

# KELMAN DGA 900



## Next Generation Online Multi-Gas DGA

Dissolved Gas Analysis (DGA) and moisture measurement of insulating fluids are recognized as the most important tests for condition assessment of transformers. In previous years, Multi-Gas DGA was traditionally confined to a laboratory environment, with infrequent off-line manual sampling forming part of time-based maintenance strategies. However, as the global average age of transformers continued to rise, the possibility of rapid ageing, unplanned outages and even catastrophic failure between off-line tests also increased, leading many asset owners to adopt online DGA monitoring strategies to increase network reliability.

In the early 2000's, GE Vernova's Kelman™ range of analysers brought consumable-free online Multi-Gas DGA to the market and GE Vernova introduced the Kelman DGA 900, our next generation Multi-Gas online DGA and moisture analyser. At its heart lies an evolved implementation of GE Vernova's proven Photo-Acoustic Spectroscopy (PAS) measurement technology, providing laboratory challenging levels of precision and repeatability with no consumables and no need for frequent re-calibration. Benefiting from over 40 years of global DGA vendor experience, the Kelman DGA 900 encapsulates learnings and improvements derived from its predecessors to bring improved performance, innovative new features, enhanced user experience and increased robustness.

### Key Benefits

- Provides remote alert and Multi-Gas diagnostic of deteriorating transformer condition
- Expedites operational decisions without needing to go to site for manual oil sampling
- Issues can be detected in their infancy, avoiding unexpected failures and facilitating planned outages
- Anchors condition based maintenance and asset replacement strategies on hard data
- No need for consumables or frequent recalibration to operate at optimum performance
- "Rapid Mode" provides near real-time insight on fast developing faults
- Enhanced computing power and scalable I/Os for a flexible transformer monitoring solution
- Compatible with mineral insulating oils and newer ester based fluids (natural and synthetic)

### Applications

The Kelman DGA 900 is an invaluable foundational tool for implementing Asset Performance Management (APM) across electrical generation, transmission and industry, enabling a condition based asset replacement strategy and delivering improvements in system reliability and availability.

The Kelman DGA 900 has a wide range of communication methods and protocols. This enables connection to those platforms and integrations with GE Vernova's Perception™ / EnergyAPM Edge transformer fleet management software as well as other software, historian and SCADA systems.

### Proven Technology

- 4th generation of GE Vernova's PAS technology, delivering improved accuracy with lower detection limits
- From the only vendor with over 20 years PAS experience and installed base in excess of ~20,000 units
- No carrier or calibration gas consumables
- Laboratory challenging field measurement of nine gases plus moisture
- Complete DGA analysis up to once per hour and "Rapid Mode" for critical gases in ~30 min

### Reliable and Available

- Designed by GE Vernova leveraging our quality and continuous improvement Lean ethos
- Enhanced reliability and easier field servicing
- 5-year warranty as standard †
- Factory calibration benchmarked against industry standard laboratory assessment

### Intuitive and Flexible

- Integrated 7" colour LCD screen for simplified local user interaction and visualisation of data
- Lightweight innovative two-enclosure design enables adjacent or separated installation
- Can connect to AC or sub-station DC power

### Scalable and Connected

- Expandable analogue/digital I/Os
- Future proof computing platform ready for feature enhancements
- Designed for cyber security, with a range of comms options and protocols

# Technical Specifications

## MEASUREMENTS

### 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	Available in Rapid Mode
<b>Hydrogen (H<sub>2</sub>)</b>	5	5,000 ppm	± LDL or ± 5 %	< 3 %	•
<b>Carb. Monox. (CO)</b>	1	50,000 ppm	± LDL or ± 3 %	< 2 %	•
<b>Methane (CH<sub>4</sub>)</b>	2	50,000 ppm	± LDL or ± 3 %	< 2 %	•
<b>Acetylene (C<sub>2</sub>H<sub>2</sub>)</b>	0.5	50,000 ppm	± LDL or ± 3 %	< 2 %	•
<b>Ethylene (C<sub>2</sub>H<sub>4</sub>)</b>	1	50,000 ppm	± LDL or ± 3 %	< 2 %	•
<b>Carb. Diox. (CO<sub>2</sub>)</b>	20	50,000 ppm	± LDL or ± 3 %	< 3 %	•
<b>Ethane (C<sub>2</sub>H<sub>6</sub>)</b>	1	50,000 ppm	± LDL or ± 3 %	< 2 %	•
<b>Oxygen (O<sub>2</sub>)</b>	100	50,000 ppm	± LDL or ± 5 %	< 3 %	•
<b>Nitrogen (N<sub>2</sub>) **</b>	10,000	100,000 ppm	± LDL or ± 15 %		
<b>Moisture (H<sub>2</sub>O)</b>	0	100% RS (in ppm)	± 3.5%RH (RS) or ± 3ppm	< 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<sub>2</sub> value is calculated and available on free-breathing transformers only.

Time Response (typical): 1 measurement cycle ; >95 %: C<sub>2</sub>H<sub>2</sub>, CO, C<sub>2</sub>H<sub>6</sub>, C<sub>2</sub>H<sub>4</sub>, CH<sub>4</sub>, CO<sub>2</sub> ; >90 %: H<sub>2</sub>

## FEATURES

### Display

4 x sunlight visible LED arrays  
Integrated backlit 7" inch color resistive touch screen (800 x 480)  
Embedded secure webserver (https)

### Analogue Inputs

1 x CT input standard  
5 x optional analogue inputs slots (Add up to 5 additional load CT's or PT100 inputs or 4-20mA sensor cards)

### Digital Output

6 x Standard customer programmable dry contact relays (type C, SPDT), NO/NC, 10A @250Vac resistive load, 8A @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 DNP3 over 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  
Option: Wi-Fi (802.11b/g/n)

### Alarms

Multiple Alarm setting/scenarios, all assignable to relays or SMS  
Gas: absolute gas level, Rate of Change (ROC), moisture level, Total Dissolved Combustible Gas (TDCG) and 7 x user defined gas ratios alarms  
Analog inputs: absolute Level, and Rate of Change (ROC)  
Digital inputs: status transition

## ENVIRONMENT

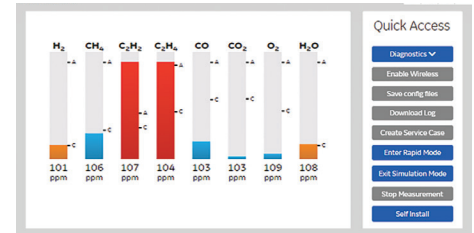
### Conditions

**Operating Ambient Temperature** -40 °C to +55 °C (-40 °F to +131 °F)  
**Operating Ambient Humidity** 0-95 % RH, non-condensing  
**Oil Temperature at Valve\*\*\*** -20 °C to +120 °C (-4 °F to +248 °F)

\*\*\*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 Vernova recommends the use of heat trace cabling on piping

### Enclosure

IP56 certified  
Standard: Powder coated marine grade aluminium (RAL9002)  
Option: Unpainted 316 Stainless Steel



DGA 900 gas levels displayed on the local LCD screen

## Power Requirements

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

## Mechanical

	Analysis Unit	Hub Unit
<b>Dimensions</b>	600 × 484 × 330 mm	600 × 380 × 330 mm
	23.6 × 19.1 × 13.0 in	23.6 × 15.0 × 13.0 in
<b>Weight</b>	33.4 Kg	18.5 Kg
	73.6 lb	40.8 lb

## OPTIONS

Mounting stand  
Sun canopy  
Longer umbilical cable between units  
Analogue output of gas values

† Terms and conditions apply

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