

TOTUS TRANSFORMER MONITOR

Reducing Risk, Maximising Reliability
Protecting your most critical assets

TOTUS Transformer Monitor

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OPTIMISING CRITICAL INFRASTRUCTURES

With a history stretching back over 30 years, the foundations of the Camlin business are built on a core belief that innovation is key to driving improvements in the energy industry. 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. Camlin continues this track record of innovation, developing innovative and intelligent monitoring products and services that help make electricity and rail networks safer, more efficient, resilient, and sustainable.

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 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. With headquarters in the UK, Chicago and China and facilities in 21 cities across 17 countries, we are set up to deliver globally, ultimately our goal is to ensure our customers see real value from monitoring technology.

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 OLTC.

A HOLISTIC MONITORING APPROACH



The Challenge for Asset Managers

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.

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.

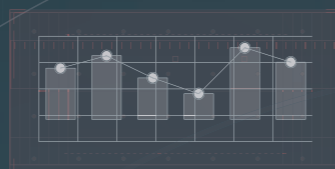
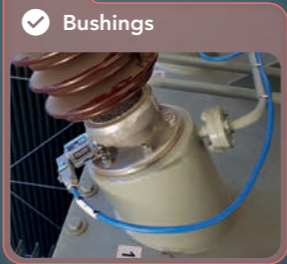
The Result

A comprehensive, granular picture of power transformer health that allows asset managers to optimise maintenance strategies resulting in;

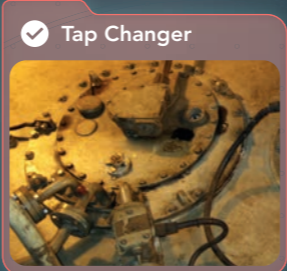
- Significantly reduced risk of sudden transformer failure and associated costs
- Enhanced predictive maintenance to extend life of the transformer
- Uninterrupted power supply, reducing unplanned outage

TOTUS MONITORING CAPABILITIES

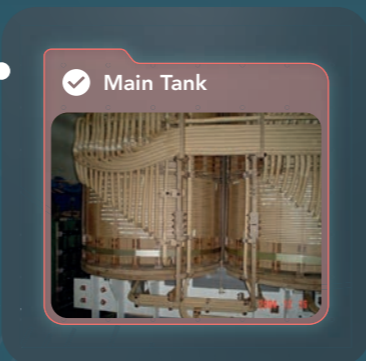
**BUSHING
MONITORING**
+17% Failure Rate



TAP CHANGER
+26% Failure Rate



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



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

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

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



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 embedded 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

Camlin 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 assess 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.



Arcing 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.



Transformer Analytics

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 is able to 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



