -20 °C GE recommends the use of heat trace cabling on piping

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