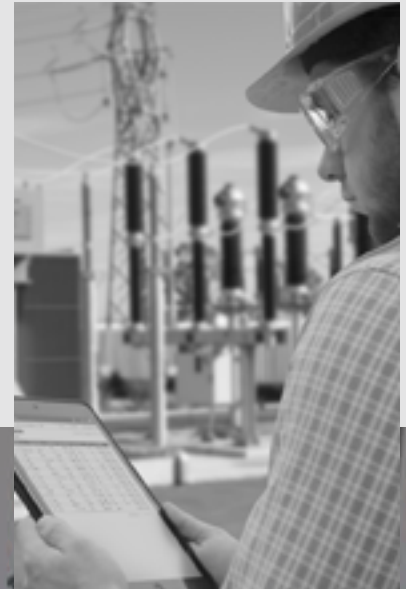


RUGGED  MONITORING

MONITORING SIMPLIFIED



Highly Efficient Partial Discharge Monitoring Solution for Switchgear

Avoid expensive downtime and catastrophic failures with
RM's Switchgear PD monitoring system

RM's PD Solution for Switchgear

Electrical switchgear plays an important role in operating the electrical power system safely with high reliability. Malfunction in switchgear operations can lead to severe failures in switchgears and its components. Partial discharge or PD is the major source for failure caused by local electrical stress in the insulation or on the surface of the electrical components. Partial discharge (PD) measurement has been used for several decades to assess the condition of high voltage (HV) and medium voltage (MV) switchgear.

The failures may lead to unplanned outages, as well as cost and resources. Monitoring and tracking their performance are important for an efficient and increased asset lifetime. In traditional monitoring method of switchgears, frequent inspection and shutdown are required, which is again associated with huge manpower and time.

Partial discharge monitoring in electrical switchgears measures electromagnetic waves propagated at various frequencies ranging from High Frequency (HF) to Ultra High Frequency (UHF) range. The monitoring system generates alarms and can be interrogated remotely at any time to detect and eliminate emerging faults.



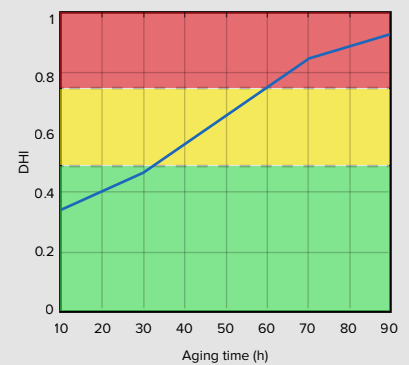
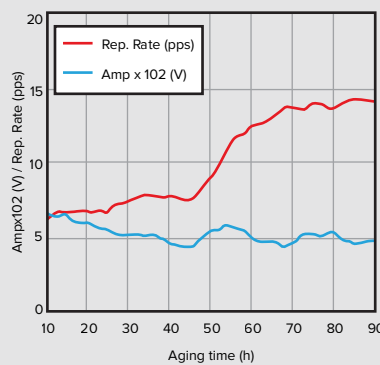
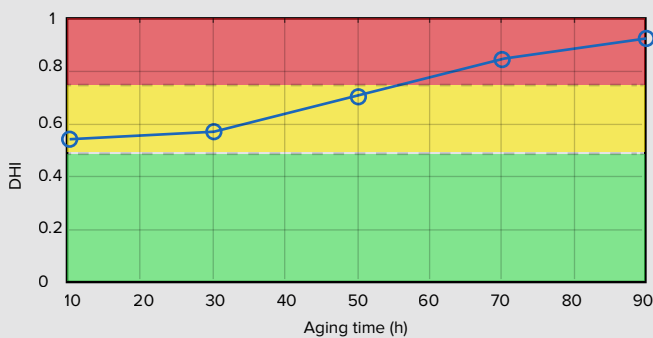
We at Rugged Monitoring offer an advanced comprehensive condition monitoring solution for various switchgear system from; sensor, monitor to software which can monitor and analyze the performance of switchgear equipment. Depending on specific operating requirements and application, we customize our condition monitoring solutions for,



The PD detector/monitoring system can be connected to any type of sensor, from HF to UHF sensors. Depending on the best techno-commercial match, single-phase or multi-phase detectors can be installed.

The major concern is to extract useful diagnostic data from noisy measurements (this holds especially for PD) and get global health condition/residual life algorithms. For noise recognition, while techniques are available for filtering out noise under AC sinusoidal voltage, that are based on the capability to distinguish noise from PD pulses in measurement records and, particularly, resorting to phase-resolved PD (PRPD) patterns, the same does not apply for DC and pulse-modulated (PWM) voltage waveforms.

RM's innovative approach allows noise to be rejected and PD identified under DC or power electronic waveforms. Then the identification of the type of source generating PD must be carried out, being related to PD harmfulness and, thus, maintenance action. These procedures come automatic and unsupervised, to have fast and low-cost interaction with asset and maintenance managers. This has to be coupled with tools for web data transfer, where e.g., cloud media may offer residual life and failure probability calculation. Parameters, Voltage range.



Rugged Monitoring offers an advanced comprehensive condition monitoring solution for various switchgears.

The solution includes from precisely designed sensors, monitors to software which displays the values in graphical or numerical form as per the requirement. The monitoring system generates alarms and can be interrogated remotely at any time to detect and eliminate emerging faults.

Features

- Wide measurements range
- Ensures very sensitive PD measurements in the UHF range from 100 to 2000 MHz
- Flexible, quick measurement and processing analytics based on AI/ML.
- Highly sensitive and Accurate PD Diagnosis
- Integration with Enterprise Monitoring
- Enhanced noise gating features for elimination of interference

Benefits

- Available in both continuous and periodic options
- Can be used for new or retrofit systems
- Can detect dangerous PD activity
- Enhanced system reliability and reduced risks
- Rigorously tested rugged sensors
- Easy fault categorization and noise elimination

System Architecture for GIS



Partial Discharge Monitoring



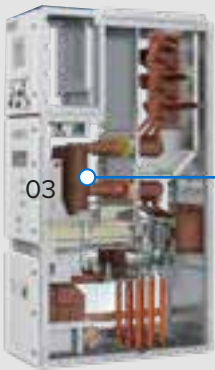
Partial Discharge Monitoring

- PD Detection
- Fault Characterization
- PD Localization
- PD Severity Analysis
- PD Test and Measurement Services



Monitoring Software
RM EYE

System Architecture for MV Panel



Partial Discharge Monitoring



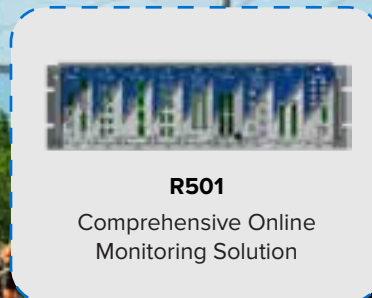
Partial Discharge Monitoring

- PD Detection
- Fault Characterization
- PD Localization
- PD Severity Analysis
- PD Test and Measurement Services



Monitoring Software
RM EYE

System Architecture for AIS



Monitoring Software
RM EYE

Partial Discharge Monitoring

- PD Detection
- PD Localization
- PD Severity Analysis
- PD Test and Measurement Services

HSENS-H

Provides automated continuous partial discharge monitoring



- High Frequency Current Transformer
- Rugged, reliable design
- IP65 rated
- Split core design for easy installation
- Transient overvoltage protection integrated inside Sensor
- Different options of internal diameter dimensions
- RG223 high noise immunity cable
- TNC connector for reliable connection

Hsens-H is a High Frequency Current Transformer sensor. It is a split core and an inductive type of sensor that can be clamped around the earth (ground) shield to measure PD signals. Based on power cable termination condition, an HFCT sensor can also be clamped around cable insulation without earth shield or around the cable with earth shield looped back for the purpose of PD measurements. For HFCT clamped around the cable insulation without earth shield or cable with earth shield looped back, high current variant can be used for rated load current of cable.

