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Defining Reliability

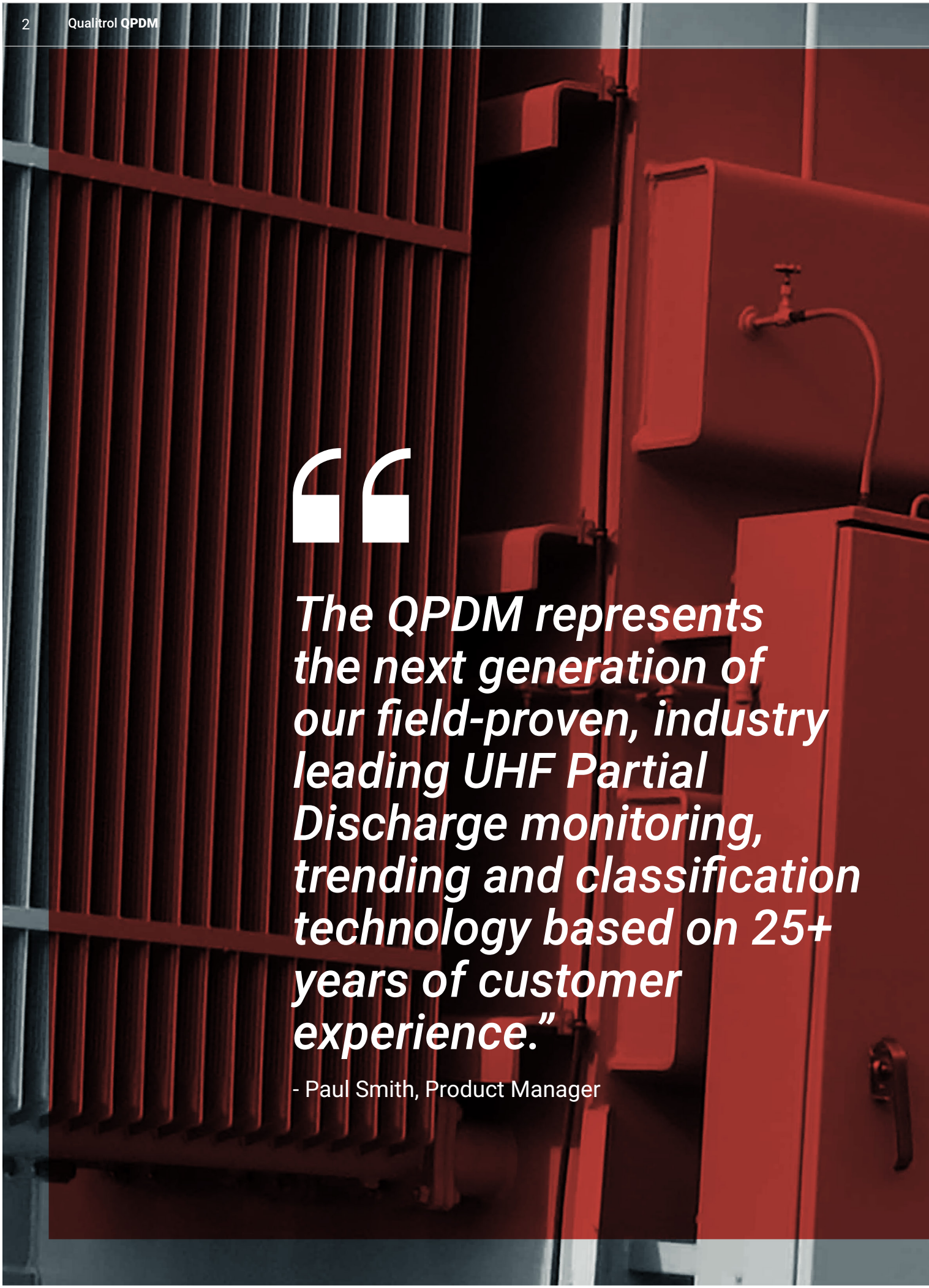
# PD MONITORING SOLUTION FOR TRANSFORMERS

## Qualitrol® QPDM Series

### Next Generation Transformer Partial Discharge Monitoring System

Protect against costly failures and extend asset life

Qualitrol® Company LLC



*“The QPDM represents the next generation of our field-proven, industry leading UHF Partial Discharge monitoring, trending and classification technology based on 25+ years of customer experience.”*

