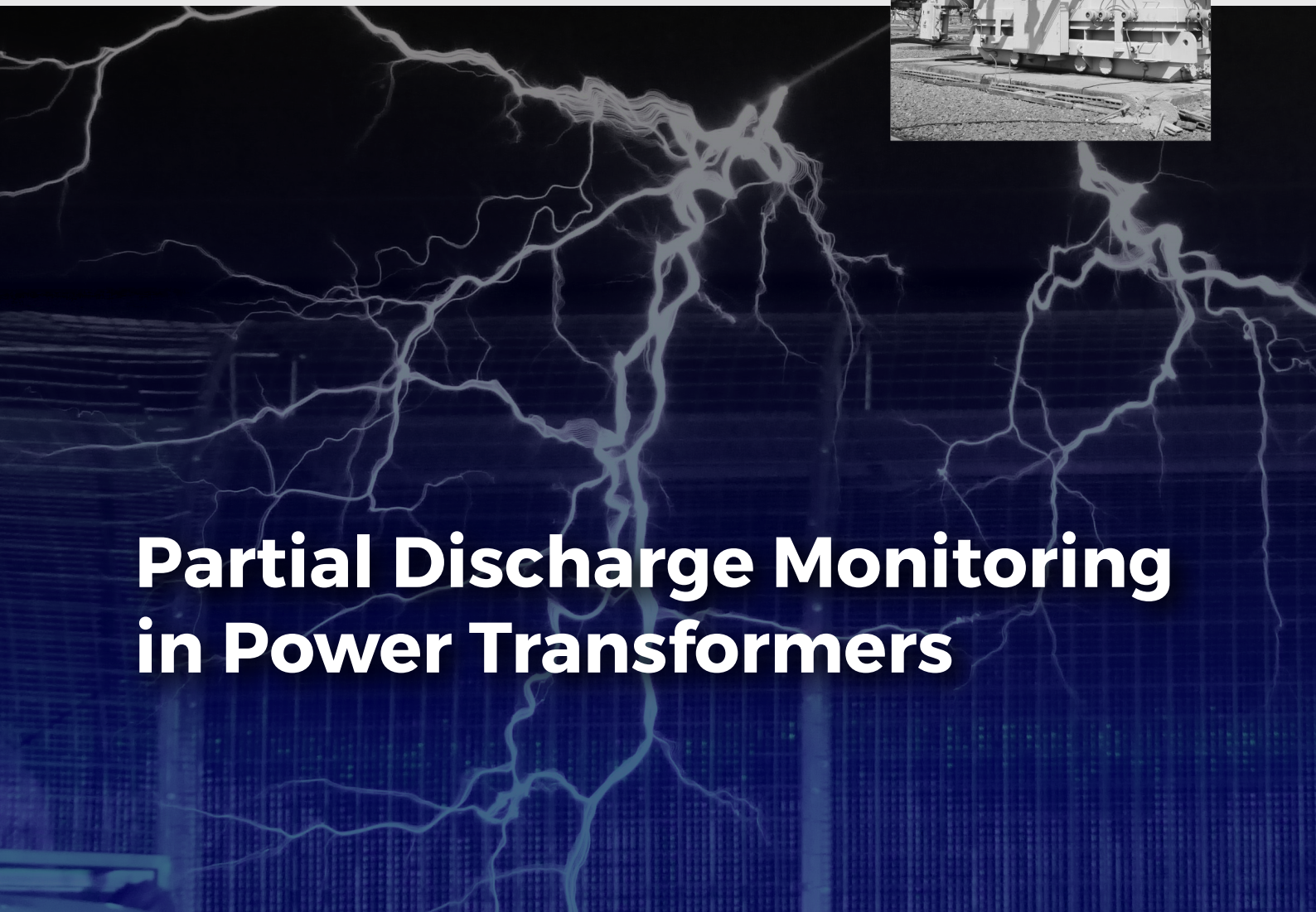
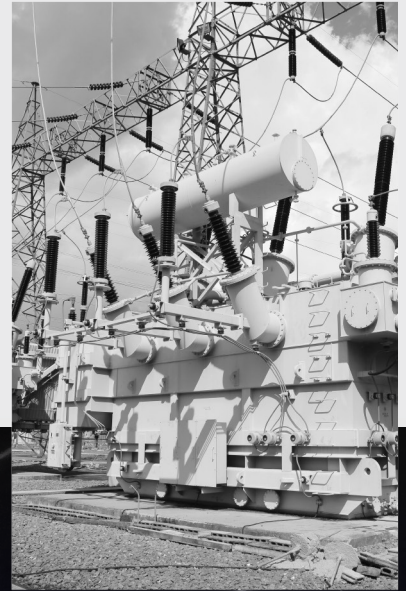