Sensor is IP65 rated and features integrated transient overvoltage protection inside sensor. Transient protection will help in minimizing transients that can be expected during PD monitoring

Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- Cables, joints and terminations
- Rotating machines
- AIS/GIS switchgear
- Power transformers

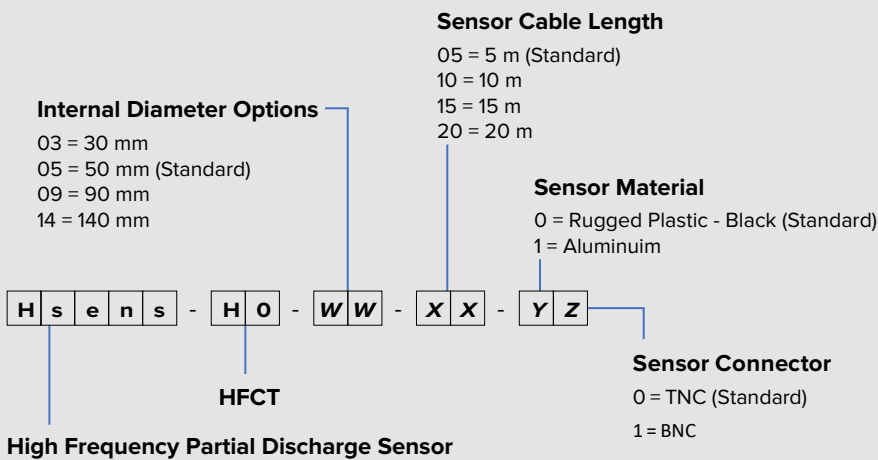
Benefits

- Transient overvoltage protected
- Noise immunity
- IP65 rated
- Rigorously tested
- Split core for easy installation
- Stainless steel robust latch to keep split core closed
- Customizable according to customer specific applications
- Suitable for Online or Online PD measurements

Technical Specifications

| | | |
|---------------------|----------------------------|---|
| SENSOR | Type | Split core |
| | Frequency Response (-6dB): | 100 kHz - 25 MHz |
| | Material | Rugged Plastic (Black), other options available |
| | Current Ratings | 50A, other options available |
| MODELS | HFCT-3 | 220mm (L) x 118mm (W) x 33mm (H) (ID = 30mm) |
| | HFCT-5 | 220mm (L) x 163mm (W) x 28mm (H) (ID = 50mm) |
| | HFCT-9 | 265mm (L) x 200mm (W) x 38mm (H) (ID = 90mm) |
| | HFCT-14 | 330mm (L) x 275mm (W) x 38mm (H) (ID = 140mm) |
| SIGNAL CABLE | Connectors | RG223 |
| | Type | Cable Gland (Sensor End) and TNC connector (Monitor End), other options available |
| | Cable Length | 5m, other options available |
| IP RATING | IP65 | |
| TEMPERATURE | Ambient | -30 °C – 70 °C |
| | Storage | -30 °C – 70 °C |
| | Customization | For any different requirement, please consult |

Ordering Code



HSENS-T

Sensors for Gas Insulated Switchgear



- **Transient Earth Voltage Sensor**
- **Rugged, compact design**
- **Strong magnets to attach sensor**
- **IP65 rated**
- **Transient overvoltage protection**
- **integrated inside Sensor**
- **RG223 high noise immunity cable**
- **TNC connector for reliable connection**

Hsens-T is a Transient Earth Voltage Sensor that can be used to detect external partial discharges inside metal clad switchgear or power cables termination box of rotating machines and power transformers. An application of HFCT along with TEV can help in PD diagnostic and confirmation of internal versus external PD.

Sensor is IP65 rated and features integrated transient overvoltage protection inside sensor. Transient protection will help in minimizing transients that can be expected during PD monitoring.

TEV sensor has strong magnets that help it to attach to the walls of metal clad switchgear. TEV forms a capacitive coupling with grounded metal switchgear to detect transients of external PD happening inside metal clad switchgear at termination

Rugged design, IP65 rated, overvoltage protected, PD measurement at Cables (and their accessories), Switchgears, Rotating Machines and Power Transformers

Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- Cables, joints and terminations
- Rotating machines
- AIS/GIS switchgear
- Power transformers

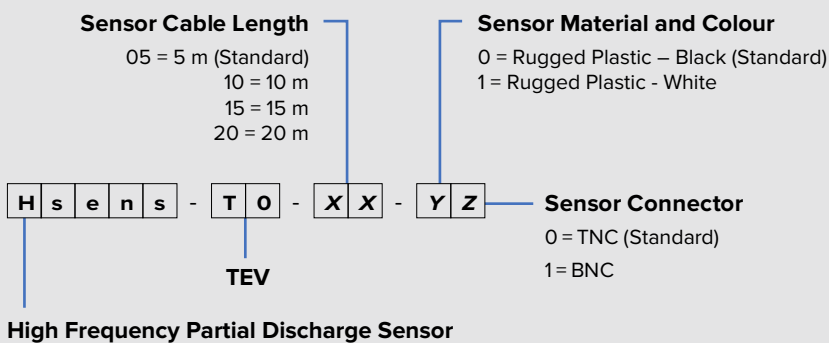
Benefits

- Rugged sensors
- Noise immunity
- IP65 rated
- Rigorously tested
- Transient overvoltage protected
- Strong magnets to help sensor attach
- Customizable according to customer specific applications
- Suitable for Online or Online PD measurements

Technical Specifications

| | | |
|----------------------|---|---|
| SENSOR | Type | Integrated magnets help it to attach to metal clad switchgear |
| | Frequency Response (-6dB): | 1 MHz - 100 MHz |
| | Material | Rugged Plastic (Black), other options available |
| SIGNAL CABLE | Type | RG223 |
| | Connectors | Cable Gland (Sensor End) and TNC connector (Monitor End), other options available |
| | Cable Length | 5m as standard, other options available |
| IP RATING | IP65 | |
| TEMPERATURE | Ambient | -30 °C – 70 °C |
| | Storage | -40 °C – 85 °C |
| DIMENSIONS | 70mm (L) x 70mm (W) x 33 mm (H) | |
| CUSTOMIZATION | For any different requirement, please consult | |

Ordering Code



ASENS

Modular design for partial discharge monitoring in electrical assets



Partial Discharge activity is an indicator of increasing defects in insulation. PD is a discharge or spark that partially bridges the gap between conducting electrodes. The discharge may be in oil filled equipment or in a gas filled environment.

RM's ASENS with acquisition system is specifically designed to detect partial discharge using portable measurement/ continuous monitoring methods and is also capable to locate PD position by studying the PD amplitude and phase delay of the acoustic waves propagating through the discharge activity. The location of the PD can be estimated by measuring the time of arrival of the acoustic wave, and PD localization is ascertained by using sensors at multiple locations of assets. This makes acoustic emission sensing a preferable measuring tool in real time PD signal detection.

RM's advanced acoustic measurement has an additional advantage of possessing better- signal to noise ratio for real-time applications. To avoid the damage to high voltage equipment, detecting and locating PD is crucial both in industries and utilities. Acoustic waves are measured by ASENS, and the AE System will identify the real PD and their location based on ML/Time Difference of Arrival (TDOA) algorithm with the highest percentage of location accuracy to fault location.

The highly sensitive ASENS can be used for measurement of PD on Transformer Tanks, GIS, Reactors, Large Pressure Vessels, and for Leak Detection. Depending on the application and environment the sensors are available with three different resonant frequencies of 40 KHz, 80 KHz and 150 KHz.

Benefits

- PD localization with multiple sensors
- High noise immunity for online partial discharge detection
- Integrated amplifier for better SNR
- Significant time saving through fast localization of the fault
- Quick and easy application
- Good return on investment

Features

- Built in pre-amplifier
- Narrow band resonant sensor with highest signal to noise ratio
- Simple and rugged sensor
- Easy to use, light weight
- Plug and play connections
- Highly sensitive

Applications



Oil Filled Reactors



Oil Filled Transformers



Gas Insulated Switchgears
and Gas Insulated Lines

Technical Specifications

| Specifications | Gas Insulated Switchgear (GIS) | Oil Filled Transformer/ Reactors | Oil Filled Transformers |
|-----------------------------------|--------------------------------|----------------------------------|-------------------------|
| Resonant Frequency | 50 KHz | 80 KHz | 150 KHz |
| Frequency Range | 15 KHz - 70 KHz | 20 KHz - 180 KHz | 60 KHz - 400 KHz |
| Sensitivity Peak | >115 dB | >70 dB | >115 dB |
| Built in Pre-amplifier | 40 dB 28 V | - | 40 dB 28 V |
| Size mm | Φ30 x 57 | Φ19 x 19.5 | Φ30 x 36.5 |
| Applicable Temperature °C | -20 to 50°C | -20 to 80°C | -20 to 50°C |
| Housing Material | SUS-504 | SUS-304 | SUS-304 |
| Receiving Surface Material | Ceramic | Ceramic | Ceramic |
| Protection Grade | IP62 | IP62 | IP62 |
| Connector Type | BNC | M5 | BNC |
| Connector Position | Side Face | Side Face | Side Face |
| Product Features | Built in Pre-Amplifier | Low Frequency | Built in Pre-Amplifier |

HSENS-T

Sensors for Gas Insulated Switchgear



- **Transient Earth Voltage Sensor**
- **Rugged, compact design**
- **Strong magnets to attach sensor**
- **IP65 rated**
- **Transient overvoltage protection**
- **integrated inside Sensor**
- **RG223 high noise immunity cable**
- **TNC connector for reliable connection**

Hsens-T is a Transient Earth Voltage Sensor that can be used to detect external partial discharges inside metal clad switchgear or power cables termination box of rotating machines and power transformers. An application of HFCT along with TEV can help in PD diagnostic and confirmation of internal versus external PD.

Sensor is IP65 rated and features integrated transient overvoltage protection inside sensor. Transient protection will help in minimizing transients that can be expected during PD monitoring.