- Paul Smith, Product Manager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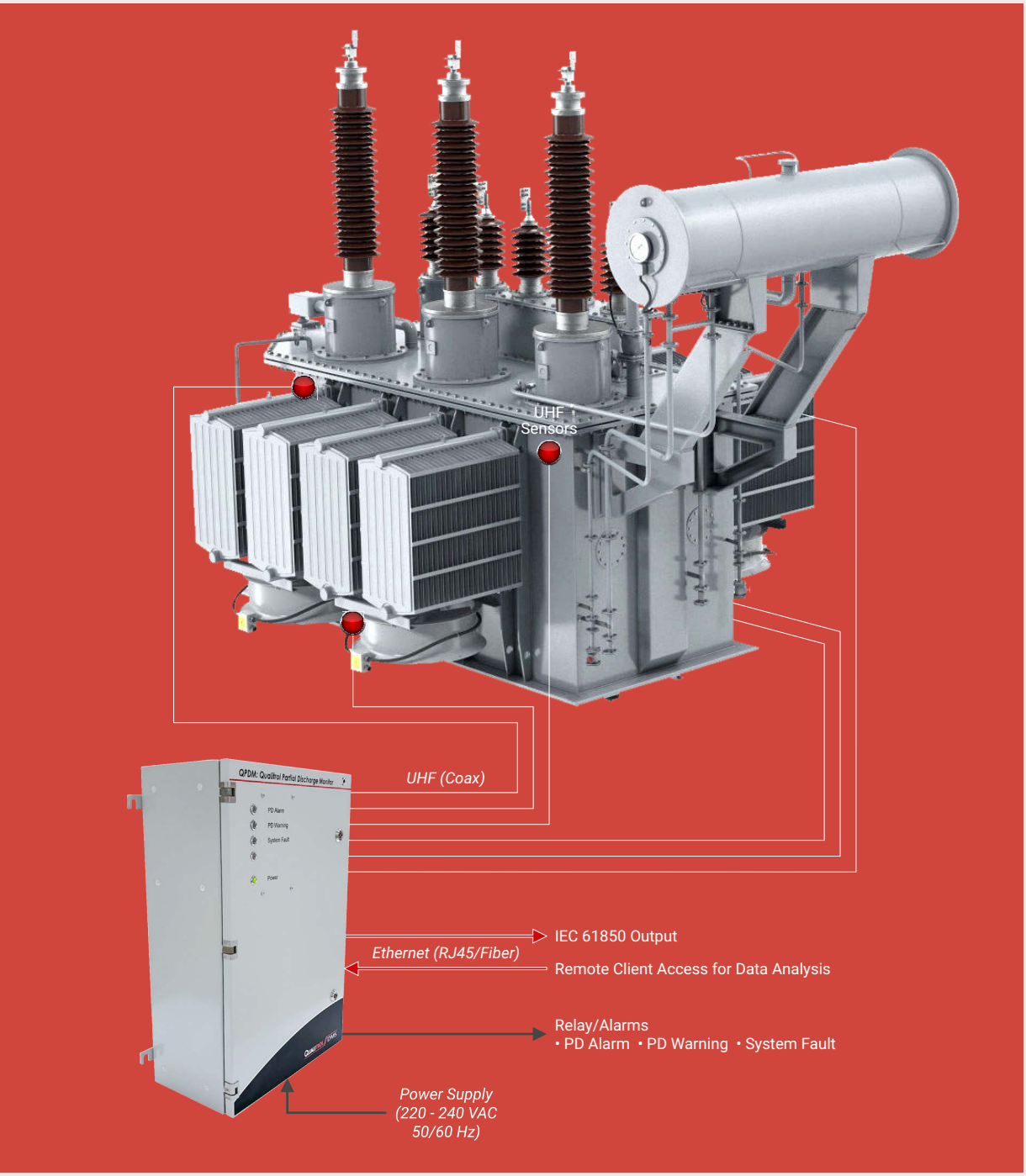
# Product Summary

