

PART OF THE CALISTO® CONDITION MONITORING PLATFORM FROM DOBLE

Calisto® R9 Dissolved Gas Analysis (DGA) Monitor

HIGH-ACCURACY & LOW-MAINTENANCE BUILT FOR YEARS OF SERVICE



Gas	Unit	Reading	Trend	Alarm Level 1	Alarm Level 2	Unit
Hydrogen (H2)	ppm	511				ppm
Carbon Monoxide (CO)	ppm	303				ppm
Methane (CH4)	ppm	411				ppm
Acetylene (C2H2)	ppm	42				ppm



Dissolved gas analysis (DGA) monitors are important tools for ensuring the power grid runs reliably and safely. They provide early detection of a wide range of transformer health problems and enable timely fault diagnosis to drive informed asset management and maintenance decisions.



CALISTO R9: A NEW WAY FOR INFRARED DGA

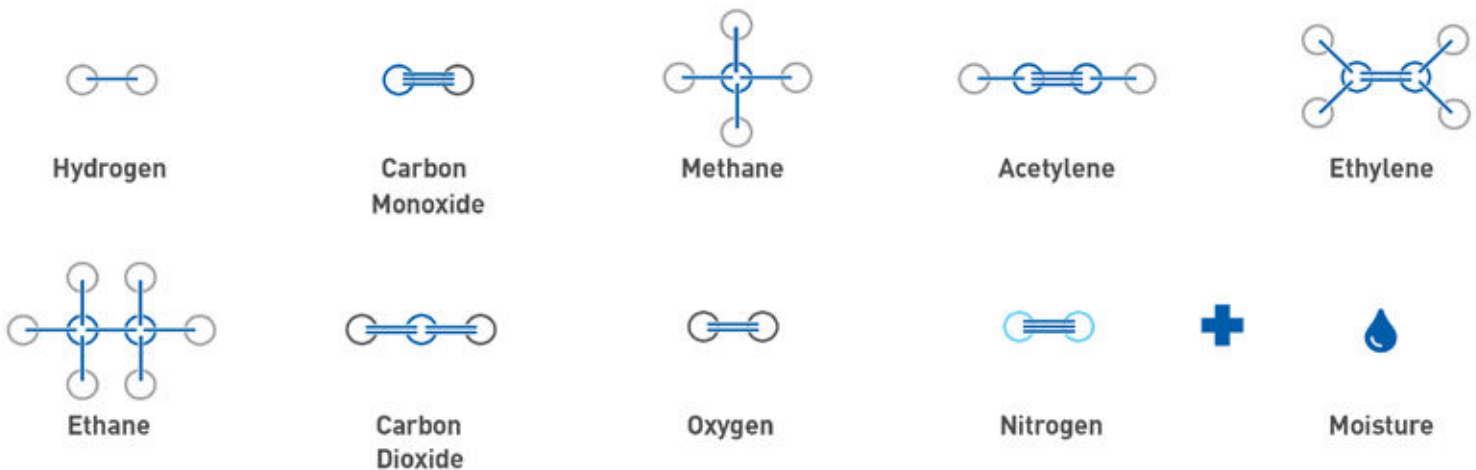
The Calisto R9 brings something new to the market of DGA monitors: long-term accuracy without calibration gas cylinders to manage. This breakthrough is achieved by combining a novel IR gas measurement technology with a game-changing calibration system that uses water vapor as a calibrant to maintain accuracy over time.

Calisto R9 combines these innovations with robust design features that have been continuously improved through many years of serving Calisto customers around the world. These include membrane extraction to keep the gas measurement system free of oil and oil vapors, our sludge-tolerant pump that eliminates the need for oil filtration, and precision thermal controls for DGA accuracy.

As you might expect, the next generation DGA monitor in the Calisto line measures the concentrations of fault gases, air components, and moisture dissolved in transformer insulating liquids.

Measures All Key Fault Gases Plus Moisture

DGA is widely considered to be the most powerful tool available for understanding transformer health. Online DGA puts these insights at the fingertips of asset managers and allows automated alerts to changes in transformer condition.



INNOVATIVE METHODS TO ENSURE LONG-TERM ACCURACY

The Calisto R9 leverages U.S. patented and innovative techniques that ensure measurement accuracy with minimum maintenance, to let asset managers focus on the condition of their transformers.

Infrared Method for Early Fault Detection and Accurate Diagnosis

Morgan Schaffer's patented Differential Infrared Photoacoustic Spectroscopy (DIPAS) method and proprietary thermal conductivity for hydrogen enable the monitor to accurately read even small concentrations of dissolved gases. Asset managers benefit from early fault detection, accurate diagnosis and informed risk assessment.

The DIPAS method ensures accurate readings even if the fluid contains considerable moisture or unexpected dissolved gases such as SF₆ or heavy hydrocarbons, common in aged transformers.

Water-Vapor Based Automated Calibration

Calisto R9 uniquely features on-board automatic calibration with water vapor, which maintains accuracy throughout the lifetime of the monitor. The system's ability to stay calibrated without the need to replace compressed gas cylinders provides premium DGA performance with very low maintenance time, cost and effort.



Membrane Gas Extraction

Proven vacuum-tolerant membrane extraction prevents oil and oil vapors from contaminating the gas measurement system over its lifetime. The membrane ensures that transformer fluid or vapors cannot contaminate the gas measurement system even during transformer or monitor maintenance. For maximum DGA accuracy, the product has built in Ostwald solubility coefficients of common oil types.