TEV sensor has strong magnets that help it to attach to the walls of metal clad switchgear. TEV forms a capacitive coupling with grounded metal switchgear to detect transients of external PD happening inside metal clad switchgear at termination

Rugged design, IP65 rated, overvoltage protected, PD measurement at Cables (and their accessories), Switchgears, Rotating Machines and Power Transformers

Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- Cables, joints and terminations
- Rotating machines
- AIS/GIS switchgear
- Power transformers

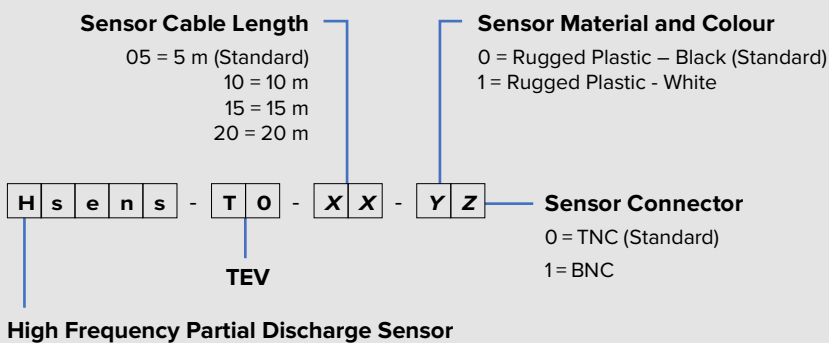
Benefits

- Rugged sensors
- Noise immunity
- IP65 rated
- Rigorously tested
- Transient overvoltage protected
- Strong magnets to help sensor attach
- Customizable according to customer specific applications
- Suitable for Online or Online PD measurements

Technical Specifications

| | | |
|----------------------|---|---|
| SENSOR | Type | Integrated magnets help it to attach to metal clad switchgear |
| | Frequency Response (-6dB): | 1 MHz - 100 MHz |
| | Material | Rugged Plastic (Black), other options available |
| SIGNAL CABLE | Type | RG223 |
| | Connectors | Cable Gland (Sensor End) and TNC connector (Monitor End), other options available |
| | Cable Length | 5m as standard, other options available |
| IP RATING | IP65 | |
| TEMPERATURE | Ambient | -30 °C – 70 °C |
| | Storage | -40 °C – 85 °C |
| DIMENSIONS | 70mm (L) x 70mm (W) x 33 mm (H) | |
| CUSTOMIZATION | For any different requirement, please consult | |

Ordering Code



HSENS-H

Provides automated continuous partial discharge monitoring



- High Frequency Current Transformer
- Rugged, reliable design
- IP65 rated
- Split core design for easy installation
- Transient overvoltage protection integrated inside Sensor
- Different options of internal diameter dimensions
- RG223 high noise immunity cable
- TNC connector for reliable connection

Hsens-H is a High Frequency Current Transformer sensor. It is a split core and an inductive type of sensor that can be clamped around the earth (ground) shield to measure PD signals. Based on power cable termination condition, an HFCT sensor can also be clamped around cable insulation without earth shield or around the cable with earth shield looped back for the purpose of PD measurements. For HFCT clamped around the cable insulation without earth shield or cable with earth shield looped back, high current variant can be used for rated load current of cable.

Sensor is IP65 rated and features integrated transient overvoltage protection inside sensor. Transient protection will help in minimizing transients that can be expected during PD monitoring

Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- Cables, joints and terminations
- Rotating machines
- AIS/GIS switchgear
- Power transformers

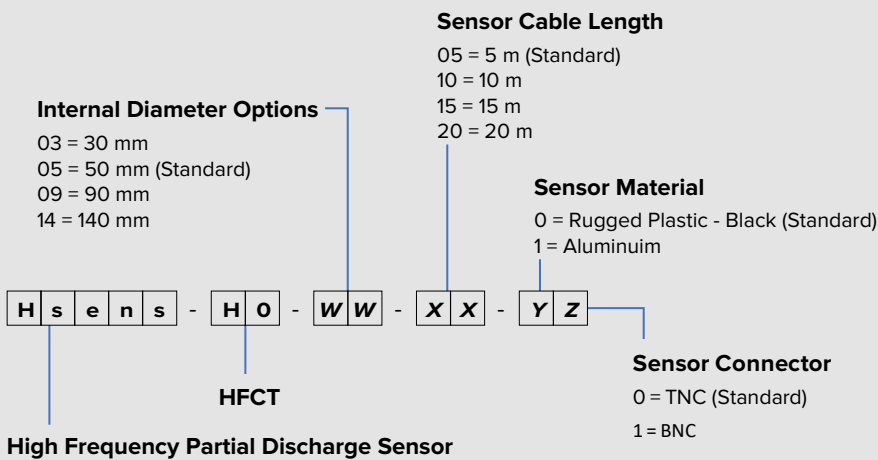
Benefits

- Transient overvoltage protected
- Noise immunity
- IP65 rated
- Rigorously tested
- Split core for easy installation
- Stainless steel robust latch to keep split core closed
- Customizable according to customer specific applications
- Suitable for Online or Online PD measurements

Technical Specifications

| | | |
|---------------------|----------------------------|---|
| SENSOR | Type | Split core |
| | Frequency Response (-6dB): | 100 kHz - 25 MHz |
| | Material | Rugged Plastic (Black), other options available |
| | Current Ratings | 50A, other options available |
| MODELS | HFCT-3 | 220mm (L) x 118mm (W) x 33mm (H) (ID = 30mm) |
| | HFCT-5 | 220mm (L) x 163mm (W) x 28mm (H) (ID = 50mm) |
| | HFCT-9 | 265mm (L) x 200mm (W) x 38mm (H) (ID = 90mm) |
| | HFCT-14 | 330mm (L) x 275mm (W) x 38mm (H) (ID = 140mm) |
| SIGNAL CABLE | Connectors | RG223 |
| | Type | Cable Gland (Sensor End) and TNC connector (Monitor End), other options available |
| | Cable Length | 5m, other options available |
| IP RATING | IP65 | |
| TEMPERATURE | Ambient | -30 °C – 70 °C |
| | Storage | -30 °C – 70 °C |
| | Customization | For any different requirement, please consult |

Ordering Code



USENS-BT BUSHING PARTIAL DISCHARGE SENSOR



- **Bushing PD sensor with wider frequency**
- **Response range**
- **HF and UHF frequency response**
- **Rugged, reliable design**
- **IP65 rated**
- **Transient overvoltage protection integrated**
- **Easy to Install**
- **Different options of internal diameter dimensions**

Usens-BT is suitable for High Frequency (HF) and Ultra High Frequency (UHF) PD signals. The Sensor is designed to be installed on transformer bushing trunk.

Sensor is IP65 rated and features integrated transient overvoltage protection inside sensor. Transient protection will help in minimizing transients that can be expected during PD monitoring.

Rugged and reliable design, IP65 rated, overvoltage protected, PD measurement at Transformer Bushings.

Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring

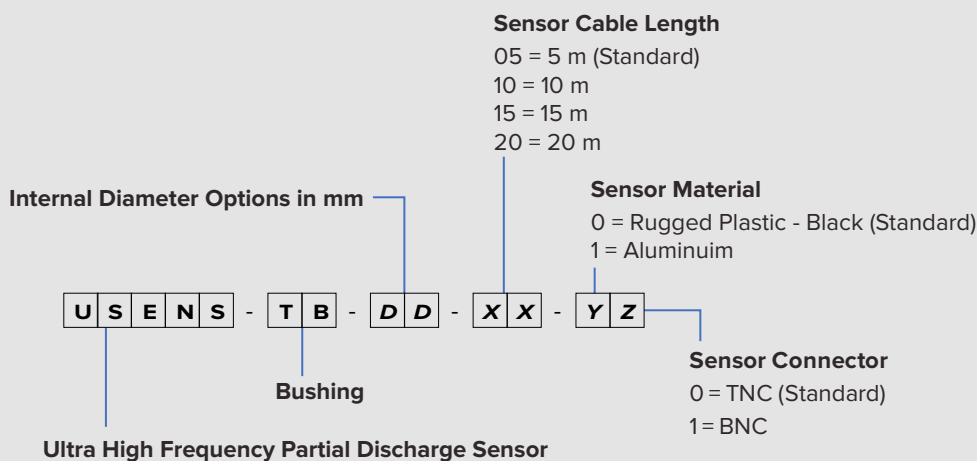
Benefits

- Transient overvoltage protected
- Noise immunity
- IP65 rated
- Rigorously tested

Technical Specifications

| | |
|---------------------------------|---|
| Frequency Response | 30MHz - 1500MHz |
| Sensitivity | up to -70 dBm |
| Withstand Voltage | up to 1000 kV |
| Output | N-Type connector; Customized option available |
| Connector Circuit Impedance | 50 Ω |
| Vibration Testing | Suitable for installation on Transformer Bushings |
| Ingress Protection (IP) | IP-65 |
| Ambient (Operating Temperature) | -60 °C to +100 °C |
| Storage Temperature | -60 °C to +100 °C |
| Operating Humidity | 95% humidity at 50 °C |
| Dimensions | Customized as per Bushing Size |
| Weight | Customized as per Bushing Size |
| Install Position | Around Bushing Trunk |
| Signal Cable | Very low attenuation UHF (Coax) cable |

Ordering Code



USENS-C PARTIAL DISCHARGE SENSOR



- Rugged, reliable design
- IP65 rated
- Transient overvoltage protection
- Easy to Install
- Different options of internal diameter dimensions

USENS-C is Ultra High Frequency (UHF) PD sensor for Power cables, Switchgears. The sensor can be installed directly on the power cable and switchgears.