**More often than not, a transformer failure is an economic disaster. Most of the time, the economic impact comes from the wait time for a replacement. Did you know that the typical time between order, manufacturing, delivery, and replacement of a transformer can easily take longer than a year? By not actively monitoring your transformer you could lose revenue, experience catastrophic failures and have major safety and environmental impacts.**

Partial Discharge (PD) monitoring, trending and localization have proven to be reliable methods for detecting defects in the insulation system of transformers before major damage or a breakdown occurs. The QPDM is a one box solution for continuous online monitoring of PD activity in a transformer's tank.

The QPDM system is based on industry proven Ultra High Frequency (UHF) technology. It monitors PD activity on real time basis and detects faults so that corrective actions can be taken before any failure occurs. This next generation system with higher sensitivity and wider dynamic range provides accurate, reliable and reproducible measurements even under the most difficult environmental conditions. The information gained from the QPDM is used for condition based maintenance decisions to optimize maintenance expenditures and extend life of the asset.

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# A SINGLE BOX PD SOLUTION

The QPDM is a one box solution capable of monitoring up to 6 UHF Partial Discharge sensors. It enables asset managers to assess the most accurate PD data available and have the confidence to make informed strategic decisions regarding the timely maintenance of the transformer before an unexpected outage occurs.

The QPDM system captures signals from UHF sensors and applies filtering to reject interference (noise) and creates patterns of PD activity. These patterns are then analysed by ANN (Artificial Neural Network) algorithms to identify if they are from PD activity or not. Amplitude, discharge rate and longevity for PD signals is stored for trend analysis, alarming and reporting.

The QPDM enclosure is designed for outdoor installations. It has 4 LED indicators to provide local indication of alarm and system faults.
The unit has Ethernet output (RJ45 or fiber optic) connection for remote connection and data export. Advanced remote client software is used for configuration (system and alarm settings), data visualization, PD analysis and reporting.

## Predict
costly asset failures

Continuous, real-time PD monitoring ensures early indication of faults and possible asset failure

## Health
assessments

PD data can be correlated and assessed with data from multiple monitors to provide a health assessment of the asset

## Extend
asset life cycles

Correlation of PD activity with operational and environmental conditions helps in optimizing asset performance

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

### Outstanding sensitivity and accuracy ensures superior analysis and rapid fault detection

The QPDM has an outstanding built-in sensitivity of -80 dBm and wide band selections, covering 300 to 2100 MHz, which reduces the chances of missing any Partial Discharge activity.

High dynamic range of 70 dB enables better analysis of PD activity with larger amplitude variations.

Real-time monitoring of Partial Discharge amplitude and discharge rate helps in correlating PD activity with Load, OLTC operations etc.

A trend view of PD amplitude and discharge rate provides indication of PD Activity. Using the QPDM to monitor the historical activity of faults helps optimize transformer maintenance scheduling.

### Robust design and excellent interference immunity for measurements under difficult environmental conditions

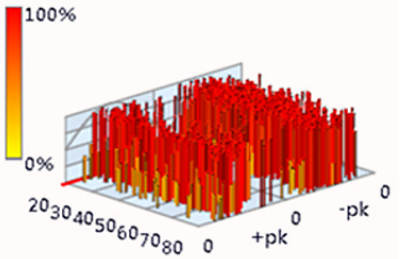
The QPDM monitor enclosure is IP66 rated. Built-in LED indicators and remote client enable safe operation in harsh environmental conditions.