Partial Discharge Monitoring in Power Transformers

Crucial Insights: Partial Discharge Diagnosis for
Transformer Health Assessment

Partial Discharge Monitoring

Partial discharge or PD is caused by local electrical stress in the insulation or on the surface of the insulation in Power Transformers. PD testing and monitoring solutions help in detecting and assessing insulation defects which can lead to failures in Power Transformers.

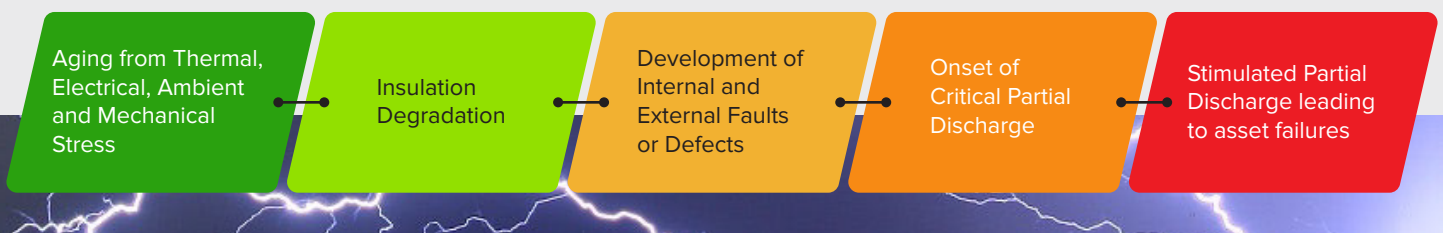
Rugged Monitoring (RM's) PD monitoring solution with sensors, modules and software are highly sensitive to PD activity, it can effectively identify weak points in the insulation system and help in diagnosing the insulation condition of an Power Transformer. Automatic warnings and alarms will immediately alert the users when pre-set PD activity thresholds have been violated.

Our precisely designed PD testing and monitoring solutions with rugged and reliable architecture can be easily customized to match customer requirements. Depending on specific operating requirements and application, we customize our solutions for:

- HV Testing
- Periodic Testing
- Continuous Online Testing
- FAT Testing / SAT Testing

Causes for Partial Discharge Activity

Power Transformers are extensively operated under stress as they are exposed to extremely high and low temperatures, thermal, mechanical, and electrical stresses with high voltage surges. These activities consequently emerge into the degradation of insulation leading to partial discharge activity.



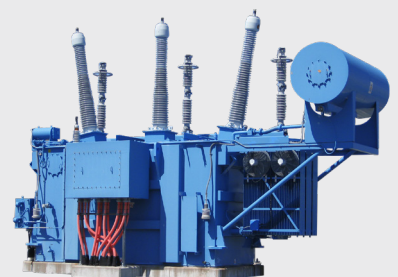
Why is RM's PD Monitoring important?

- High Sensitivity
- Accurate PD Diagnosis
- Fault Categorization
- Noise Elimination
- Rugged and Reliable Solution
- One Solution for Multiple Assets
- Integration with Enterprise Monitoring



RM's PD Solution for Transformers

Partial discharge measurements on power and distribution transformers are a proven tool to identify and locate insulation defects. The sensors installed on the transformer body, acquires High Frequency (HF) and Ultra High Frequency (UHF) PD signals and the PD monitoring system provides reliable diagnosis and recommendations.



