



# TOTUS TRANSFORMER MONITOR

Reducing risk, maximising reliability  
Protecting your most critical asset





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# OPTIMISING CRITICAL INFRASTRUCTURES



We understand the increasing challenges facing the UK energy industry. Ageing assets are being driven to work harder as the network evolves, while asset managers are constrained by limited resources and reduced maintenance budgets. Transformers are critical assets in the energy industry, When transformers fail prematurely, damages can far exceed the cost of a replacement and additional expenses may include the loss of production time and regulatory fines.

TOTUS TTM 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 while maintaining visibility of asset health.

## 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

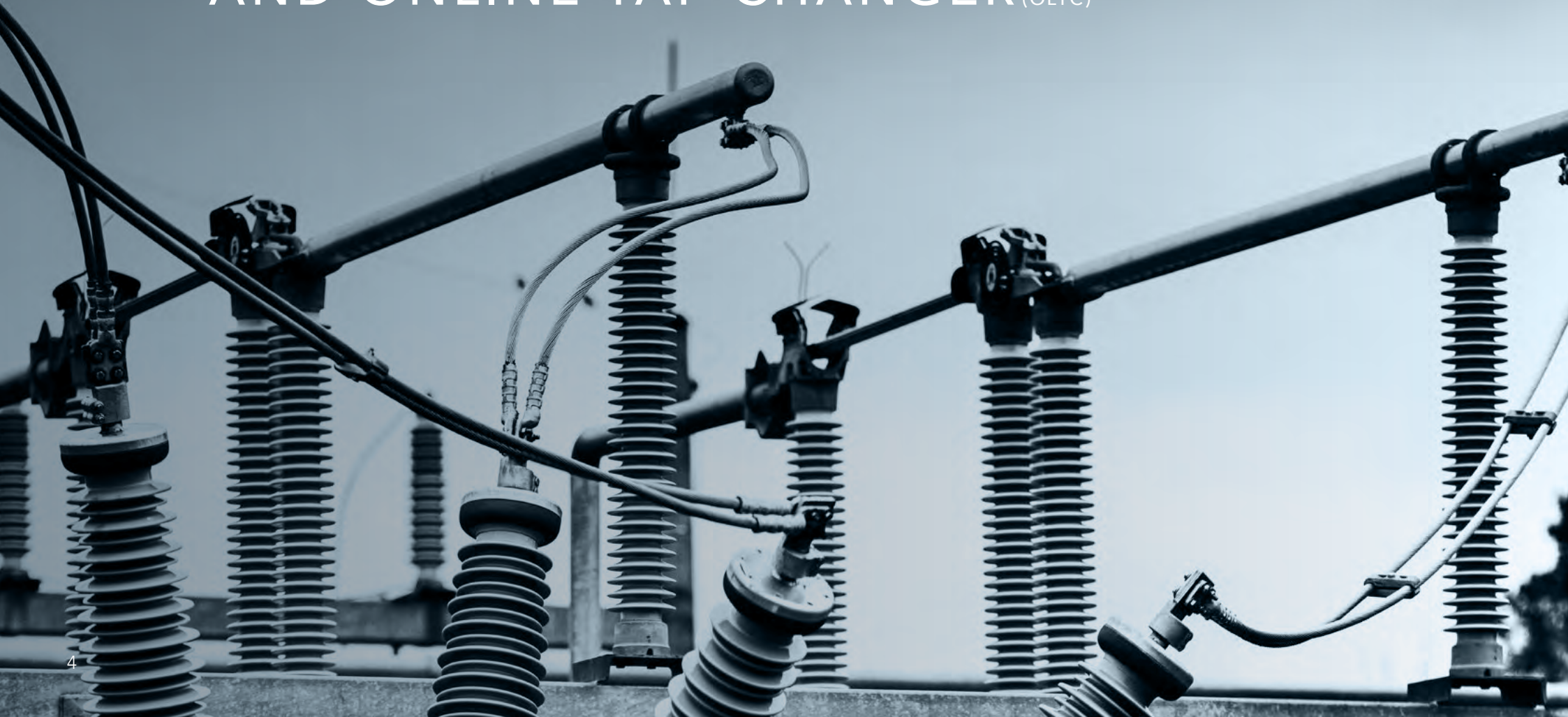
We believe in leveraging our partners existing platforms and technology, partnering this with new developments to provide expert analysis into asset condition, translating diagnostic data into prescriptive actions. Kelvatek is part of the Camlin Group which has a worldwide presence with facilities in 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.