The IP65 rated Sensor has integrated transient overvoltage protection inside. Transient protection will help in minimizing transients that can be expected during PD monitoring.

Ultra High Frequency PD sensors for Cables and switchgears

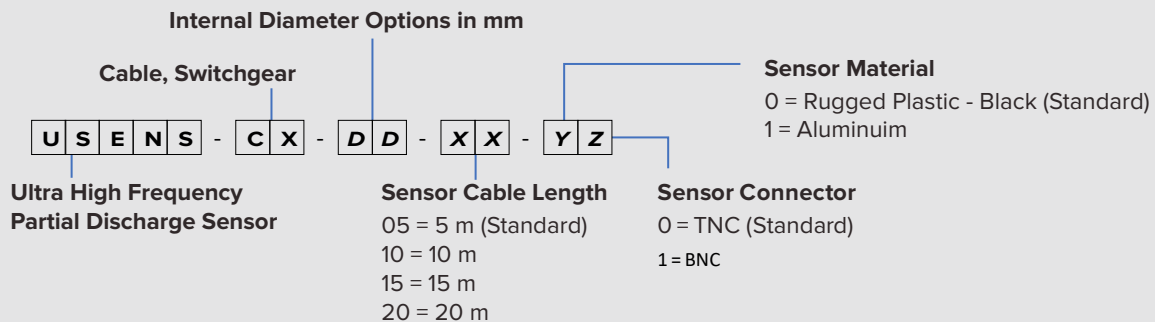
Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring

Benefits

- Transient overvoltage protected
- Noise immunity
- IP65 rated
- Rigorously tested

Ordering Code



Technical Specifications

| | |
|---------------------------------|--|
| Frequency Response | 30MHz - 1GHz |
| Sensitivity | up to -70 dBm |
| Withstand Voltage | up to 1500 kV |
| Output | N-Type connector; Customized option available |
| Connector Circuit Impedance | 50Ω |
| Vibration Testing | Suitable for HV - GIS and Transformer applications |
| Ingress Protection (IP) | IP-65 |
| Ambient (Operating Temperature) | -60 °C to +100 °C |
| Storage Temperature | -60 °C to +100 °C |
| Operating Humidity | 95% humidity at 50 °C |
| Dimensions | Customized as per customer requirements |
| Weight | Customized as per customer requirements |
| Install Position | Power Cables, Terminations, Switchgears, Rotating Machines |
| Signal Cable | Very low attenuation UHF (Coax) cable |

SYNC-EF Synchronization Sensor



Rugged design, designed for reliability, synchronization.

- Rugged, compact design
- Safe and reliable operation
- Captures the electric field of high voltage asset near termination
- Used when acquisition system (PD Monitor) is energized with external supply which is not in synchronization with device under test
- No outage required for installation
- IP65 rated

A synchronization signal is required during Partial Discharge measurement in power cables and other high voltage assets. SYNC-EF utilises the benefits of Electric Field to capture the field generated AC voltage in a power cable or low voltage cables. This sensor is well suited to the application where AC mains synchronised with cable under test is not available and PD Monitor is being powered by using external AC generator or UPS.

Applications

- Online periodic partial discharge monitoring
- Synchronization of PD measurements
- Multiple point PD monitoring
- Cables and their accessories
- Rotating machines
- AIS/GIS switchgear/switchboards
- Power transformers

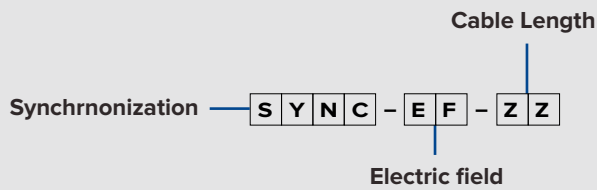
Benefits

- No direct connection to any live conductor
- Can be used temporarily or mounted permanently
- Enhanced noise rejection
- Rugged and reliable design

Technical Specifications

| | | |
|---------------------------|-------------|--|
| SENSOR | Technology | Electric Field |
| | Frequency | 50 Hz / 60 Hz |
| | Material | Anodized Aluminum |
| | Cable | 10m shielded cable from Sensor to PD Monitor |
| | Output | Up to 10m shielded cable with 8 pin connector on other end Compatible with Rugged Monitoring PD Monitors Compatible |
| IP RATING | IP65 | |
| TEMPERATURE RATING | Ambient | -25C - 70C |
| | Storage | -40C - 85C |
| POWER RATING | Input Power | 1W |

Ordering Code



SYNC-MF Synchronization Sensor



Rugged design, designed for reliability, Synchronzation.

A synchronzation signal is required during Partial Discharge measurement in power cables and other high voltage assets. SYNC-MF utilises the benefits of Rogowski Coil technology to capture the magnetic field generated by load or circulating currents in a power cable or ground loop. This sensor is well suited to the application where PD monitor is powered up using external generator, renewable energy or UPS and is not synchronised with asset under test.

Applications

- Online periodic partial discharge monitoring
- Synchronzation of PD measurements
- Multiple point PD monitoring
- Cables and their accessories
- Rotating machines
- AIS/GIS switchgear/switchboards
- Power transformers

Features

- Rugged, compact design
- Safe and reliable operation
- Captures the magnetic field of conductor load current or sheath circulating current to generate synchronzation pulses for PD Monitor
- Used when acquisition system (PD Monitor) is energized with external supply which is not in synchronzation with device under test
- No outage required for installation
- IP65 rated

Benefits

- No direct connection to any live conductor
- Can be used temporarily or mounted permanently
- Enhanced noise rejection
- Rugged and reliable design
- Software packed with useful tools for reliable and interactive
- PD measurements
- Robust recording and analytics
- Customizable according to customer specific applications
- Suitable for Online or Offline PD measurements

Technical Specifications

| | | |
|---------------------------|-------------------|--|
| SENSOR | Technology | Rogowski Coil |
| | Frequency | 10 Hz - 1 MHz |
| | Current | 1A - 2000A |
| | Material | Thermoplastic Rubber |
| | Dimensions Sensor | 150mm Internal Diameter |
| | Dimensions Cable | 10m shielded cable from Sensor to Junction Box |
| TERMINATION | Connectors | Cable Glands |
| | Material | Anodized Aluminum |
| | Output | 1m shielded cable with 8 pin connector on other end Compatible with Rugged Monitoring PD Montors 3.3V synchronization pulses for load or circulating current of 1A and above |
| IP RATING | IP65 | |
| TEMPERATURE RATING | Ambient | -25C - 70C |
| | Storage | -40C - 85C |
| POWER RATING | Input Power | 1W |

Ordering Code



T501

Rugged Monitoring Temperature Monitor



Power transformers play a vital role in the electrical system and undergo critical stress most of the times. Rugged Monitoring T501 offers a whole range of functions designed to let the utilities use their transformers to the greatest limit by accurately monitoring all parameters required to calculate health index in order to maximize asset life.

Our advanced transformer monitoring system T501 is capable to perform but not limited to data logging, event recording, dynamic loading analysis, remote communication including IEC 61850. Keeping an eye on your transformer, the monitoring system can be integrated with various fiber optic sensors for direct winding temperature monitoring, H2Sens and any other third party online dissolved Gas Analyzer for measurement of gas in oil.

A monitoring system must be Robust, Reliable and Responsive, Our system meets all these features and is competent to perceive.

Options

- Integrated data logging (up to 20 parameters) and Event recording (up to 8 events)
- Ethernet port and/or fiber optic communications output (RS485)
- Weather proof enclosure with or without heater, 19" rack mount or control cabinet panel mount
- Oil RTD, Ambient RTD, clamp on CT, pressure transducer, oil level transmitter along with various other input modules.