Noise gating is provided by an external signal antenna (optional).

### Confidence with Qualitrol DMS

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

We provide long term serviceability assurance and upgrade options to the QPDM system.




## UHF

### UHF technology is industry proven for online monitoring of Partial Discharge in the insulation of high voltage apparatus.

UHF has excellent interference immunity and a sensitivity higher than any other kind of PD measurement e.g., DGA, acoustic or conventional measurements. Immediate detection of PD (earlier than DGA) makes it ideal for online monitoring.

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# UHF PD SENSORS

Qualitrol's UHF sensors are the key components of any PDM system. They detect the UHF signals induced from PD pulses and transfer the signal to the data acquisition system for interpretation. The QPDM can be connected with any available UHF sensor; internal, window or drain valve. The system can be scaled from 1 to 6 sensors.

## Internal Sensors

In new transformers the sensors are usually fitted internally, inside the tank wall.

## Window Sensors

For retrofitted systems, external sensors can be fixed in transformer tap changers or available hand or manhole covers.

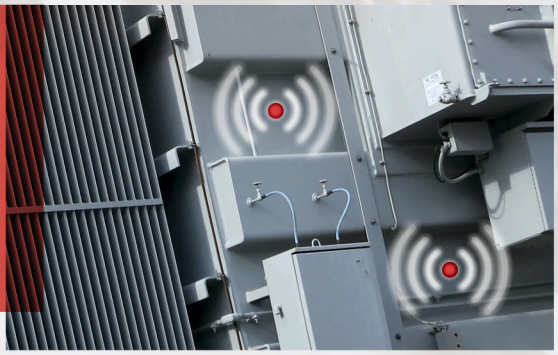
## Drain Valve Sensors

For retrofitted systems, external sensors can be also be inserted in the transformer drain valves.

## Custom Sensors

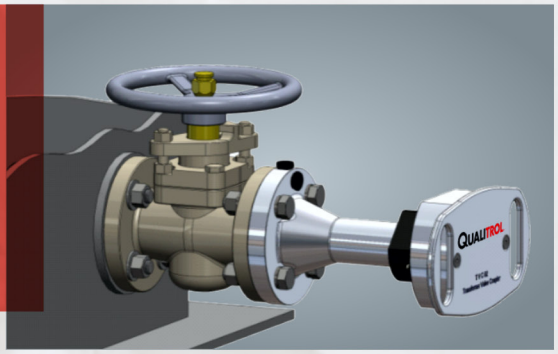
Qualitrol can custom-design all types of UHF sensors for particular applications.

Internal sensors act as antennas picking up UHF signals emitted from PD. Complete protection for sensitive electronics of the QPDM is assured by fitting an external protector which suppresses dangerous voltages or transients

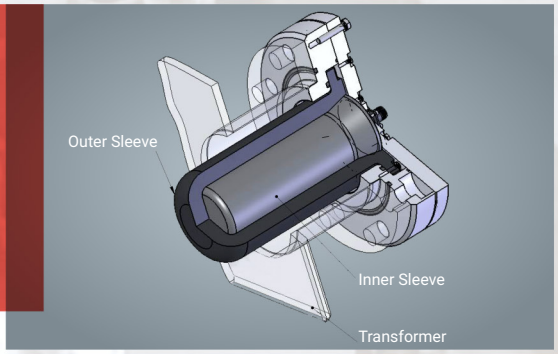


Replacement hatch covers are prepared before the installation Sensors are fitted on top of tank to the replacement hand or manhole covers. Oil is only drained to a few cm below the hatch level and outage times are kept to a minimum.

Qualitrol's drain valve sensor can be easily and rapidly retrofitted to the existing transformer oil drain / filter valve.