Modular

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

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



Usability

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



Bespoke Services

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



Modular Software

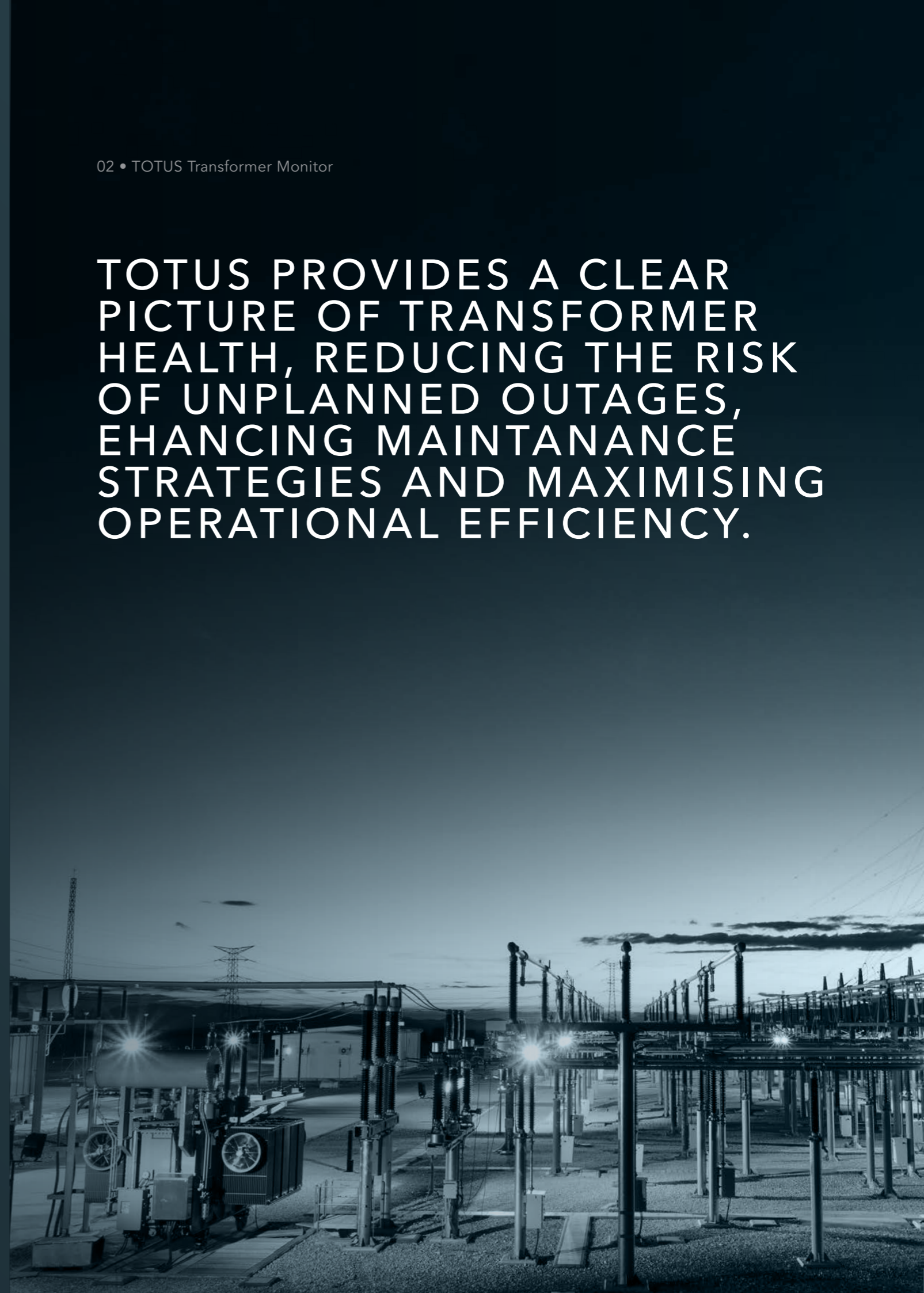
Access to TOTUSPRO Software Suite, which is modular based on your requirements. We provide a clear picture of asset health and fleet health depending on asset strategy.