Benefits

- Proactive Risk Monitoring
- Improved asset protection and utilization
- Simplified analysis for condition-based maintenance
- Intervention before failure and Malfunctioning
- Optimize loading and equipment life

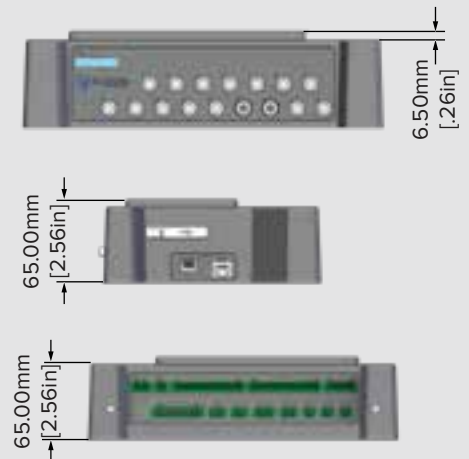
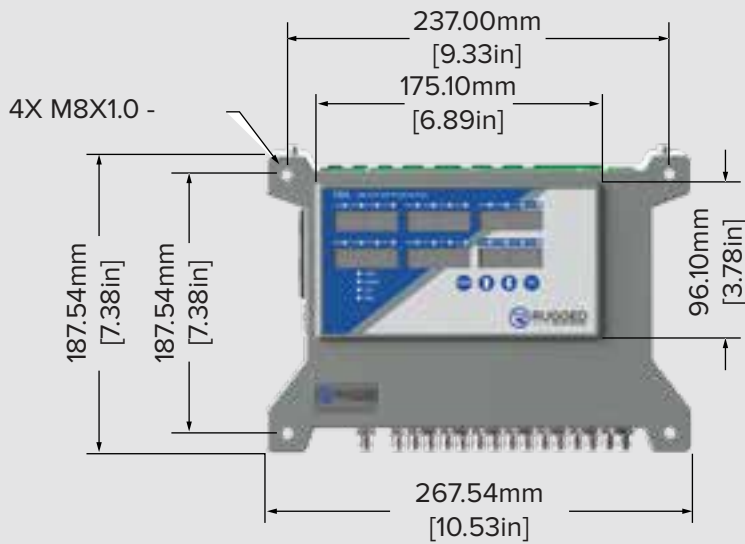
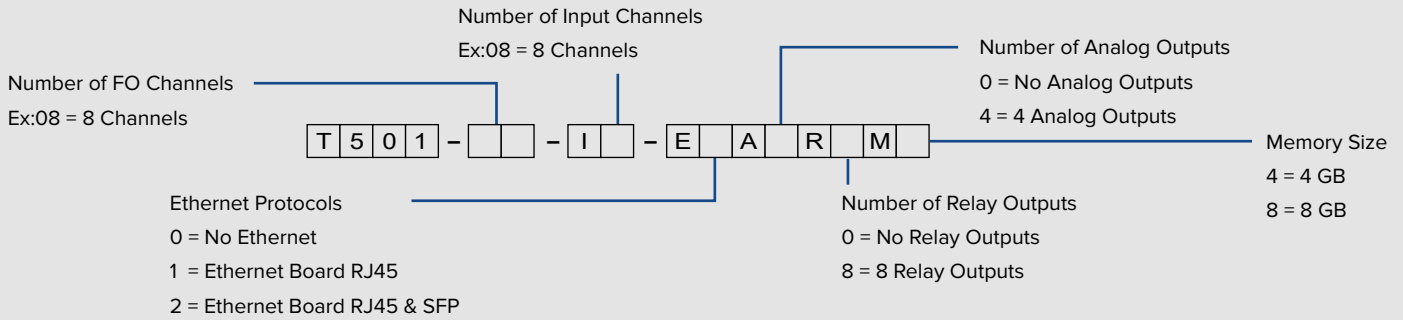
Features

- 8 relays (1 dedicated for system status) for alarm and control based on up to 8 modular inputs of various types.
- 4 magnetically isolated current loop outputs (0-1 or 4-20mA selectable)
- RS 485 remote communication, fiber optics (Rs-485) communications and Ethernet ports
- Transformer monitor for condition based, continuous online monitoring of asset health (CBM).
- Interfaces with a variety of Rugged Monitoring and third party smart sensors, as well as traditional gauges to accurately measure transformer parameters vital to asset management.
- Web based software is specifically designed for ease of unit commissioning, setup and daily use.

Applications

- Transformer monitor for condition based, continuous online monitoring of asset health (CBM).
- Interfaces with a variety of smart sensors including third party sensors, as well as traditional gauges to accurately measure transformer parameters vital to asset management.
- Specifically designed web based software for ease of unit commissioning, setup and daily use.

Ordering Code



Weight : 2 Kilograms

R501 Rack Mount Comprehensive and Customizable Transformer Monitoring Solution



Most Versatile, Multi Channel, Comprehensive Transformer Monitoring Solution

Single Monitoring Solution for: Temperature, Partial Discharge, Bushing, Load, Power, Losses and more...

Key Features

- Fully flexible rack mount and distributed architecture support
- Expandable to add different analog and (or) digital inputs and outputs
- Best in class EMI, ESD Immunity; range of communication options and protocol support
- Range of communication options for third party system integration
- Complies with the latest IEC/IEEE standards for Emission, Immunity, Safety and Environment.

Benefit

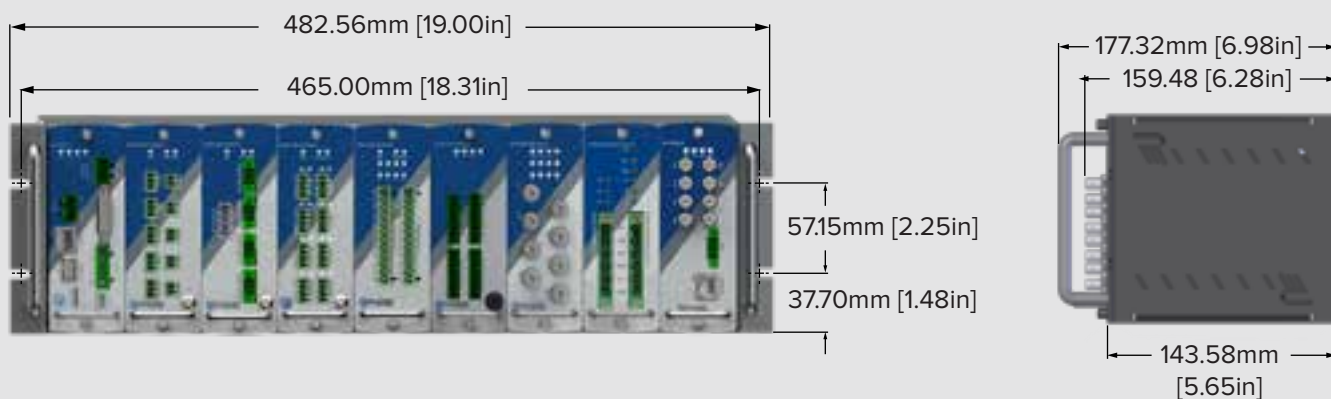
- Improved reliability
- Accurate predictive analysis
- Access asset data from anywhere
- One monitoring solution for various parameters
- Increased lifetime
- Highest Return on Investment
- Field upgradable with no device downtime



Sensors that can be connected to R501

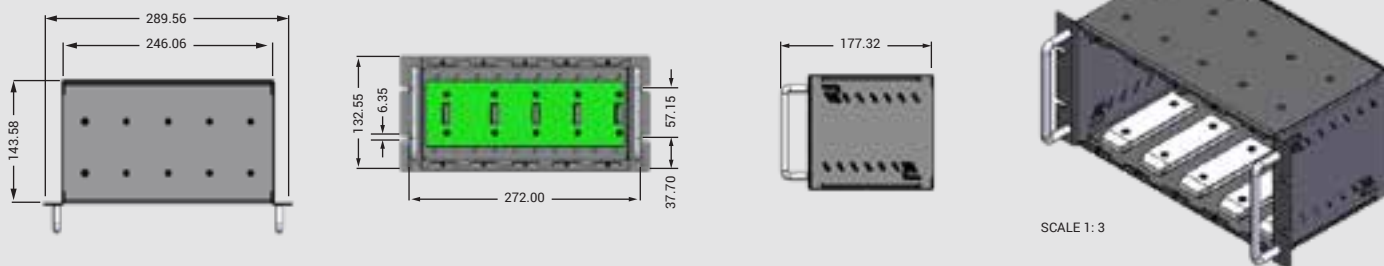
1. OTI,WTI, RTD, PRD, Breather, Buchholz Relay, LLG/OLI, Pressure Sensor etc.
2. Direct winding Hot Spot Monitor
3. Cooling System and Control Cabinet
4. Dissolved Gas Analyzer
5. Bushing Monitoring
6. Partial Discharge Monitor

Product Drawing



Weight : 5 Kilograms

Optional Smaller 3U Chassis



Ordering Code

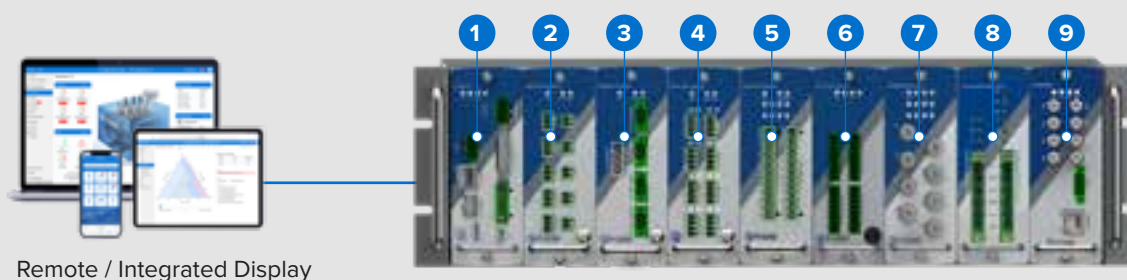
Contact our sales team for Ordering Code