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WE WANT TO  
ENSURE OUR  
CUSTOMERS SEE  
REAL VALUE FROM  
MONITORING  
TECHNOLOGY.

OVER 80% OF TRANSFORMER  
FAILURES CAN BE ATTRIBUTED  
TO THREE KEY AREAS;  
WINDINGS, BUSHINGS  
AND ONLINE TAP CHANGER (OLTC)



## A HOLISTIC MONITORING APPROACH

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### The Challenge for Asset Managers

When it comes to critical assets, 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 damage to the transformer.

#### Key challenges for asset managers include;

- Managing multiple transformer assets
- Gathering relevant health data to make informed decisions
- Cutting through the noise to see critical data
- Trusting the data from transformer monitoring
- Building a transformer monitoring strategy that is sustainable

### The Solution

TOTUS 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.

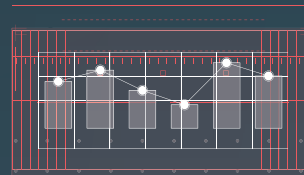
### The Result

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

# TOTUS MONITORING CAPABILITIES

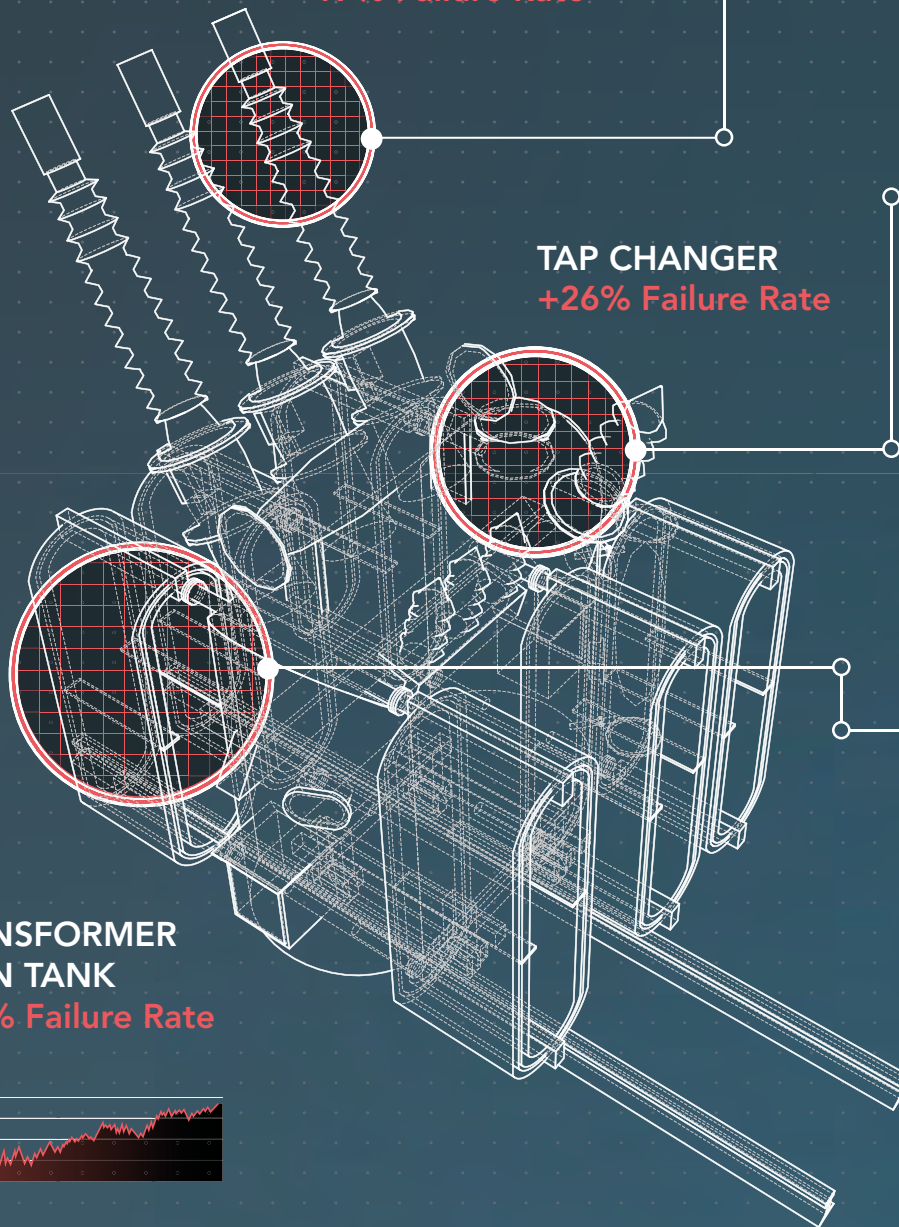
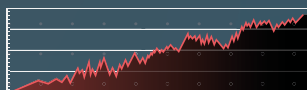
BUSHING  
MONITORING  
**+17% Failure Rate**



