QUALITROL®
Defining Reliability

Qualitrol DMS Gen3

Partial Discharge Monitoring for Gas Insulated Switchgear

Qualitrol® Gen3 Series

Qualitrol DMS has been trusted by utilities around the world since the 1990's to monitor GIS, saving them millions and keeping their customers out of the dark along the way.

Protecting against costly failures, extending asset life & enabling Condition Based Maintenance

Qualitrol® Company LLC

The Value of Partial Discharge Monitoring

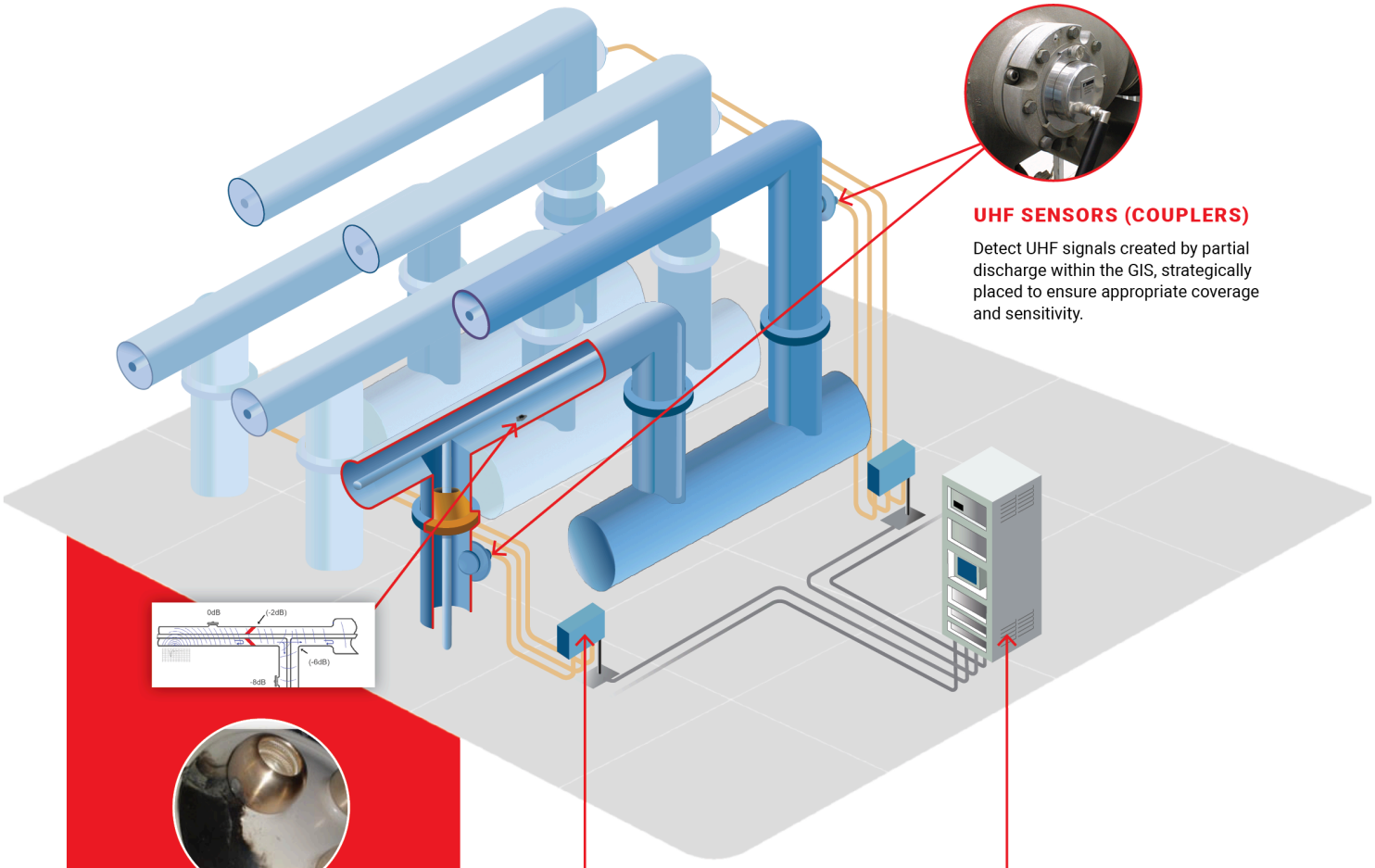
Understanding asset health is fundamental to optimizing asset life, asset utilization, and maintenance resources. Monitoring Partial Discharge (PD) for Gas Insulated Switchgear (GIS) is the foundation for understanding asset health, because PD is a leading indicator for most causes of GIS failure. By monitoring for PD, customers can efficiently and effectively identify issues, escalate when appropriate, and deploy valuable resources where they are needed most.