**One Solution for Multi-Site
Multi Asset Monitoring**



R501 Monitoring Modules

Comprehensive Features to Meet Market Demand



Remote / Integrated Display

1. CPU/GTW Module



Option A. CPU Module

- Data Processing & Storage
- System Fault Relay
- 01 x Serial (RS485) ports
- 02 x Ethernet (PRP support)
- Health Assessment Analytics

Option B. CPU with GTW

- Main rack with CPU, Slave rack with GTW
- Provides power to all modules
- Up to 4 Racks can be daisy chained
- 01 x Serial (RS485) ports

Option C. GTW without CPU

- Main rack and slave racks with GTW
- Provides power to all modules
- Supports FOM and FLM modules
- Up to 4 Racks can be daisy chained
- 01 x Serial (RS485) ports

2. Analog Input Module



- 05 or 10 channels
- AC/DC current input
- RTD / Potentiometer
- Built-in LED indicators

3. Power Monitoring Module



- 03 Current & 03 Voltage Inputs
- Active, Reactive & Apparent Power
- Transformer Power Factor
- Through-Fault Monitoring (I2T)
- Current Signature Analysis
- OLTC Motor Torque

4. Digital Input Module



- 08 or 16 channels
- Input Voltage 75 - 250Vdc
- Threshold Voltage > 60V
- Built-in LED indicators

5. Relay Output Module



- 04 or 08 Form C Relays
- Dry contact (NO-C-NC)
- User Programmable
- Built-in LED indicators

6. Analog Output



- 08 or 16 Analog output
- DC Current Loop (4-20mA / 0-1mA)
- Dc Voltage (0-5V / 0-10V)
- User Programmable
- Built-in LED indicators

7. Fiber Optic Module



- 02, 04, 06 and 08 Channels
- GaAs (200u and 62.5u) Module
- Fluro Module
- Built-in LED indicators

8. Bushing Monitoring Module



- 03 or 06 Channels
- Leakage Current
- Tan Delta / Power Factor
- Capacitance
- Phase Voltage
- Custom Tap Adaptor for Different Bushing

9. Partial Discharge Module



HF UHF

- 04 or 08 Channels Continuous Monitoring
- Wide Range (HF and UHF)
- Sampling 100 MS/s
- Vertical Resolution 12bit
- Advanced PD Analysis
- UHF, Acoustic, Bushing PD Sensors available

Technical Specifications

| | | |
|----------------------------------|----------------------------|--|
| POWER SUPPLY | Input Power Requirement | 24 Vdc (Default), Optional 48 Vdc, 125 Vdc, and any other (upon request) |
| CPU MODULE | Data Storage Capacity | MicroSD external memory slot (up to 2 TB) |
| | Logging Rate | 1 sec interval on USB |
| | Config port | USB (to use with Rugged connect windows software) |
| SYSTEM CAPACITY | Maximum number of Channels | Expandable to 256 Channels, Daisy chain up to 32 units (with Modbus, Canbus) |
| FIBER OPTIC MODULES | # of Channels | 2, 4, 6 and 8 channels |
| | Measurement Range | -80 °C to +300 °C (cryogenic 4 °K range optional) |
| | Resolution | 0.1 °C |
| | Accuracy | ±1.0 °C (±0.2 °C in relative temperature) |
| | Scan Rate | 200 ms / channel (Optional: Faster scanning rates available) |
| ANALOG INPUT MODULE | # of Input Channels | 05 or 10 Channels |
| | AC Current Input | Clamp-on CT with different ranges: 5Amp, 10Amp, 20Amp, 100Amp and others available |
| | DC Current Input | 4 - 20 mA |
| | Temperature Input | 100 ohm platinum (Pt100) |
| | Potentiometer | up to 20,000 ohms |
| POWER MONITORING MODULE | # of Input Channels | 03 Current and 03 Voltage |
| | Current Input Range | 0 - 5A |
| | Voltage Input Range | 0 - 250V |
| | Sampling Rate | 32 KS/s |
| | Measurement Parameters | Power, Through-Fault, Motor Torque etc. |
| DIGITAL INPUT MODULE | # of Input Channels | 08 or 16 Channels |
| | Dry Contact | Resistance between the contact < 100 Ω |
| | Powered Contact | 75 - 250Vdc |
| ANALOG OUTPUT MODULE | # of Input Channels | 08 or 16 Channels |
| | Output format | 4-20 mA or 0-5V or 0-10V Configurable for any measured / calculated value |
| BUSHING MONITORING MODULE | # of Input Channels | 03 or 06 Channels |
| | Leakage Current Range | 1mA to 200mA |
| | Monitoring Parameters | Tan Delta (PF), Capacitance, Phase Voltage |
| PARTIAL DISCHARGE MODULE | # of Input Channels | 04 or 08 Channels |
| | Acquisition Bandwidth | HPM: 0.01 - 100Mhz UPM: 100 MHz - 2 GHz |
| | Monitoring Parameters | PD Amplitude, Discharge Rate and PRPD |
| OUTPUT RELAY MODULE | # of Output Channels | 04 or 08 Form C relays |

HPM601-C High Frequency Partial Discharge Monitor



"Rugged Monitoring High Frequency Partial Discharge (PD) monitoring solution is a platform that enables HV asset owners to keep monitoring PD round the clock due to insulation defects.

System can also be used to perform online PD measurement during HV AC testing. Solution can communicate with its user over IEC61850 or using Rugged Monitoring proprietary Rugged Enterprise software suite. Shielded monitor with small dimensions make it easy to get installed and start.

Enhanced and newly added hardware and software features ensure highly sensitive multi-channel PD measurements for reliable, industry-standard PD testing on a variety of electrical equipment and components. System simple design enables it to get interfaced to third party protocols. Thousands of pulses per second can be transferred to the Server enabling the user to generate fast and reliable Phase Resolved Partial Discharge (PRPD) graphs. PRPD graphs help the user to identify type of PD in HV assets. Monitoring solution is packed with all necessary tools that help to perform effective PD measurements. Integrated variable amplifiers and on-board noise suppression features help during onsite testing even in case of presence of huge noise.

Rugged Monitoring's team of experienced condition monitoring specialists provide innovative testing, Diagnosis and Customized Monitoring Solutions.

Applications

- Online PD measurement during HV AC testing (Resonant test set, VLF, OWTS)
- Multiple point PD monitoring
- Cables and their accessories
- Rotating machines
- AIS/GIS switchgear/switchboards
- Power transformers

Features

- Rugged, simple design
- 4 synchronous input channels allow 3 phase synchronous measurement with additional external synchronous channel to enable the use of other type of sensor
- Rugged Enterprise, a complete software suite for analyzing the data and generating reports
- Indicator LEDs to alert in case of PD alarm or warning
- Gigabit ethernet copper Cat5e or multimode fiber communication link between monitor and server

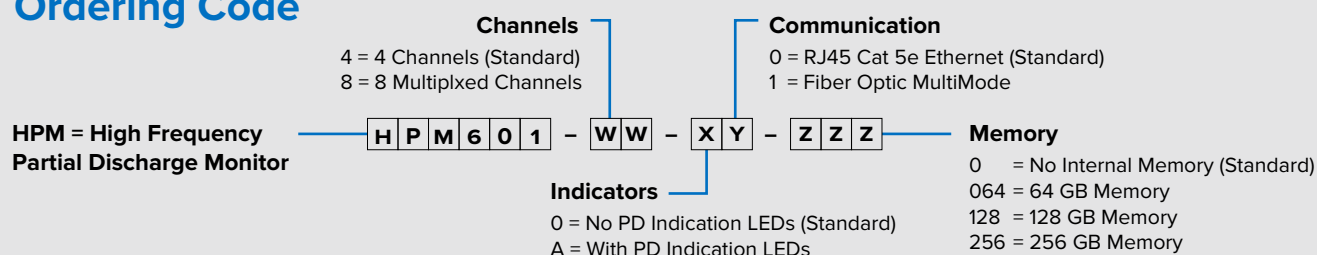
Benefits

- Highly Efficient sensors, monitor and server
- Gigabit ethernet communication between monitor and Server
- Robust design parameters
- Each device is tested rigorously
- Software packed with useful tools for reliable and interactive PD measurements
- Robust recording and analytics
- Customizable according to customer specific applications
- Suitable for Online PD measurements

Technical Specifications

| | | |
|-------------------------------|---|--|
| MONITOR | Channels | 4 simultaneous channels 8 & 12 channel options available with multiplexer |
| | Sampling Rate | 250 MS/s |
| | Bandwidth | 0.01-100 MHz |
| | Amplification | up to 28 dB, software selectable |
| | Filtering | Software configurable band pass filters |
| MEMORY | SSD | upto 256 GB (Optional) |
| DATA TRANSFER | High Resolution (Pulses data on simultaneous channels) | 10,000 pulses per second for 4 simultaneous channels |
| | Low Resolution (Pulse amplitude on simultaneous channels) | 50,000 pulses per second for 4 simultaneous channels |
| | Transfer Rate | 400 Mbps (depending on operating system and connection) |
| REMOTE COMMUNICATION | IEC61850 (Optional) | |
| | Proprietary Rugged Connect for remote communication | |
| | Customized third party interface on request | |
| COMMUNICATION LINK | Type | Ethernet Fiber / Copper |
| | Cable Multimode | Fiber / Cat5e |
| | IP Rating | IP65 |
| TEMPERATURE RATING | Ambient | -30°C - 60°C |
| | Storage | -40°C - 85°C |
| POWER RATING | Input Power | 35 W max |
| SYNCHRONISATION INPUTS | 2 Inputs, software | Internal |
| | Selectable | External |
| DIMENSIONS | 260mm(L)x310mm(W)x120mm(H) | |
| SOFTWARE | Rugged Enterprise | |

Ordering Code



HPM601-P High Frequency Partial Discharge Monitor



Rugged design, designed for reliability, 3 Phase synchronous partial discharge monitoring equipment.