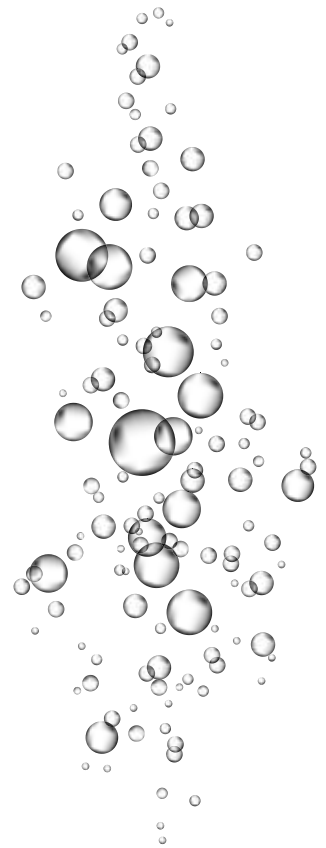


Intelligent Bubble Trap System

The intelligent bubble trap system prevents risks associated with gas bubbles entering the transformer tank during installation and use. To protect the dielectric system, air and gas bubbles are automatically removed from the oil before it is returned to the transformer. The bubble trap feature simplifies installation, which typically takes less than 2 hours.

Reliable Oil Circulation and Flow Monitoring

This next generation monitor comes with the same field-proven oil pump as earlier Calisto models. The unique solenoid pump allows the Calisto R9 to be intrinsically sludge tolerant without the need to maintain oil filters. Additionally, proprietary oil flow monitoring system provides a low-flow error if the flow drops below a pre-set threshold.



Precision Temperature Regulation

For maximum accuracy, Calisto products precisely control the oil temperature for both gas extraction and moisture measurements. Also, the temperature of the gas measurement system is carefully regulated to ensure constant conditions for the gas measurement system. Together, these temperature control systems eliminate the need for elaborate temperature compensation schemes and generate consistently accurate DGA readings.



FEATURE-RICH & DEPENDABLE

Calisto R9 is designed to simplify the setup and operation of your transformer monitoring program, and provide confidence in the state of each transformer in your fleet.

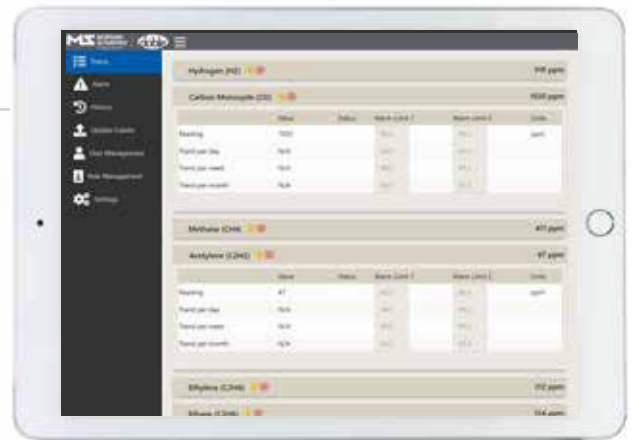


Reliable and Secure

Calisto R9 comes with field-proven Morgan Schaffer designs for headspace gas extraction, oil flow monitoring, bubble prevention, and thermal management. Newly designed electronics enhance reliability and supply-chain resilience, while a Linux operating system meets evolving requirements for cyber security. The product has been tested to exacting international standards for EMI/EMC, safety, environmental, and vibration. The modular design also simplifies any required service and support.

Intuitive User Interface

The Calisto R9 Software user interface runs with any common web browser. It streamlines monitor set-up and provides clear and intuitive views of historic readings and alarm settings. It is easy to port the data to INSIDEVIEW® or doblePRIME™ for in-depth DGA diagnostics.



Smart Substation Communications Ready

Calisto R9 comes standard with a generous offering of digital communication ports. Relay and analog outputs are available as options. The protocols DNP3, Modbus and IEC61850 are available as software-enabled options. All together, Calisto R9 is ready to integrate into any smart substation topology.



Upgrade Your Condition Monitoring Program with Doble

Managing critical assets requires deliberate and strategic decision-making. This requires the right data and tools for proper analysis and visualization. Ensure your team is armed with the right equipment.

THE CALISTO LINE

Doble's Calisto Condition Monitoring Platform offers a complete line of on-line monitors that can analyze and alert you to changes in dissolved gas, moisture in oil, partial discharge, bushing health and tap changer condition. These monitors can be used individually or as an integrated platform. The modular nature of these devices enables you to determine the level of condition monitoring you need for each asset so you can plan your monitoring program accordingly.



CALISTO® T1: Captures the functionality of bushings, partial discharge and Input/Output modules in a single configurable package in a cost-effective manner. It provides a clear user interface through a built-in server and manages user access, alert setting, alert management and data visualization — bringing together data from Doble and third-party devices. Standard communication protocols include Modbus and DNP3 with optional IEC 61850, which allow data to be moved between Calisto T1 and other applications such as SCADA.



CALISTO® H1: Contains the industry's premier solid-state hydrogen sensor technology in a robust yet compact package. It continuously samples the oil in transformers to detect spikes in hydrogen levels that are often indicative of an electrical fault.



doblePRIME: Provides a clear, consolidated means to assess overall transformer condition. A scalable, on-line monitoring system, doblePRIME enables you to choose the appropriate level of condition monitoring for an individual transformer or group of transformers in one location and can also integrate into an asset risk management system.

Check out our full line of Calisto® DGA Monitors and Condition Monitoring Solutions [here](#).

For more information about Calisto R9, visit www.doble.com/calisto-R9. To request a demo, speak with your Doble representative.





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