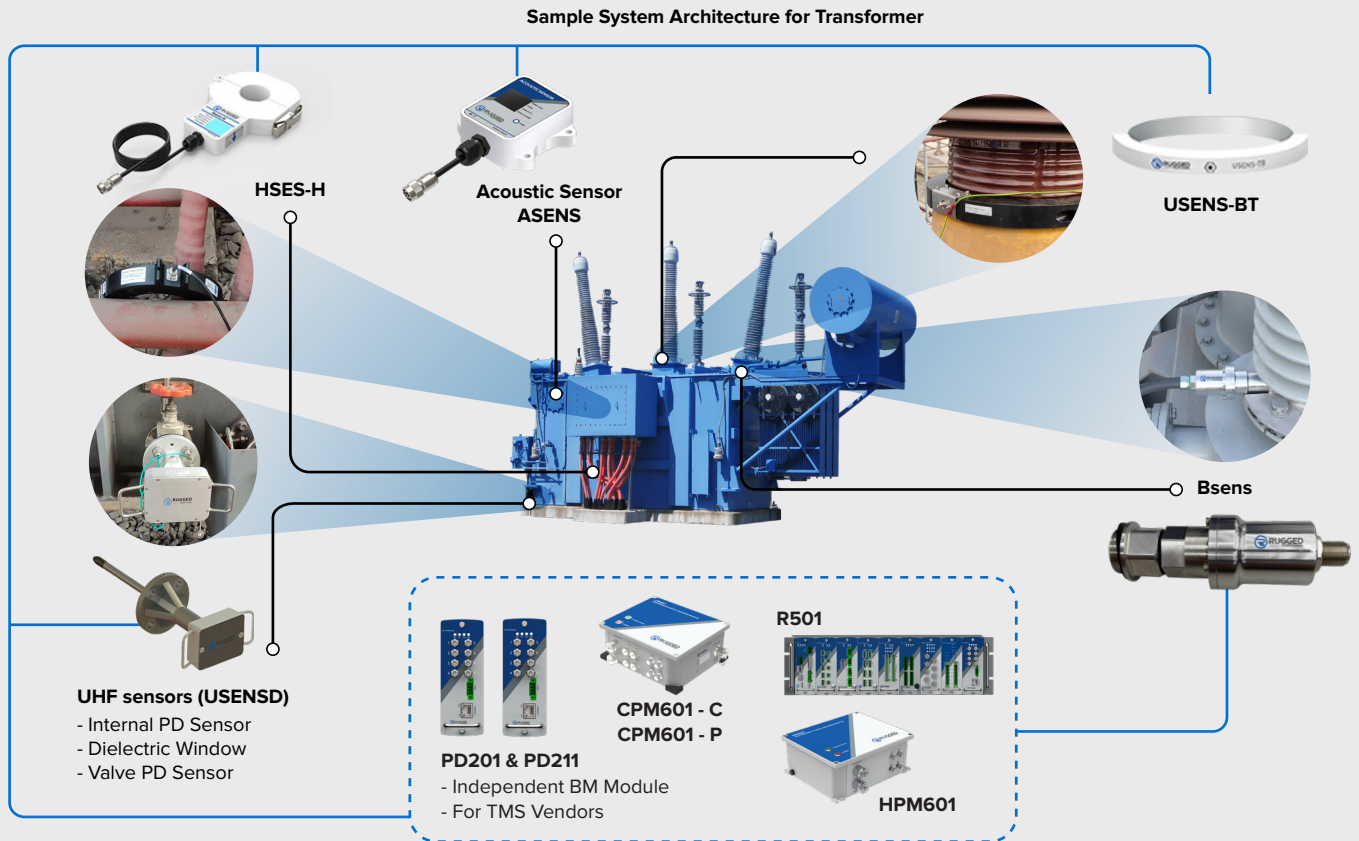
What can be tested:

- | | | | |
|---|--|--|---|
|  Maintank |  Winding Insulation |  Bushings |  OLTC Insulation |
|  Oil |  Cooling System |  Power | |

Continuous Online PD Monitoring System

RM's Monitoring solutions are precisely designed to monitor PD signals on different electrical assets offering a broad range of PD Monitoring Modules and Sensors.

Our On-line PD Monitoring Modules CPM601-C, HPM601-C, PD211 and PD201 along with compatible Sensors ranging from various HF to UHF ranges for MV/HV/EHV/UHV Power Transformers and Networks, provides an early warning of incipient insulation faults, helping network operators to avoid unplanned outages.



Portable PD Monitoring System

RM's Portable Monitoring modules UPM601-P, CPM601-P, HPM601-P are on-line Partial Discharge monitoring system for short-term installation. This monitor is designed to be moved around the network for short-term On-Line Partial Discharge monitoring in small time intervals. The system trends PD activity over time and detects any load variances and intermittent PD activity.

Our PD Monitors are capable of transferring the data directly to PD Connect software installed on laptop or data can be temporarily stored (optional) in the device enabling the user to record PD pulses with higher sampling rate. Thousands of pulses per second can be transferred to the laptop enabling the user to generate fast and reliable Phase Resolved Partial Discharge (PRPD) graphs. PRPD patterns help the user to identify type of PD. Monitor and Software are packed with all necessary tools that help to perform effective PD measurements.