Rugged Monitoring High Frequency Partial Discharge (PD) Portable Monitor is a compact and rugged device enabling the user to perform periodic offline and online PD measurements in power cables and accessories, switchgears and rotating machines. Compact size and rugged enclosure and electronics make it portable, easy to carry and enabling the user to perform PD measurements with less hassle.

Monitor is capable of transferring the data directly to Rugged Enterprise 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. Integrated variable amplifiers and on board denoising features help during onsite testing in case of presence of huge noise.

There is a dedicated team for application specific customizations for sensors, monitor configuration and software integration to simplify data collection of testing and monitoring applications.

Applications

- Online periodic partial discharge monitoring
- Offline PD measurement during HV AC testing (Resonant test set, VLF, OWTS)
- Multiple point PD monitoring
- Cables and their accessories
- Rotating machines
- AIS/GIS switchgear/switchboards
- Power transformers

Features

- Rugged, compact design
- 4 synchronous input channels allow 3 phase synchronous measurement with additional external synchronous channel to enable the use of other type of sensor
- An interactive and comprehensive software Rugged Enterprise for reliable PD measurement and analysis
- Gigabit ethernet copper Cat5e communication link between monitor and laptop
- Optional rugged laptop with installed software suite IP65 rated

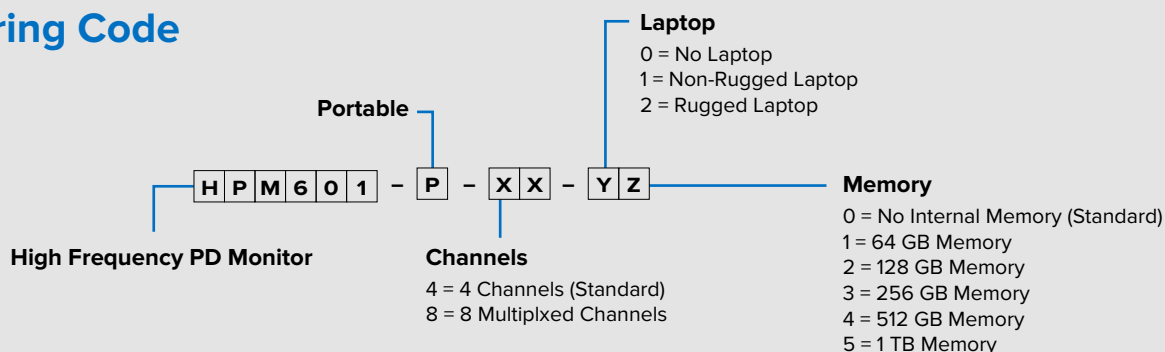
Benefits

- Rugged sensors, monitor and laptop
- Gigabit ethernet communication between monitor and laptop
- Enhanced noise rejection
- Realtime denoising
- Software packed with useful tools for reliable and interactive PD measurements
- Robust recording and analytics
- Customizable according to customer specific applications
- Suitable for Online or Offline PD measurements

Technical Specifications

| | | |
|------------------------------------|---|--|
| INPUT SIMULTANEOUS CHANNELS | Channels | 4 simultaneous channels 8 & 12 channel options available with multiplexer |
| | Sampling Rate | 250 MS/s |
| | Bandwidth | 0.01-100 MHz |
| | Amplification | up to 28 dB, software selectable |
| | Filtering | Software configurable band pass filters |
| MEMORY | SSD | up to 1 TB (Optional) |
| DATA TRANSFER | High Resolution (Pulses data on simultaneous channels) | 10,000 pulses per second for 4 simultaneous channels |
| | Low Resolution (Pulse amplitude on simultaneous channels) | 50,000 pulses per second for 4 simultaneous channels |
| | Transfer Rate | 400 Mbps (depending on operating system and connection) |
| COMMUNICATION LINK | Type | Ethernet Copper |
| | Cable | Cat5e |
| TEMPERATURE RATING | Ambient | -30°C - 60°C |
| | Storage | -40°C - 85°C |
| POWER RATING | Input Power | 35 W |
| SYNCHRONISATION INPUTS | 2 Inputs, software | Internal & xternal |
| | IP Rating | IP65 |
| DIMENSIONS | 260mm(L)x310mm(W)x120mm(H) | |
| SOFTWARE | Rugged Enterprise | |

Ordering Code



CPM601-P

One Device for a wide range of assets and testing applications



Rugged Monitoring presents most advanced Partial Discharge Monitor CPM601 to perform PD measurements in dual frequency range i.e., in the range of 0.01MHz - 100MHz as well as 300MHz - 2GHz.

With the help of advanced electronics embedded inside CPM601, user can perform PD measurement using various sensors without the need of using external frequency down converters. This presents All-in-One solution to perform PD measurements using Acoustic, Ultrasonic, HFCT, TEV, Coupling Capacitors as well as UHF Sensors on all assets, GIS, Power Transformers, Rotating Machines and Power Cables.

CPM 601 is a Compact and sturdy enclosure with electronics making it portable, easy to carry, while enabling the user to perform PD measurements with less hassle. Monitor can directly transfer the data to PD Connect software installed on laptop else 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. CPM 601 and Software are packed with all necessary tools that help to perform effective PD measurements. Integrated variable amplifiers and onboard denoising features help during onsite testing in case of any huge noise.

We at Rugged Monitoring have a dedicated team for application specific customizations for sensors, monitor configuration and software integration to simplify data collection of testing and monitoring applications.

Applications

- Online periodic partial discharge monitoring
- Online PD measurement during HV AC testing (Resonant test set, VLF, OWTS)
- Multiple point PD monitoring
- Cables and their accessories
- Rotating machines
- AIS/GIS switchgear/switchboards
- Power transformers

Features

- Rugged, compact design
- Dual Frequency Ranges; 0.01MHz - 100MHz as well as 300MHz - 2GHz
- Compatible with Acoustic, Ultrasonic, HFCT, TEV, Coupling Capacitors as wells as UHF Sensors
- An interactive and comprehensive software PD Connect for reliable PD measurement and analysis
- Gigabit ethernet copper Cat5e communication link between monitor and laptop
- Optional rugged laptop with installed software suite
- IP65 rated

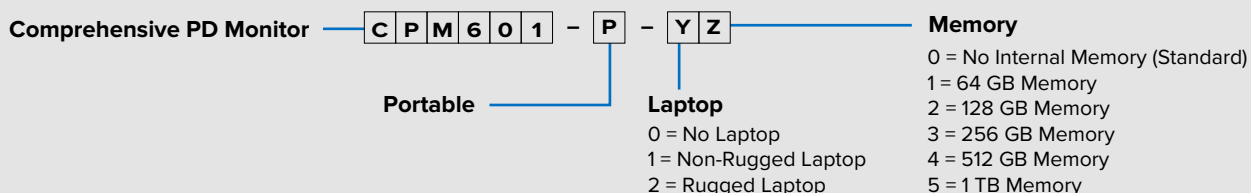
Benefits

- Rugged sensors, monitor and laptop
- Gigabit ethernet communication between monitor and laptop
- Enhanced noise rejection
- Realtime denoising
- Software packed with useful tools for reliable and interactive PD measurements
- Robust recording and analytics
- Customizable according to customer specific applications
- Suitable for Online PD measurements

Technical Specifications

| | | |
|-------------------------------|---|---|
| INPUT CHANNELS | Channels | 8 Multiplexed (4x HF and 4x UHF) |
| | Sampling Rate | 250 MS/s |
| | Amplification | up to 50 dB, software selectable |
| | Filtering | Software configurable band pass filters |
| HF CHANNELS | Bandwidth | 0.01 - 100 MHz |
| | Sensitivity | -50dBm |
| | Dynamic Range | 50dB |
| UHF CHANNELS | Bandwidth | 300 MHz - 2 GHz |
| | Sensitivity | -80 dBm |
| | Dynamic Range | 70 Db |
| DATA TRANSFER | High Resolution (pulses data on simultaneous channels) | 10,000 pulses per second for 4 simultaneous channels |
| | Low Resolution (pulse amplitude on simultaneous channels) | 50,000 pulses per second for 4 simultaneous channels |
| | Transfer Rate | 400 Mbps (depending on operating system and connection) |
| MEMORY | SSD | up to 1 TB (Optional) |
| COMMUNICATION LINK | Type | Ethernet Copper |
| | Cable | Cat5e |
| SYNCHRONISATION INPUTS | 2 Inputs, software | Internal |
| | External | selectable |
| IP RATING | IP 65 | |
| TEMPERATURE RATING | Ambient | -30°C - 60°C |
| | Storage | -40°C - 85°C |
| POWER RATING | Input Power | 45 W |
| DIMENSIONS | 260mm(L)x310mm(W)x120mm(H) | |
| LAPTOP | Rugged Laptop | (Optional) |

Ordering Code



UPM601-C High Frequency Partial Discharge Monitor



Rugged design, designed for reliability, 3 Phase synchronous partial discharge monitoring equipment.

