OPTIMISING CRITICAL INFRASTRUCTURES

For over two decades, Kelvatek have been collaborating with Network Operators across the UK and Ireland to support their strategic goals and help them pivot successfully to a low carbon future with the transition to modern energy systems.

Our intelligent solutions deliver data-driven insights that enable Energy Network Operators to monitor and protect their networks, optimise performance, safeguard their assets and people, enhance customer satisfaction and drive a more sustainable future.

We have been at the forefront of key innovations that have changed the face of the industry – including digital fault recorders, digital circuit breaker analysers, advanced protection systems and network automation technologies.

Key products and services include:

- Holistic Asset Monitoring
  - Transformer, circuit breakers and rotating machines

- Digital Solutions
  - Advanced analytics providing prescriptive actions on asset health

- Asset Condition Assessment
  - Building a full picture of asset health

- Expert Services
  - Focused seminars and training aimed at driving knowledge-sharing

We believe in leveraging our partners existing platforms and technology, partnering this with new developments to provide expert analysis into asset condition, translating diagnostic data (from both offline and online results) into prescriptive actions. Kelvatek is part of the Camlin Group with facilities in 21 cities across 17 countries. Camlin’s goal is to optimise the critical infrastructures that people, cities and communities around the world depend on, all day and every day.
Transformer failures can have a significant impact on your operations, understanding current risks and how to manage them is critical. TOTUS G9 is a high-performance nine gas monitoring system, developed to give asset managers a deeper understanding of transformer failure modes and how to manage them. TOTUS G9 detects and measures all critical fault gases as outlined by international standards as well as moisture in oil, providing a comprehensive DGA profile as well as in-depth insight with highly accurate trend analysis. With the inclusion of an embedded web server asset managers can detect, diagnose, and react quickly to failure risks.

**KEY BENEFITS**

**Superior Performance**
PAS technology provides highest specification & reliability, compared to NDIR

**Low Cost of Ownership**
No consumables such as calibration or carrier gases

**Usability**
Intuitive user interface for commissioning, without the requirement for external software

**Scalable**
Can be equipped with Partial Discharge (PD), Bushing Monitoring (BM) and Through Fault Current (TFC) to give a comprehensive picture of transformer health

**Planning**
Early detection of risks facilitating planned maintenance

**FEATURES**

- Measures nine dissolved gases (hydrogen, methane, ethane, ethylene, acetylene, carbon monoxide, carbon dioxide, nitrogen and oxygen) plus moisture
- Leading-edge photo-acoustic spectroscopy (PAS) for increased measurement accuracy
- Embedded web server and web-based software with full control and comms via secure, flexible browser access
- Integrated LCD touchscreen for on-site analysis and visualisation of data
- Data hub for third party monitors
- Inputs/outputs for additional sensors including load and oil temperature as standard
- Ability to perform Duval’s triangle, and access live data from any smart device
A HOLISTIC MONITORING APPROACH

TOTUS Total Transformer Monitoring

The Problem
When it comes to big-ticket items, power transformers are at the top of the list - and when they fail prematurely, it’s all the more painful. Damages can far exceed the cost of a replacement. Over 80% of transformer failures can be attributed to three key areas: Windings, Bushings and O&T.

The Solution
TOTUS TTM monitors all key components on the transformer, giving a full picture of transformer health and is the ONLY unit to integrate DGA, Partial Discharge (PD), Bushing Monitoring (BM), Through Fault Currents (TFC) and Transformer Analytics into a single system.

The Result
A comprehensive, granular picture of power transformer health that allows asset managers to optimise maintenance strategies resulting in:
- Significantly reduced risk of sudden transformer failure and associated costs
- Enhanced predictive maintenance to extend life of the transformer
- Uninterrupted power supply, reducing unplanned outage

WHAT DO WE MONITOR?