TAP CHANGER  
**+26% Failure Rate**



TRANSFORMER  
MAIN TANK  
**+40% Failure Rate**





✓ Bushings



Partial Discharges

Dedicated trend for Partial Discharges in bushings  
Arcing events

Leakage Current

Currents amplitude and phase. Current polar plot

C1/PF

Tandelta/PF variations, C1 and C2 variations

Others

Temperature, Load, Humidity

✓ Tap Changer



Temperatures

Main Tank Temperature, OLTC Temperature  
Differential Temperature

Motor

Current, Voltage, Torque

DGA

7 Gas, Moisture in Oil

Others

Tap Position, Oil Level, Load, Status / Alarms

✓ Main Tank



DGA

9 Gas, 5 Gas, Moisture in Oil

Partial Discharges

Active PD's, Arcing events

Through Faults

Event Count, Cumulative Effect

Cooling System

Pump / Fan Absorption, Cooling Status, Temperatures

Models

Hot Spots  
Aging / Remaining Life  
Moisture in Paper  
Bubbling  
Dynamic Loading  
Oil Breakdown Voltage

Others

Geomagnetic Induced Currents (GIC)  
Direct winding temperatures with fiber optics  
Analog and Digital Inputs  
Integration of any third party monitor/system

# TECHNOLOGY SPOTLIGHTS

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## Dissolved Gas Analysis

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Providing a DGA profile of 5 or 9 gases, TOTUS delivers cost-efficient condition-based maintenance with best-in-market accuracy without the need for any carrier gas consumable. Featuring an embedded and 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 Discharges

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Early detection of PD can significantly improve risk diagnosis, driving quicker accurate decision making. With no need for expert interpretation, our user-friendly interface uses the innovative 'PD Triangle' for a 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

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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 assess the mechanical strength of the transformer and the risk for mechanical damages. TOTUS monitors the electrodynamic stress caused by through faults and cellulose ageing due to the combined action of temperature, moisture, and oxygen.



## Bushing Monitoring

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Online monitoring of bushings, through monitoring of internal insulation (capacitance/ tan delta or power factor) and the internal electrical activity (partial discharges/arcing) enables Asset Managers to detect a fault in its inception. This allows an action to be taken before reaching a critical and irreversible condition. TOTUS monitors the following parameters in bushings: Partial Discharges, High Energy Events, Leakage Current Angles and Magnitude, Temperature, Load, Bushing Properties.



## Arcing Events

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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. This helps identify 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 developing fault.



## Transformer Analytics

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The TOTUS Transformer Analytics module provides reliable diagnostic and prognostic guidance on transformers based on IEEE and IEC loading guides. By combining data from sensors, nameplate details and factory test results, TOTUS can run thermal models to estimate transformer remaining life as well as assess overloading capabilities. A specific moisture-package provides bubbling temperature, online breakdown voltage and moisture in paper estimation by using the moisture in oil data.

## KEY BENEFITS

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### Modular

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



### Decision Making

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Embedded web server enables asset managers to detect, diagnose, and react quickly to failure risks.



### Usability

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Intuitive user interface for commissioning, without requirement for external software.



### Bespoke Services

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Access to a range of Kelvatek Services from product training and seminars, condition assessment and dedicated project manager for installation, commissioning and aftercare.



### Modular Software

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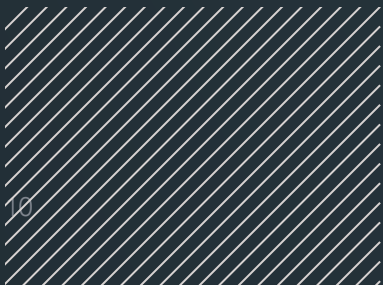
Access to TOTUSPRO Software Suite, which is modular based on your requirements. We provide a clear picture of asset health and fleet health depending on asset strategy.