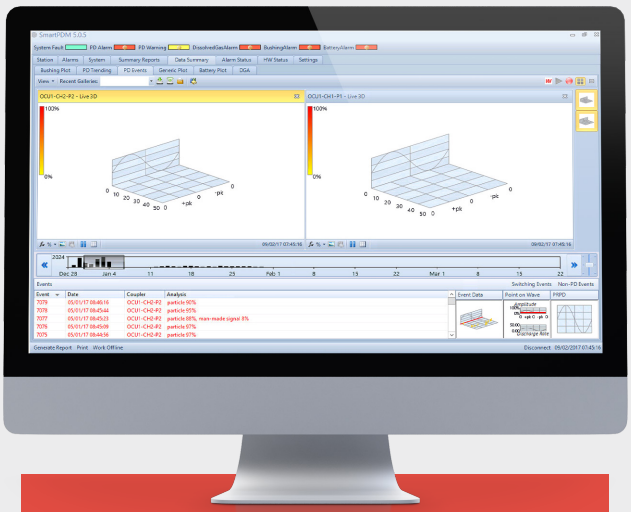



Qualitrol can calibrate all custom designed sensors to ensure they meet any customer specifications for sensitivity and bandwidth.



# 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.

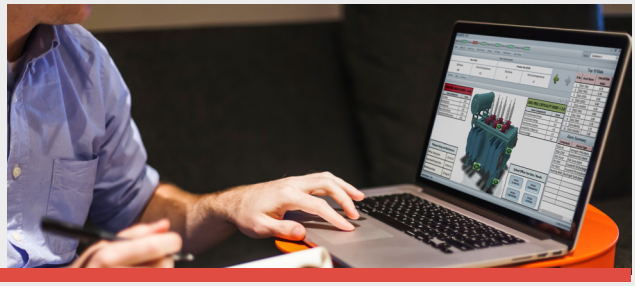


## Key Features:

- 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

| | |
|---|---|
| **QPDM Unit** | |
| Voltage range | 90 to 264 V AC; 50/60 Hz |
| Output | 4 x SCADA / SCS alarms contacts for PD Warning, PD Alarm and System Fault<br>4 x LED status indicators (bi-color) |
| **Inputs and Outputs** | |
| Input (UHF) | Supports 1 to 6 channels for UHF sensor inputs |
| Input (noise) | 1 separate noise channel for external noise antenna |
| Frequency bandwidth | 300 MHz to 2100 MHz with HDR card<br>4 selectable bands: 440 - 800 MHz, 300 - 800 MHz, 1100 - 2100 MHz, 300 - 1200MHz (default) |
| Dynamic range | 70 dB |
| Sensitivity | -80 dBm |
| Sample rate | 15360 samples/s per channel at 60Hz |
| Output | Ethernet (multi/single mode fiber optic or RJ45) |
| Output protocols | IEC61850 |
| **Environmental** | |
| Ambient operating temperature | -25° to +55° C [-13° to +131° F]. (Custom ranges available) |
| Storage temperature | -25° to +85° C [-13° to +185° F] |
| Humidity | 5 to 95%, non-condensing |
| Enclosure rating | IP66 |
| Seismic | IEEE C37.98 (seismic testing of relays) |
| Environmental test compliance | BS EN60068-2-2, BS EN60068-2-1, BS EN60068-2-78 |
| Vibration test compliance | BS EN68-2-6, BS EN68-2-27, BS EN68-2-29 |
| **Immunity and Mechanical** | |
| EMC test compliance | Conforms to relevant specifications for monitoring / control equipment in HV substations. BS EN55022 (:2006); BS EN61000-3-2 to -3-3, BS-EN61000-4-2 to -4-6, BS EN61000-4-8, BS EN61000-4-11, BS EN61000-4-18; IEC 60255-5, IEC 61180-1 |
| Others | CE and RoHS Compliance |
| Dimensions | 600 mm (height) x 430 (width) x 210 mm (depth). [23.6” x 16.9” x 8.3”] |
| Weight | 25 kg [55.2 lbs] |

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## Contact Us


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