Planning

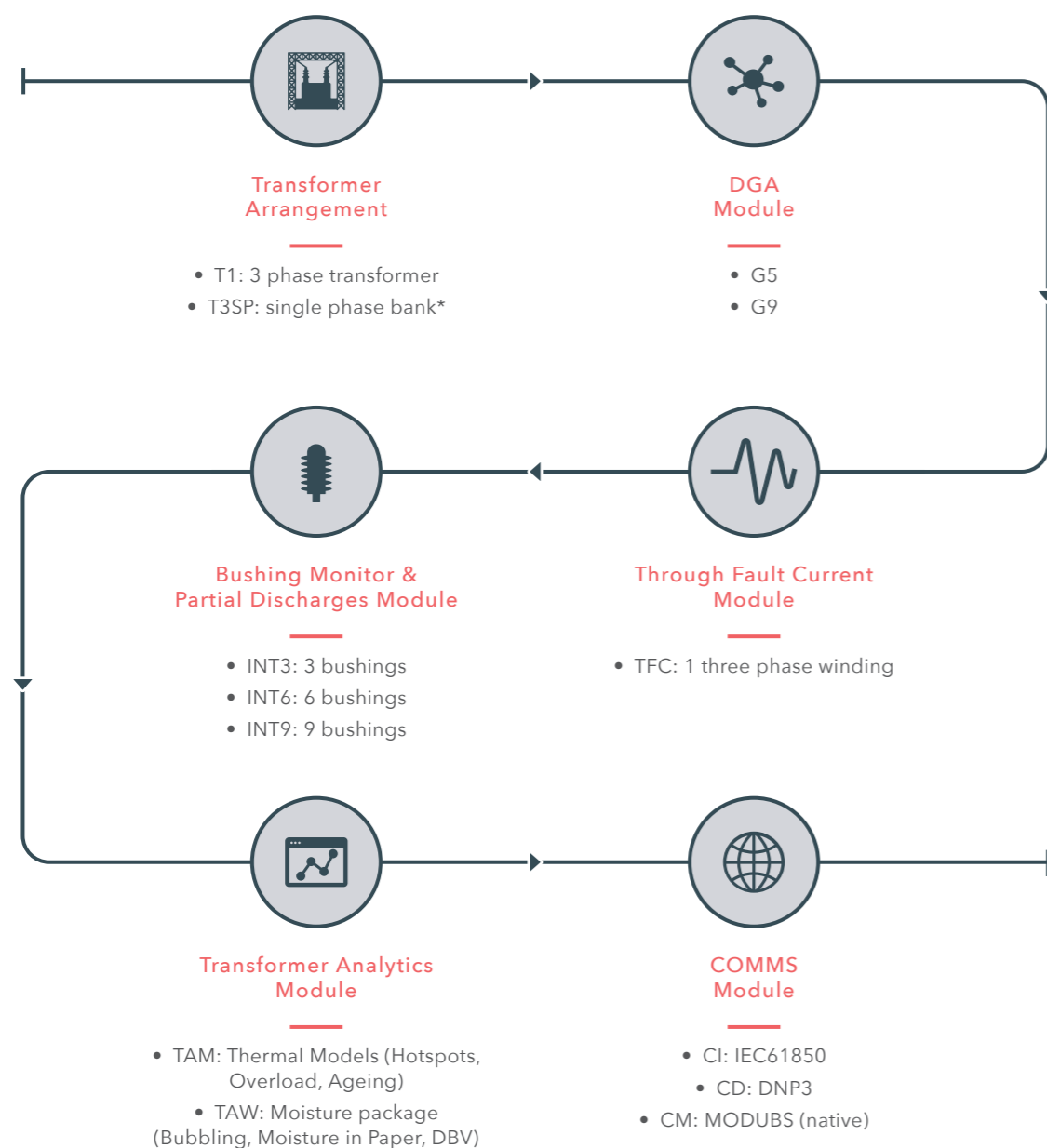
Early detection of risks facilitating planned maintenance.

TOTUS PROVIDES A CLEAR PICTURE OF TRANSFORMER HEALTH, REDUCING THE RISK OF UNPLANNED OUTAGES, ENHANCING MAINTANANCE 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. Below 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

