

GE  
Grid Solutions

# Monitoring & Diagnostics

ENABLING KEY ASSET PERFORMANCE MANAGEMENT





# Why monitor assets?



## The Asset Manager's dilemma

- Managing an ageing electrical infrastructure with assets approaching their end of design life
- Being under budget constraints (OpEx) with overworked crews putting pressure on needed preventive maintenance activities
- Frequent emergency outages forcing rescheduling of planned jobs and fostering customer discontent
- Loss of asset historical knowledge as company technical experts retire
- More regulatory pressure, possible financial penalties for power non-delivery
- Concerns about EHS and bad press coverage



## Outcomes



OPERATIONAL  
EFFICIENCIES



RELIABILITY  
ENHANCEMENTS



FINANCIAL  
BENEFITS



## Value propositions

- Reduce risk of catastrophic failure
- Avoid unplanned outages
- Minimise costly impact
- Stretch asset capability
- Reduce maintenance costs
- Detect small life-sapping issues early
- Focus asset replacement strategy
- End of life asset intensive care

For electric utilities and industrial customers



# Hydran Single Gas DGA

## ONLINE DGA FOR MONITORING

- Continuous online early-warning fault monitors for transformers
- Uses fuel cell technology behind a vacuum resistant membrane
- Tracks mainly Hydrogen (H<sub>2</sub>) which is the key gas omnipresent in all fault types
- Can detect a rising gas level, indicative of a possible fault condition
- Raises an alarm if a gas threshold or a gas rate-of-change is exceeded
- Choice of "Hydrogen only" or traditional Hydran "Composite gas" sensor
- No moving parts, and easy single valve installation



### Hydran 201Ti

Simple but effective, with gas level readout, alarm relay contacts, 4-20mA analogue outputs and Modbus\* over RS-485 serial data communication. Optional display repeater for high level mounting.

*When a fault occurs, the transformer oil and paper insulation break down generating gases that dissolve into the insulating fluid.*

*DGA (Dissolved Gas Analysis) is the extraction and analysis of these gases for transformer monitoring and diagnostics.*



### Hydran M2-X

As per the 201Ti but with added moisture in oil measurement and wider range of communications options (including Ethernet) and protocols (DNP3, IEC\*61850). Can also connect additional sensors and run transformer models. Versions available for Ester based insulating fluids.

# Kelman Portable DGA

## OFF-LINE OIL SAMPLE ANALYSIS AND DIAGNOSTIC

- Equivalent to having a DGA lab in a box
- Quick set up. Get results from a manually taken oil sample in <30 minutes
- Easy to use by a trained operator, no need for a laptop
- Ideal partner when dealing with an alarm from a single gas DGA monitor as it provides on-site diagnostics
- Supports mineral oil, ester-based fluid and Buchholz gas samples



### Transport X<sup>2</sup>

Portable 7 fault gas + moisture DGA analyser. Built-in thermal printer and computer with large touch LCD screen. Provides ppm results and analysis using common DGA diagnostic tools. Only 11Kg, no carrier gas. Can be carried as hand luggage on a plane.



# PAS Technology

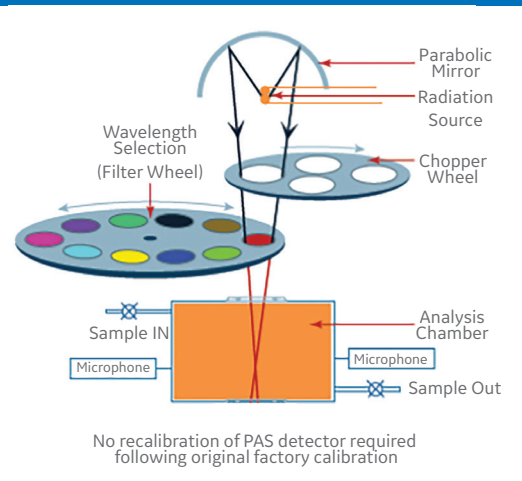
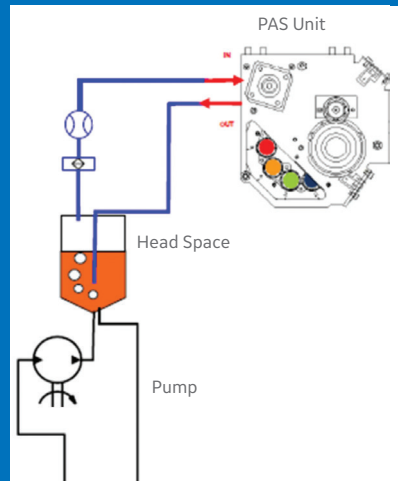
## PHOTO ACOUSTIC SPECTROSCOPY (PAS)