### Planning

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Early detection of risks facilitating planned maintenance.

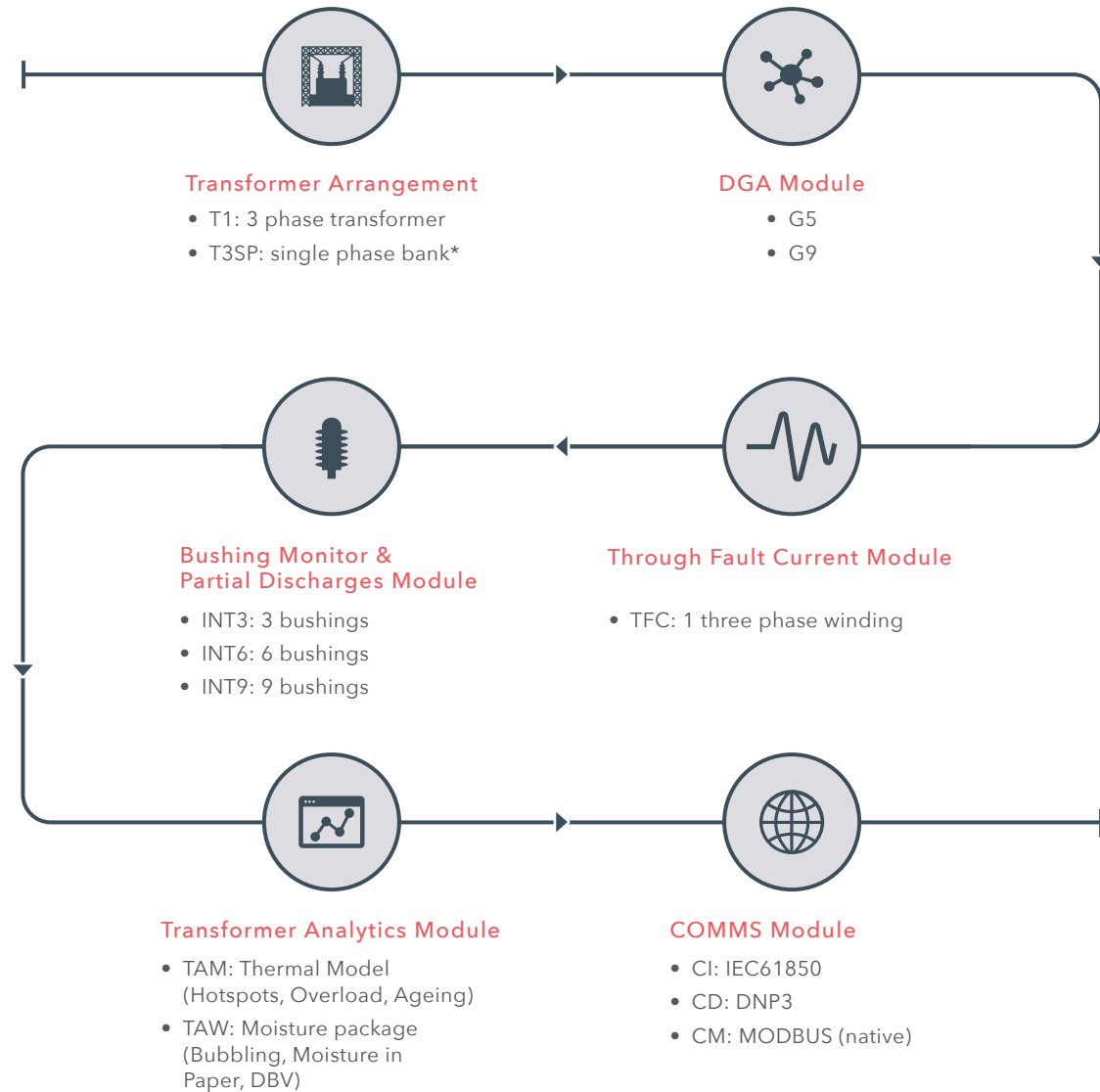




TOTUS PROVIDES A CLEAR PICTURE OF TRANSFORMER HEALTH, REDUCING THE RISK OF UNPLANNED OUTAGES, ENHANCING MAINTENANCE STRATEGIES AND MAXIMISING OPERATIONAL EFFICIENCY.