BUSHING MONITORING
17% Failure Rate
- PD
- Temperature
- Leakage Current Angle
- Leakage Current Amplitude
- Capacitance
- TanDelta/Power factor
- High Energy Events
- Load

TAP CHANGER
26% Failure Rate
- Temperatures
- Gases DGA
- Moisture in Oil
- Tap Position
- Motor Current

TRANSFORMER MAIN TANK
45% Failure Rate
- DGA 5 & 9 Gas
- PD
- TFC
- Hot Spots
- Temperature
- Operating Condition Status
- Moisture in Oil
- High Energy Events
- Transformer Status/Levels
- Cooling Status/Temperature
TECHNOLOGY SPOTLIGHTS

Dissolved Gas Analysis

Providing a full DGA profile of up to 9 gases, TOTUS delivers cost-efficient condition-based maintenance with best-in-market accuracy without the need for any carrier gas consumable. Featuring advanced alarm management, our dependable solutions enable more efficient maintenance scheduling for asset managers, with alerts only triggered when there is an issue with the transformer.

Partial Discharge

Kelvatek is the ONLY company that can separate the PD in bushings from the PD in the Main Tank. Early detection of PD can significantly improve risk diagnosis, driving quicker accurate decision making. With no need for expert interpretation, our user-friendly solution uses the innovative ‘Camlin PD Triangle’ for quick and easy understanding of data. This data can be graphed and correlated to other parameters such as temperature, humidity, load and DGA.

Through Fault Current

One of the largest causes of transformer faults is due to external events such as through faults. Understanding which transformer is impacted in the fleet, plus visibility of the integrity of the paper insulation can help access the mechanical strength of the transformer and the risk for mechanical damages. TOTUS monitors the stress caused by through faults and cellulose ageing due to the combined action of temperature, moisture and oxygen.

Bushing Monitoring

Online monitoring of bushings, through monitoring of internal insulation (capacitance / Tan Delta or Power Factor) and the internal electrical activity (Partial discharges), enables asset managers to detect a fault at its very preliminary stage, allowing action to be taken before reaching a critical and irreversible stage. TOTUS monitor the following on bushings: Partial Discharges, High Energy Events, Leakage Current Angles and Magnitude, Temperature, Load, Bushing Properties.

High Energy Events

Acetylene is the primary marker of a high-energy event. Whereas other monitors can provide basic information identifying acetylene in the transformer, TOTUS delves deeper into arcing activities, identifying the phase and winding, as well as visibility on the number of arcing events. The key benefit is the ability to correlate data and generate a deeper understanding of the transformer.
The modular design of the TOTUS, combined with a holistic and flexible approach to transformer monitoring enables the option to expand monitoring predictive capabilities depending on requirements, either at time of purchase or later in the field.

Modular capabilities include:

**DGA**
- 9 Gas DGA

**Options**
- Flexible mounting & communication options available

**Modules**
- TFC
- OLTC
- MODELS
- Ability to integrate with 3rd party monitors

**Tanks**
- Up to 3 separate transformers or Main Tank & Vacuum LTC

**BM & PB**
- G9 up to 9 Bushings

**DATA VISUALISATION**

With a Camlin transformer monitoring device, valuable information can already be obtained from the monitoring device itself. Each device has an embedded powerful application, which incorporates advanced diagnostics, graphical display of information and a customisable alarm management, making any additional software obsolete and thus avoiding any additional costs.

Our software suite of products consolidates data from our hardware devices to provide a clear picture of asset health and fleet health, reducing unplanned shutdowns, boosting production and increasing operational efficiency.

**TOTUSWEB**, the device embedded application with all necessary analytical tools, accessible through the device HMI or via any browser and connected PC

**TOTUSPRO Desktop**, an optional expert tool for deeper investigation on failure modes, providing customizable widgets and the ability to import offline data archives

**TOTUSPRO Access**, an access portal for server deployment designed to manage Camlin devices, check their status and visualize the condition of multiple transformers on a single page, supporting automatic archiving and notification services
Kelvatek Services

We understand the increasing challenges facing the global power industry. Ageing assets are being driven to work harder while asset managers are constrained by limited resources and reduced budgets. Our comprehensive range of services enables customers to generate real value from their monitoring technology.