DMS partial discharge monitoring systems enable customers with a wide range of options for identifying and categorizing partial discharge. This allows them to make informed decisions about the appropriate course of action to optimize asset utilization and prolong asset life.

Backed by a team of industry experts and the largest library of PD data in the industry, Qualitrol offers PD analysis. Our experts leverage years of experience and industry knowledge with our own AI algorithm to make sense of this often overwhelming and unfamiliar data, providing actionable insights. By taking advantage of this offering, users can support action with data to fully unlock the power of PD monitoring.

WHAT MAKES UP A DMS GEN3 PDM SYSTEM?

The Gen3 system is made up of three key components: The Radial Control Cabinet (RCC), the Optical Converter Unit(s) (OCU's) and UHF Sensors which are also know as Couplers. OCU's can be added to cover additional UHF sensors (up to 2,000) giving Gen3 the flexibility to cover a wide range of GIS.



UHF SENSORS (COUPLERS)

Detect UHF signals created by partial discharge within the GIS, strategically placed to ensure appropriate coverage and sensitivity.

DEFECT DETECTED

Qualitrol's Expert System analyzes PD patterns and provides classification by defect type, with a percentage of likelihood. Defect types are recognized across the industry as root causes of PD:

1. Protrusion on Conductor
2. Protrusion on Enclosure
3. Floating Parts (Bad Galvanic Contact)
4. Free Particles
5. Voids – Between Screens and Insulation
6. Voids and Treeing in Insulation

OPTICAL CONVERTER UNIT (OCU)

Processes UHF signals to filter out noise and digitizes the signal to be passed to the RCC.

RADIAL CONTROL CABINET (RCC)

Main Server and HMI for DMS PDMS, houses Expert System which classifies PD by defect type.

Gen3 PDMS

A Fully Integrated GIS Monitoring Solution

The Gen3 system utilizes a series of UHF sensors to detect PD. The data captured is analyzed and noise is filtered out by Qualitrol's proprietary ANN. Analysis yields classification of the PD signal by its root cause, known as “Defect Type” and it is assigned a confidence level. This information along with amplitude, discharge rate and trending serves as the foundation for developing a comprehensive assessment and risk analysis which can be used to drive a condition based maintenance program.

Gen3 is capable of monitoring 2,000 UHF PD Sensors, and 4,000 Gas Density Sensors.

Qualitrol's Artificial Neural Network (ANN) is unique in the industry, based off of millions of PD signals captured over 25+ years from assets of every major OEM, operated by utilities around the world. Many PDM suppliers claim they "Classify" PD which is not the same as assigning it to one of the six GIS defect types, along with a confidence level:

1. Protrusion on a Conductor (fixed particle)
2. Protrusions on Enclosure (fixed particle)
3. Floating Parts (Bad Galvanic Contact)
4. Free Particles
5. Voids Between Screens and Insulation
6. Voids and Treeing in Insulation

Predict Asset Failures

A major utility in the US, had a catastrophic loss of an asset. Therefore, they decided to invest in PDM as a method to gain early warn of problems before they escalated to that level again. They started on their largest (765kV) assets and are currently installing down to 230kV.

Realize ROI

As of 2023 they have recorded nearly 20 "saves"' worth an estimated $75MM USD. With an investment of less than $100K per asset, few projects can compete with the ROI of PDM.

Outstanding sensitivity and accuracy ensures superior analysis, rapid fault detection and adaptability to adverse environmental conditions.

The Gen3 has industry leading sensitivity of -80 dBm and wide band selections, covering 300 to 2,000 MHz, reducing the chance of missing Partial Discharge activity. High dynamic range of 70 dB enables better analysis of PD activity with larger amplitude variations. All of which is controlled through simple filtering in the UI allowing filters to be applied to each sensor individually. This allows for an installation tailored to whatever site conditions are present, and equally important how they change over time.

Wide band selection and high dynamic range enable the industry's most sophisticated filtering options, thus streamlining commissioning and delivering a product that can be adapted over its life to a changing environment. Just think how the use of various frequency ranges for commercial and industrial purposes has changed in the last 10 years and will change in the next 10 years!

Gen3 is driven by a rules engine which can be customized to meet a customer's application needs without expensive and time consuming software development.