## BUILD YOUR SYSTEM

The flexible and modular design of TOTUS allows you to configure your system based on your assets. Here is an outline of key configuration options available.





### Customer Installation:

T1-G5-INT3-TFC+Models: TOTUS with DGA 5 Gas, PD and Bushing Monitoring on 3 bushings with Transformer Models

### Configuration examples: Adaptable to your requirements

T1-G9	TOTUS with DGA 9 gas module
T1-G9-INT9	TOTUS with DGA 9 gas and PD and Bushing Monitoring on 9 bushings
T1-G5-TFC -TAW	TOTUS with 5 gas, through fault currents and moisture analytics package



## TOTUSPRO SOFTWARE SUITE

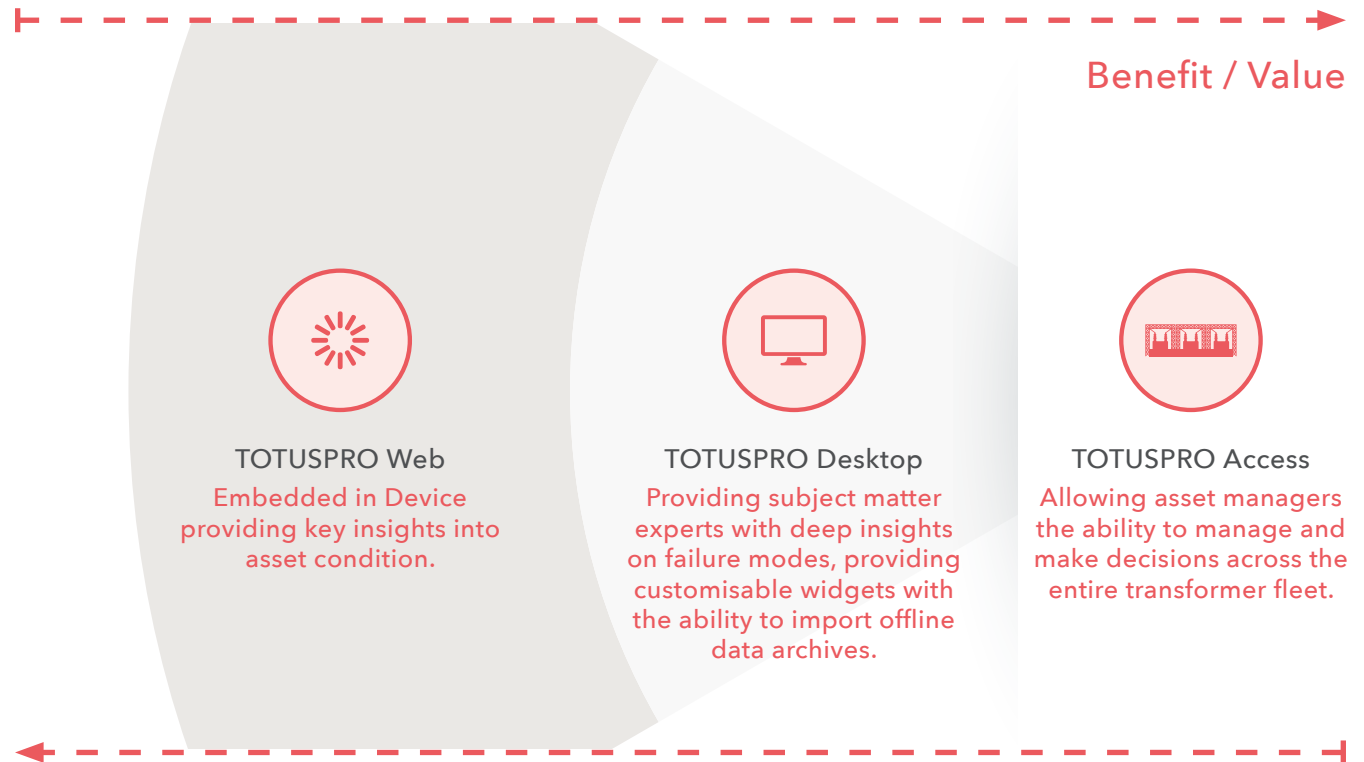
### Embedded web server

Each TOTUS device comes embedded with TOTUSPRO Web, and online server which incorporates advanced diagnostics, providing a graphical and easy to read display of information.