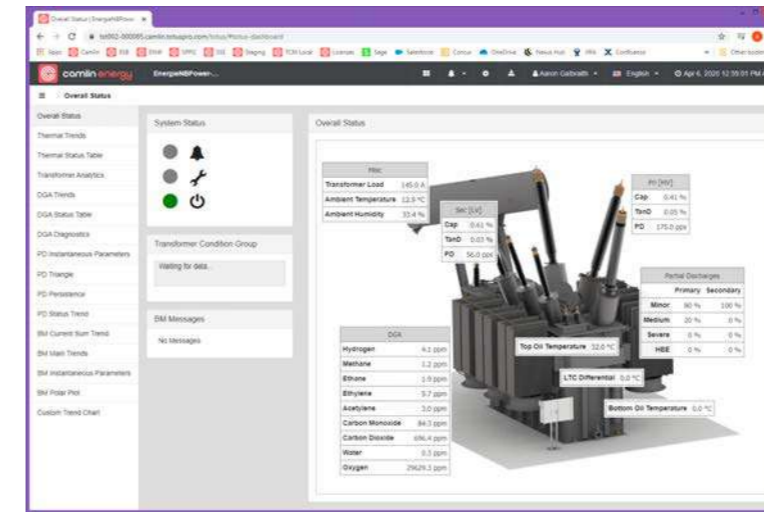
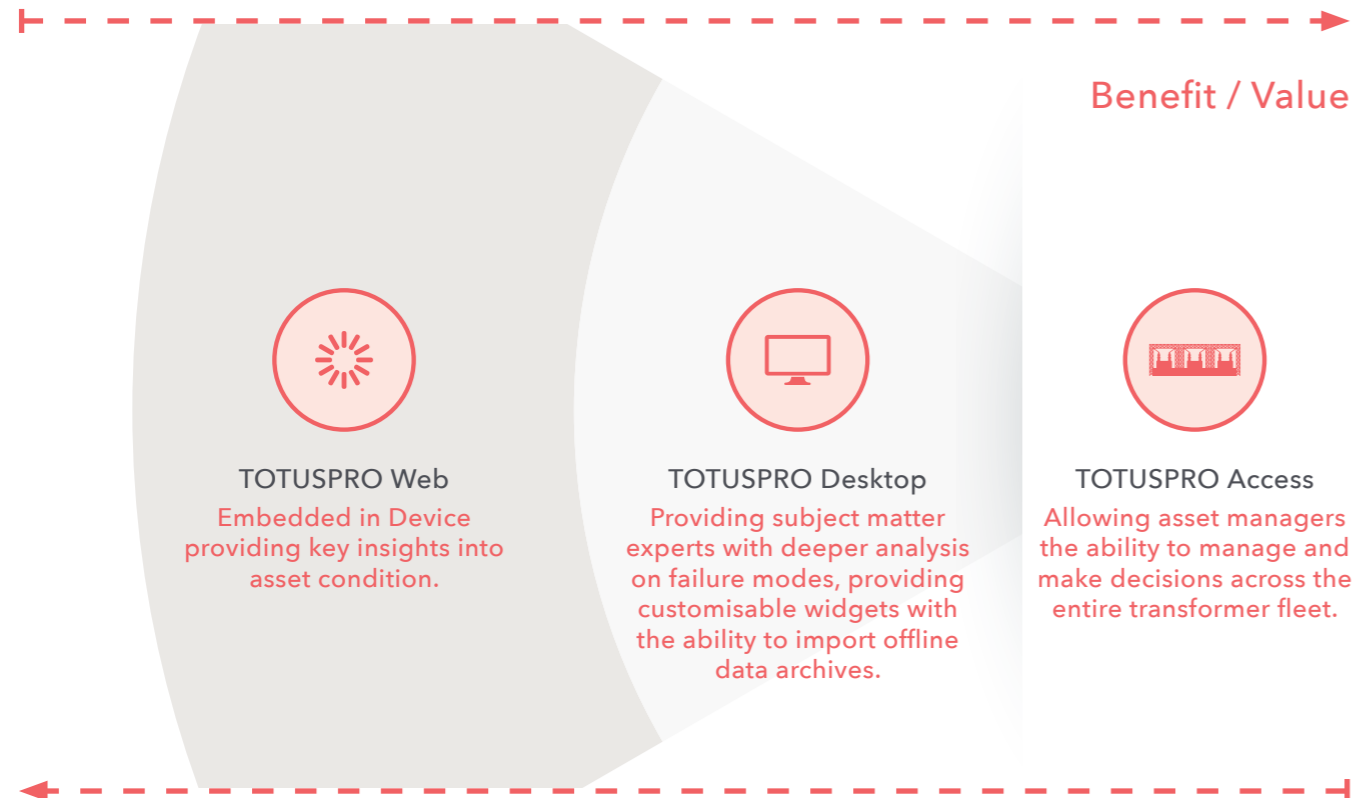
Embedded web server

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 optional 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



Example dashboard TOTUSPRO Access

VALUE BEYOND THE BOX

Camlin 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.

04 • TOTUS Transformer Monitor • 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



Field Services & Customer Delivery

Camlin 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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