With an onboard HMI as well as Support for Modbus, DNP 3.0 and 61850 on copper or fiber, Gen3 can be managed locally or remotely from anywhere within your network. All data is stored locally and pushed to a location of your choice. Flexibility for managing the device, security of a system insulated from the outside world.

Confidence with Qualitrol DMS

Qualitrol DMS has over 25 years of experience supplying UHF PD monitoring systems to utilities across the world.

- 100+ Customers
- 500+ Substations Monitored
- 60,000+ UHF Sensors
- 4,000,000+ Exemplar Database

Founded in 1994, after pioneering the use of UHF technology for identifying PD over 10 years prior.

Qualitrol's Xpert Services team of highly experienced, PD specialists can help analyze PD data from the Gen3 and provide reports and recommendations. Support is also available on system installation and testing.

Qualitrol Xpert Services

QUALITROL®
Defining Reliability

REMOTE CLIENT SOFTWARE

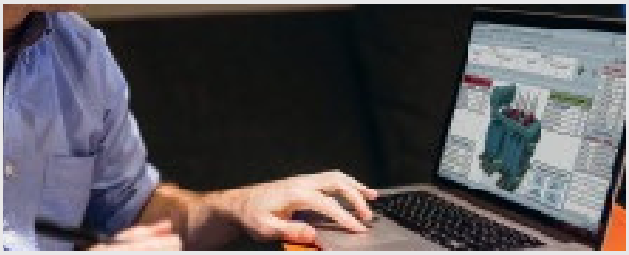
Qualitrol's advanced remote client software is used for configuration (system and alarm settings), data visualization, PD analysis and reporting. Instant visualization of PD characteristics enables faster and smarter responses to real-time operational challenges.

Key Features:

- 2D, 3D, point-on-wave PRPD and PRPS data display and analysis; PRPD, STT real-time displays (optional)
- Data stored on solid state drive for up to 5 years
- Data library of typical defects
- Automatic self-check of PDM with logging and alarming
- Configurable alarm criteria
- Alarm notification and data output using IEC 61850 or Modbus

The data can be viewed in a number of ways including point-on-wave (2D) or in single-cycle (3D) formats.

In addition, trend analysis identifies irregular changes in the parameter levels defining the PD activity and alerts the operator.



Technical Overview

Radial Control Cabinet (RCC)	Input	2000 channels max, VT input and switching signals
	Interface	Central Control Computer with backup system. 21.5'' Screen, Keyboard and Mouse
	Time Stamping	LAN NTP signal or GPS
	Output	3 standard SCADA or SCS alarm contacts and additional 5 configurable alarms.
		PD warning, PD alarm and System fault
	External interface	Remote client over Ethernet, Data summary and alarms notifications through IEC 61850 and Modbus
	External indication	8 x LED status indicators
		Automatic self-test with logging and indication of the system fault
Radial Distribution Cabinet (RDC)		Communication and Power hub between RCC and OCUs when needed
Optical Converter Unit (OCU)	Input	7 UHF channels
		6 UHF coupler inputs + 1 external antenna
	UHF bandwidth	Standard OCU: 300MHz -1500MHz
		HDR OCU: 300MHz - 2000MHz (Multiple band selection)
	Dynamic range	Standard OCU: -75dBm to -30dBm
		HDR OCU: -80dBm to -10dBm
	Power Supply	110V 50/60Hz, 250mA
	Humidity	100% Condensing
	Operating Temperature	-25C to 55C
Interference filtering	Methods	Per Channel: Bandpass or Software filtering, Software selectable gating, Coincidence and notch filtering.
UHF sensors	Compatible	Internal sensors and External sensors
Smart PDM and Smart Sub Software	Operating system	Windows 10
	Data display	Single-Cycle(3D), Point-On-Wave, PRPD and trend
	Data recording	Events, trend, and classification of the signals
	HV testing module	HV testing monitoring and record PD events during HV testing
	Alarm notification	Software programmable criteria
		Warning and alarm of the PD activity
		Automatic alert of warning/alarm via Email
		Notification through IEC 61850 and Modbus
	Interpretation	Multiple Artificial Neural Network(ANN) classification of events
	Reporting	Automatic daily, weekly and monthly reports and Experts advise on signals
Compliance	EMC Compliance	Tested to Industrial Generic Immunity and Industrial Emission standards at enhanced levels.

QUALITROL®
Defining Reliability

Contact Us

Qualitrol® DMS

Orbital House, 3 Redwood Crescent
East Kilbride, G74 5PA
United Kingdom

Ph. +44.141.572.0840

info@qualitrolcorp.com

Visit our website for more information and a complete portfolio

www.qualitrolcorp.com