Product Selection and Configuration

DESCRIPTION		UPM601-P	UPM601-C	PD 211	CPM601-P	CPM 601-C	HPM601-P	HPM601-C	PD 201
Usage	Periodic	✓	–	–	✓	–	✓	–	–
	Continuous	✓	✓	✓	✓	–	✓	–	✓
PD Measurements	HF IEC 60270	–	–	–	✓	✓	✓	✓	✓
	HF and VHF	–	–	–	✓	✓	✓	✓	✓
	UHF	✓	✓	✓	✓	✓	–	–	–
	Acoustic	–	–	–	✓	✓	✓	✓	✓
Sampling Rate		250 MS/s		125 MS/s	250 MS/s				125 MS/s
Frequency	HF Channels	–			0.01 – 100 MHz				
	UHF Channels	200 –3000 MHz					–		
No. of Channels	HF Channels	–			4		4 or 8	4, 8 and 12	
	UHF Channels	4		4 or 8	4		–		
Communication Protocols		IEC 61850, DNP 3.0, Modbus, MQTT, CANBUS							
IP Rating		IP 65		IP 4X	IP 65				IP 4X
Compatible Sensors		USENS-D, USENS-T, USENS-BT		USENS-T, USENS-BT,	USENS-D, USENS-T, USENS-BT		HSENS-T, HSENS-H, HSENS-CC		USENS-T, USENS-BT

RM's range of Partial Discharge (PD) sensors can detect dangerous PD activity in Transformers



Features

- Multiple PD monitoring options to suit different site conditions
- Built-in Transient protection with Sensors and Monitors
- Rugged and reliable PD sensors
- Easy to install and commission
- Highly accurate measurement for PD activities
- Available for periodic and continuous monitoring
- Easy integration with third party Monitoring Devices/ SCADA/ Cloud
- Realtime PD Trends and PRPD analysis

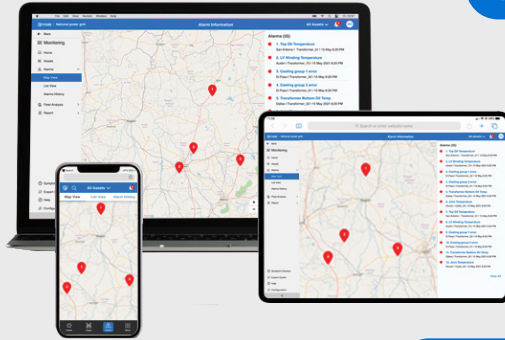
Benefits

- Improved availability, Minimal or low equipment outages
- Reduced Risk, Avoid catastrophic failures of HV/MV assets
- Optimized asset maintenance and replacement planning
- Cost effective solution for various types of electrical assets
- Improved PD detection with Effective Noise gating

Asset Monitoring : Enterprise Architecture

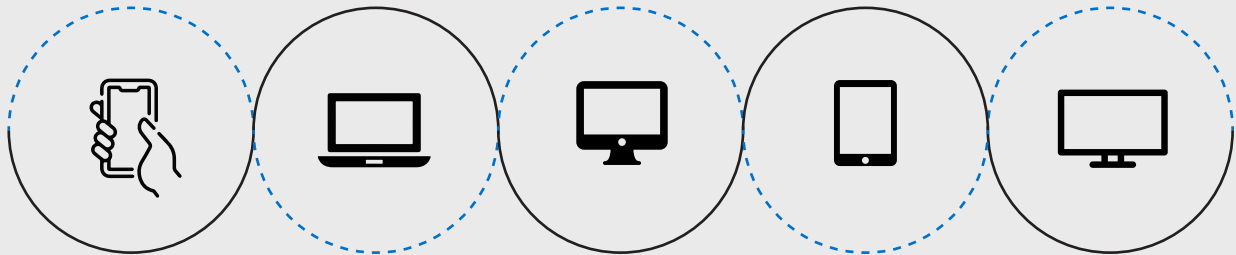
Compatible with Rugged Monitoring Enterprise Solution

UI UX



- Data Layer
- Analytics
- User Interface
- Custom Dashboards
- Reporting
- Email/SMS Notifications