### Designed for stability without recalibration

- Parabolic mirror and analysis chamber - Gold coated for a tarnish free lifetime
- IR radiation source - With photo-diode feedback loop to maintain constant output
- Filter Wheel - Sandwiched filter stacks using sapphire glass. Not subject to change with time
- Chopper and stepper motors - Use photo interrupter feedback to ensure correct position and rotational speed
- Microphones - High sensitivity with maximum drift in response <1% in 20 years

### Ideal for field applications

- Head-space gas extraction method and PAS gas analysis
- No consumables, no carrier or calibration gas, no frequent recalibration required
- Lab challenging measurement accuracy and repeatability with great lower detection limits
- Range of monitors measuring from 3 to 9 gas + moisture in oil
- Equally applicable to mineral oil or ester-based fluid filled transformers



# Kelman Multigas DGA

## ONLINE DGA FOR MONITORING AND DIAGNOSTIC



### MINITRANS

Entry level multi-gas DGA measuring Hydrogen ( $H_2$ ), Carbon Monoxide (CO) and Acetylene ( $C_2H_2$ ) plus moisture.

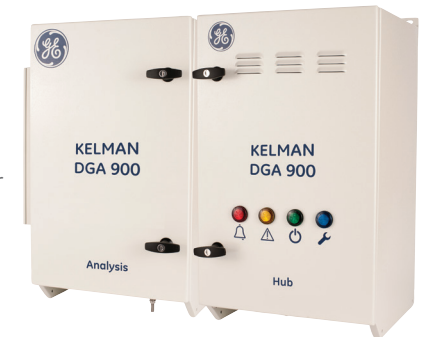


### DGA 500

Based on the Transfix platform, offers 5 discrete gases plus moisture and enables Duval's Triangle. The same gases as Minitrans plus Ethylene ( $C_2H_4$ ) and Methane ( $CH_4$ ).

### DGA 900

Next generation expandable platform using 4th generation PAS. Offers 9 gas DGA: all 7 diagnostic gases plus Oxygen ( $O_2$ ), Nitrogen ( $N_2$ ) and moisture in oil. Colour LCD and Web-page server. Industry leading 30 minutes rapid mode. Clever two-enclosure design.



### TAPTRANS

9-gas DGA for monitoring main tank and OLTC related tanks where gas concentrations are different. Uses unique dual manifold system to avoid oil mixing.

### MULTITRANS

9-gas DGA specifically designed for monitoring three single phase transformers in close proximity.





# MS 3000

## HOLISTIC TRANSFORMER MONITORING SOLUTION

- A modular system that adapts to the transformer and the monitoring needs
- Suitable for all types and makes of transformers, new or retrofit
- Maximises transformer availability, reliability and performance at lowest life-cycle cost through monitoring of all transformer main components
- Connects with a single or multi gas monitor for DGA
- Covers the other causes of possible transformer failure using:
  - IEC/IEEE\* transformer models
  - Bushing monitoring
  - Cooling system monitoring and control
  - OLTC motor drive mechanical condition supervision
  - UHF PD and transients detection
- Integrates any other sensor present on the transformer (oil level, oil pressure, oil temperature, load, winding temperature, Buchholz relay gas level, etc...)
- Assesses and classifies the condition of the transformer into one single health/risk score
- Provides alarms, diagnostics and suggested next steps using a web-page server HMI



### MS 3000 system

“All-in-one” transformer monitoring solution that combines online data from all transformer components with sophisticated analytics to form an aggregate view of the transformer’s health and provide an accurate expert diagnostic for continuous peace of mind.