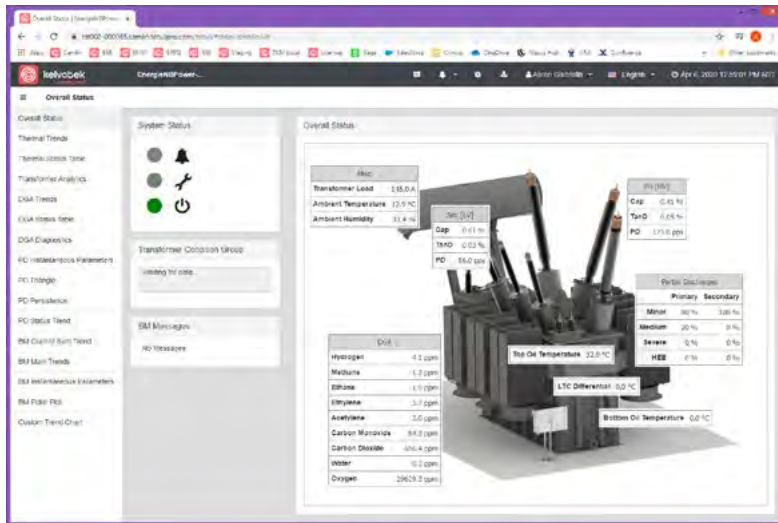
### Modular approach to software

Customers have the option to expand software options depending on maintenance strategies, the TOTUSPRO Desktop is an additional expert tool with the ability to import offline data for deeper investigation into failure modes, while TOTUSPRO Access provides asset managers with a full fleet view.

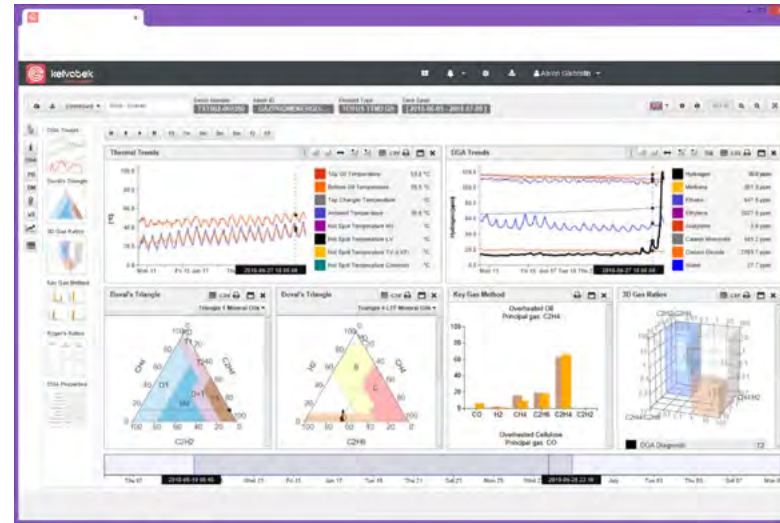
Our software suite of products consolidates data from our hardware devices to provide a clear picture of asset health and fleet health, reducing unplanned shutdowns, boosting production and increasing operational efficiency.







Example dashboard TOTUSPRO web



Example dashboard TOTUSPRO Desktop

The screenshot shows the 'Devices' page in the TOTUSPRO Access interface. It provides a clear overview of the monitored transformer assets, including their status and condition groups.

Serial Number	Asset ID	Status	Condition Group	Alarm
TOT001-000022	ATR275	Online	5	●
INT001-000012	ATR275	Online	6	●
TOT001-000026	TR1	Online	7	●
TMT015-000011	U6	Online	1	●
INT001-000056	PST2	Online	1	●
INT001-000057	PST3	Online	1	●

Example dashboard TOTUSPRO Access

## VALUE BEYOND THE BOX

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### 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.





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## 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



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## 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



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## Field Services & Customer Delivery

Kelvatek plays a vital role from product conception to product installation, and most importantly support and aftercare. We deliver focused services and support programme to our global network of customers including;

- Dedicated Account Manager for installation commissioning & aftercare
- Bespoke Customer Support Portal
- 24/7 support 365 days

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