RM EYE



Private Cloud (Customer Cloud),
Rugged Monitoring Cloud

IEC 60870-104

IEC 61850

FTP/SFTP

- XML, JSON

- CSV, COMTRADE



Data Collection

ODBC

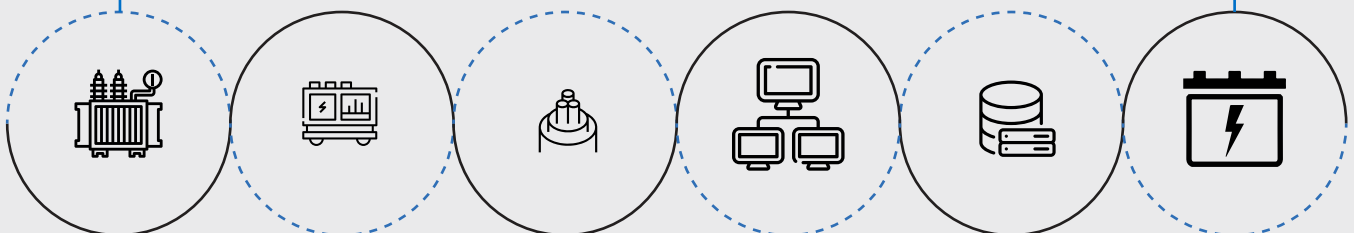
MODBUS

DNP 3.0

HTTPS

MQTT

Asset Data



Transformer
Monitoring
System

Switchgear
Monitoring
System

Power Cable
Monitoring
System

- Offline Test Results
- Inspection Records
- Name Plate

- Historian
- CMMS
- SCADA/ DCS

Power Electronics
(Battery, UPS,
VFD, Relay)

One Solution for Multi-Site Multi Asset Monitoring

Manage different industrial assets on one platform without human intervention

Features

- **Advanced and Exceptional Reporting** Technology with automated alerts
- **Modern remote monitoring solutions** provide valuable insights to Multiple Assets at Multiple Sites on real-time
- **Robust asset health monitoring** with analysis and recommendations support asset effectiveness in addition to maximizing equipment uptime
- **Establish a real time and consistent monitoring** by getting the right information into right hands
- **An efficient, reliable partial discharge monitoring** for all the assets
- **A detailed comprehensive DGA Analysis**
- **Lifetime Consumption details.**
- **Built on well-established remote and cloud-based monitoring technology**
- **Simple user-friendly interface** providing fast access to all the features and commands
- **Quick and easy 1 step configuration setup**
- **Encompasses a secure access to data and configuration**
- **Advanced asset algorithms** based on standard ones with new ideas
- **Systematic fleet management and analysis**
- **Extended multilingual support** to handle product inquires or troubleshoot problems proactively
- **Up System Level Reporting**
- **Industrial IoT**

Features Specific to PD Monitoring

- Partial Discharge monitoring and Analysis
- PRPD : Phase resolve partial discharge
- Partial Discharge Amplitude and Discharge rate trend analysis
- Partial Discharge Fault localization
- Artificial Intelligence based PD fault Identification
- Realtime PD Alarm system
- Get Alarm notifications for individual bushing parameters over Email, sms and push notifications
- Analytics on Online, and offline partial discharge test data

Why Customers Choose Us?

RM solution, the trusted monitoring solution for over 10000+ assets across 50+ countries. We are a leading High Value Electrical Asset Monitoring Company integrating fibre optic technology to the assets.



Attention to Details

It's our attention to the small stuff, scheduling of timelines and keen project management that makes us stand out from the rest.



A plan for Success

Our Customers are well satisfied with the advisory services that we offer to help them with best in class technological performance and a long durable life.



Experts only

We bring in our diversified experienced team with over 100+ years of experience in Asset Monitoring



Meeting Deadlines

Work with us, and you'll work with seasoned professionals – vigilant of deadlines, and committed to exceeding client expectations.



Money Matters

We protect you against currency fluctuation with competitive and fair market prices



Rugged Monitoring Services

Rugged Monitoring provides customization of sensors, monitors & software. In addition we offer on-site commissioning services, maintenance contracts and technical support to all customers worldwide.

About Rugged Monitoring

Industry's leading team of asset condition monitoring experts with 100+ years of combined experience committed to delivering customizable solutions for challenging applications. We offer a range of reliable, high performance, customizable sensors and monitoring solutions that are immune to external influence.

Certification



ISO 9001



ISO 14001



ISO 45001/
OHSAS 18000



Lloyd's
Register



ATEX
Certification

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