# Intellix BMT 330

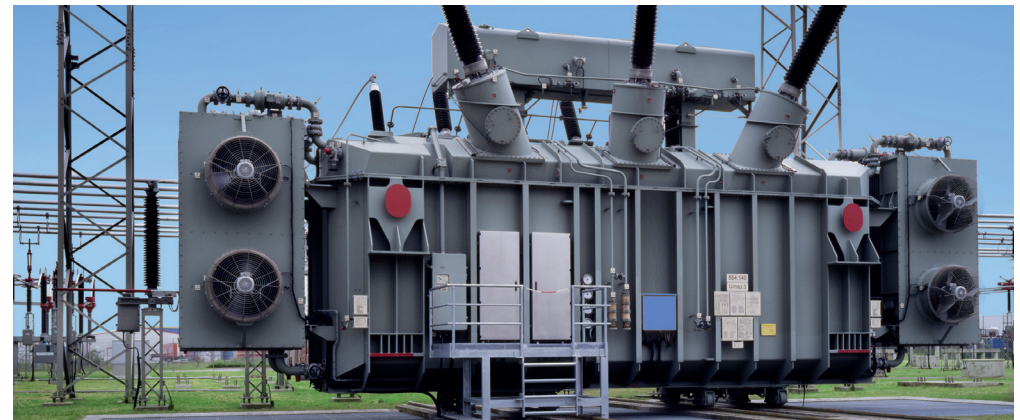
## ONLINE BUSHING MONITORING

- Stand-alone system that continuously monitors the condition of up to six transformer bushings (HV and LV).
- Uses tapping point adaptors specifically designed for each bushing/tapping point
- Adaptors guarantee that:
  - bushing remains earthed if cable becomes open circuit
  - voltage at remote end of cable is always limited
  - any oil leaking remains sealed in the adaptor



### Intellix BMT 330

System provides % change in Capacitance C1 and relative Power Factor (tan delta) with respect to the “as new” nameplate values. Also detects the presence of Partial Discharge (PD) activity in the bushings and the transformer main tank.

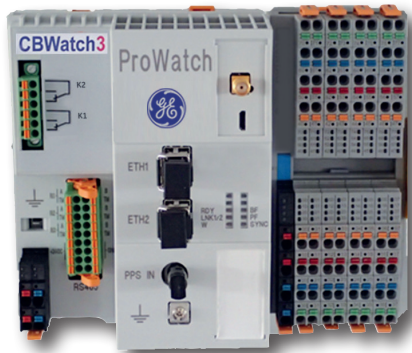




# CB Watch 3

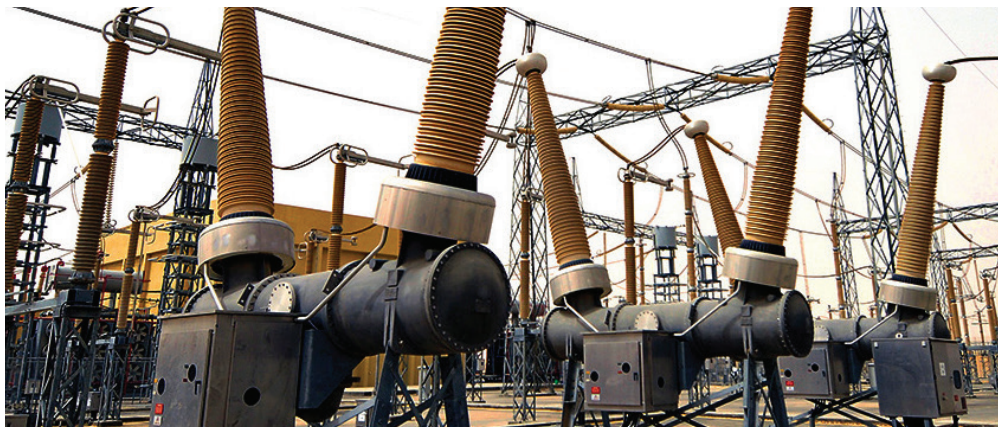
## ONLINE HV CIRCUIT BREAKER MONITORING

- Compact, modern and modular online monitoring device for most brand/type of HV circuit breaker
- Measures and checks key parameters every time the circuit breaker operates and continuously monitors other values in-between operations
- Used to keep ageing assets operating while extending maintenance intervals and reducing the risk of "failure to operate"
- Detects gas leaks early to reduce costly SF<sub>6</sub> releases to the atmosphere