VALUE BEYOND THE BOX

Expert Services

Our team of in-house experts are backed by decades of experience in transformer technology. Our range of expert services enables our customers to tap into this wealth of knowledge via 3 key areas;
- Product training
- Expert support
- Academic seminars

Condition Assessment

While other monitoring systems can provide data trending and alarm notifications, TOTUS is unique in its ability to visually show transformer condition at a glance. Condition assessment service includes;
- Asset Reporting
- Acceptance Tests
- Online Tests

Monitoring System Services

Camlin plays a vital role from product conception to product installation, and most importantly support and aftercare. We deliver a focused service and support programme to our global network of customers including;
- Dedicated Account Manager
- Bespoke Customer Support Portal
- 24/7 support 365 days
### TOTUS G9 SPECIFICATIONS

#### Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂</td>
<td>0 – 5,000 PPM</td>
</tr>
<tr>
<td>CH₄</td>
<td>1 – 50,000 PPM</td>
</tr>
<tr>
<td>C₂H₆</td>
<td>1 – 50,000 PPM</td>
</tr>
<tr>
<td>C₂H₄</td>
<td>1 – 50,000 PPM</td>
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<tr>
<td>C₂H₂</td>
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<tr>
<td>CO</td>
<td>1 – 50,000 PPM</td>
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<td>CO₂</td>
<td>3 – 50,000 PPM</td>
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<tr>
<td>H₂O (RS)</td>
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<tr>
<td>Accuracy</td>
<td>± 5% or ± LDL</td>
</tr>
<tr>
<td>O₂</td>
<td>100 – 50,000 PPM (±10%)</td>
</tr>
<tr>
<td>N₂</td>
<td>10,000 – 150,000 PPM (±15%)</td>
</tr>
</tbody>
</table>

#### Data (DGA)

| Measurement frequency | 1 – 24 hours |
| Storage               | 32GB micro SSD card, > 10 years |

#### Data (Partial Discharge & Bushing)

| Acquisition mode       | Continuous |
| Trending               | Hourly, daily, weekly, monthly |
| Storage                | 32GB micro SD card, > 5 years |

#### Environmental

| Operating temperature  | -45 to +55°C |
| Operating humidity     | 0 – 100% RH  |
| Oil temperature range  | -40 to +120 °C |

#### Partial Discharge

| Input channels          | 3 phases & 1 gating (option for additional 6) |
| Simultaneous channels   | 4 (up to 10) |
| Sensors                 | Bushing Tap Adaptors |
| Input measuring range   | -10V to +10V |
| Accuracy                | Amplitude: <5% |
| Resolution              | 12 bit |
| Sampling rate           | 100 MS/s |
| Bandwidth               | Ultra-wide (<50MHz) & Wide (IEC 604 70) |

#### Bushing Monitoring

| Input channels          | Up to 3 sets of 3 phases |
| Simultaneous channels   | 3 (up to 9) |
| Sensors                 | Bushing Tap Adaptors |
| Input measuring range   | 0 – 200mA |
| Accuracy                | Amplitude: 0.1%, Relative Phase Angle: 0.05° |
| Resolution              | 12 bit |
| Sampling rate           | 18KS/s |
| Power system frequency  | 50 – 60Hz, ± 0.01Hz |

#### Enclosure

| IP rating | IP56 |
| Material  | 316 SS |

#### Communications

| Protocols | HTTP, ModBus, DNP3 & IEC61850 |
| Carriers  | RS232, RS485, Ethernet, 3G, Fibre, USB, PSTN, Modem, Power Line Carrier |
| HMI       | 7” High Resolution Colour LCD |
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