### CB Watch 3

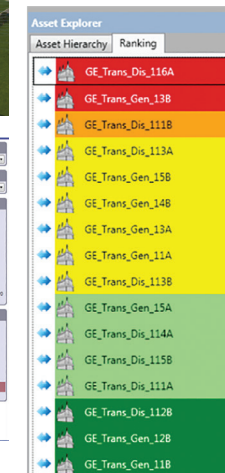
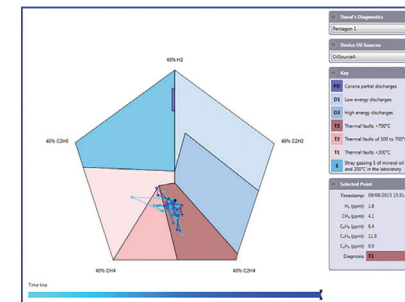
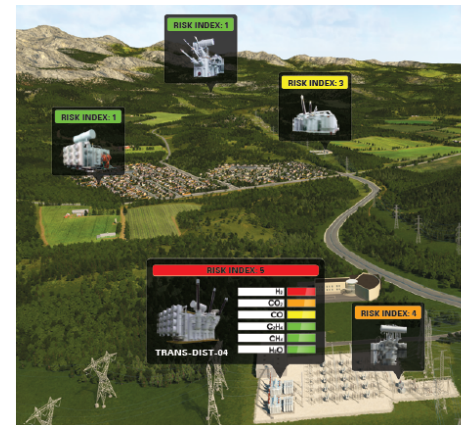
Modular and configurable. Monitors operation timing, SF<sub>6</sub> gas leaks, arcing contact wear, coil current, rewind/pump motor current and cabinet temperatures by adding more modules and sensors. Rich in features: Web HMI, Ethernet, F/O, IEC 61850 and Comtrade files.



# Perception Fleet

## ASSET FLEET MONITORING SOFTWARE

- Automatically downloads, stores and analyses data from all GE monitors (for transformers and circuit breakers)
- Centralised Server software with Desktop and Web clients
- Evaluates both online (downloaded) and offline (imported) data using powerful algorithms based on Standards and/or best practice
- Calculates a Risk Index (1 to 5) to represent the health of the asset and risk to normal operation
- Raw data and Industry-standard diagnostic tools for the asset expert
- Fleet-wide health assessment and Risk Index ranking for the asset manager
- Simple and intuitive user interface with email alerts
- Representation of assets status on geographical view





# Why GE as your partner of choice?

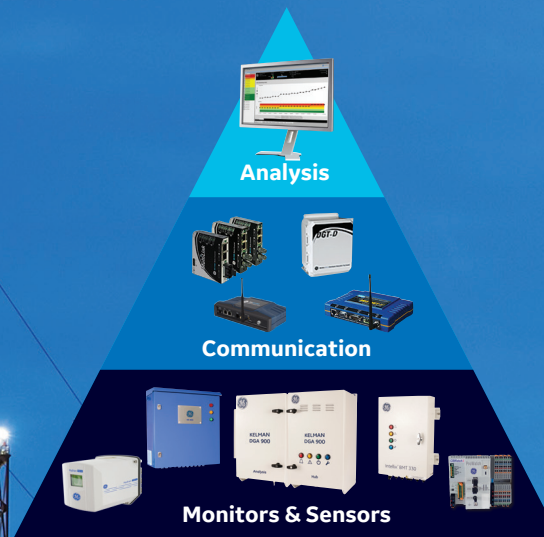


## Experience

- Stable, large multinational, here for the long term
- Significant R&D capability to continually innovate and solve any issue
- One-stop shop with largest portfolio of M&D products, software and services
- Focused on product reliability, offering some of the industry's longest warranty periods
- Dedicated regional sales, installation and service teams around the globe
- Largest DGA monitoring installed base: over 50,000 units sold world wide
- Well integrated with GE's Protection & Control and Industrial Communication products



## Delivering Outcomes



## Support Services

- Installation and commissioning
- Technical support and product training
- Long term maintenance and service agreement
- Product rental solutions

## Expert Services

- Cloud based remote monitoring
- Data diagnostics and interpretation
- Alarm setting and result analysis training

For electric utilities and industrial customers





imagination at work

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