"Rugged Monitoring Ultra High Frequency Partial Discharge (PD) monitoring solution is a platform that enables HV asset owners to keep monitoring PD due to insulation defects 24/7. System can also be used to perform online PD measurement during HV AC testing . Compact size and rugged enclosure of

monitor make it easy to get installed and get started. Solution can communicate with its user over IEC61850 or using Rugged Monitoring proprietary Rugged Enterprise software suite. System simple design enables it to get interfaced to third party protocols.

Each Monitor is capable of transferring data directly to Rugged Enterprise software installed on Server or data can be temporarily stored in the device in case of communication loss between server and monitor. Thousands of pulses per second can be transferred to the Server enabling the user to generate fast and reliable Phase Resolved Partial Discharge (PRPD) graphs. PRPD graphs help the user to identify type of PD in HV assets. Monitoring solution is packed with all necessary tools that help to perform active PD measurements. Integrated variable amplifiers and on board denoising features help during onsite testing even in case of presence of huge noise.

There is a dedicated team for application specific customizations for sensors, monitor configuration and software integration to simplify cable data collection of testing and monitoring applications.

Applications

- Online continuous partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- Power Transformer
- Gas Insulated Switchgear (GIS)
- Circuit Breakers
- Cable Terminations

Features

- Rugged, simple design
- 4 synchronous input channels allow 3 phase synchronous measurement with additional external synchronous channel to enable the use of other type of sensor
- Rugged Enterprise, a complete software suite for analysing the data and generating reports
- Indicator LEDs to alert in case of PD alarm or warning
- Gigabit ethernet copper Cat5e or multimode fiber communication link between monitor and server IP65 rated

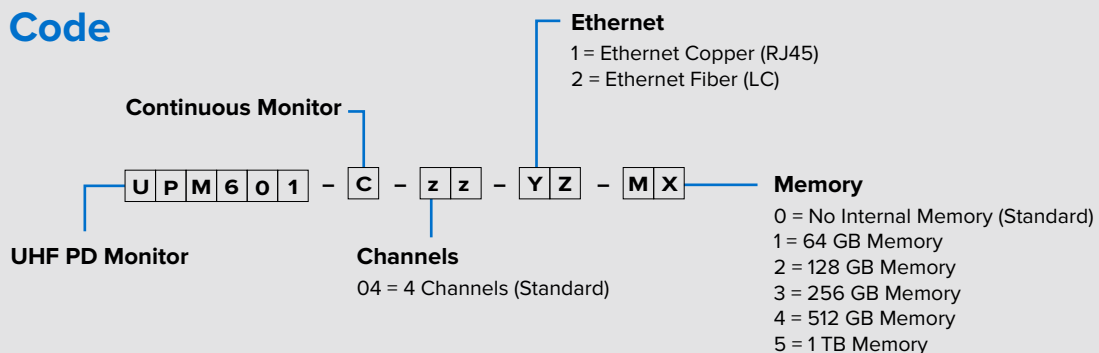
Benefits

- Rugged sensors, monitor and server
- Gigabit ethernet communication between monitor and server
- Robust design
- Each device is rigorously tested
- PD measurements
- Software packed with useful tools for reliable and interactive
- Robust recording and analytics
- Customizable according to customer specific applications
- Suitable for online or online PD measurements

Technical Specifications

| | | |
|-------------------------------|---|---|
| MONITOR | Channels | 4 simultaneous channels |
| | Sampling Rate | 250 MS/s |
| | Bandwidth | 300Mhz - 2000 MHz |
| | Amplification | up to 50 dB, software selectable |
| | Filtering | Software configurable band pass filters |
| MEMORY | SSD | upto 256 GB (Optional) |
| DATA TRANSFER | High Resolution (Pulses data on simultaneous channels) | 10,000 pulses per second for 4 simultaneous channels |
| | Low Resolution (Pulse amplitude on simultaneous channels) | 50,000 pulses per second for 4 simultaneous channels |
| | Transfer Rate | 400 Mbps (depending on operating system and connection) |
| COMMUNICATION LINK | Type | Ethernet Fiber / Copper |
| | Cable | Multimode Fiber / Cat5e |
| | IP Rating | IP65 |
| TEMPERATURE RATING | Ambient | -30°C - 60°C |
| | Storage | -40°C - 85°C |
| POWER RATING | Input Power | 35 W max |
| SYNCHRONISATION INPUTS | 2 Inputs, software | Internal & xternal |
| DIMENSIONS | 260mm(L)x310mm(W)x120mm(H) | |
| SOFTWARE | PD Live and Rugged Enterprise | |
| REMOTE COMMUNICATION | IEC61850 (Optional) Proprietary Rugged Connect for remote communication Customized third party interface on request | |

Ordering Code



PD201

Rugged Partial Discharge Monitoring Module for OEMs



The Rugged Monitoring PD201 is a compact design, designed for reliability Partial Discharge (PD) Monitoring Module for Transformers, Switchgears, Power Cables and Rotating Machines.

PD201 combines accuracy and easy to use software. It has two variants, 04 channel and 08 channels, that can connect to 4 and 8 PD sensors respectively. The system can be integrated with wide range of PD sensors such as HFCT, TEV, Bushing Adaptors, Capacitive Couplers, Acoustic, and Ultrasonic PD sensors.

The PD201 connects to the HF PD sensors installed at the MV/HV assets. It measures the High Frequency (HF) signals emitted by the PD Faults in HV/MV assets. The HF signals are then analyzed for PD activity and Module categorizes pulses as Internal PD, External PD and Noise Signals. Internal PD signals are captured and stored for further analysis such as PRPD, PD Amplitude, Discharge Rate and trending. The PD amplitude and discharge rate is sent to the third-party system via Modbus (RTU) protocol using built-in serial (RS-485) port. The PRPD data is stored in the module and sent to third party system via CANBUS protocol using built-in CAN port.

Applications

- Online continuous partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- PD Monitoring in Transformer using Bushing
- Adaptors/Sensors
- PD Monitoring in Dry Type Transformers
- PD Monitoring in MV Switchgear using TEV / HFCT
- PD Monitoring in Power Cables using HFCT
- PD Monitoring in Generators and Motors using
- Capacitive Couplers and HFCT

Features

- Rugged, Compact Design with multiple mounting options - Din-Rail, Direct
- 4 or 8 Synchronous Input Channels for monitoring Partial Discharge
- Monitors Partial Discharge into the Insulation of MV/HV assets
- Best in class EMI, ESD Immunity
- Modbus (Serial-RS485) and Canbus integration with third party systems
- Advance noise gating with built-in filters and software algorithms
- Built-In Fail Safe Relay for System Failure

Benefits

- Suitable for OEM-type applications (TMS, Gateways)
- Multiple mounting options - Din-Rail and Direct (Bare-board)
- Cost optimized solution for Partial Discharge monitoring
- Software designed for integration into monitoring systems / gateways
- Robust datalogging and Analytics
- Customizable according to customer specific applications
- Most accurate PD analysis with advanced noise gating
- Highly robust and safe monitoring systems

Technical Specifications

| | |
|-------------------------|--|
| Number of Channels | 04 or 08 (Simultaneous acquisition, No Multiplexing) |
| Sampling Rate | 100 MS/s per channel |
| Acquisition Bandwidth | 0.01 - 100Mhz |
| Vertical Resolution | 12-Bit |
| Noise Elimination | |
| - Bad Pass Filters | User selectable integrated filters with 5Mhz to 25Mhz bandwidth range |
| - Software Noise Gating | Advanced denoising algorithms |
| Data Storage (Memory) | MicroSD external memory slot (Up to 2 TB) |
| Compatible PD Sensors | Any High Frequency (HF) PD Sensors (Bushing Adaptors, HFCT, TEV, Capacitive Couplers, Acoustic, Ultrasonic etc.) |
| Synchronization Inputs | 2 Inputs (Internal and External) |
| Serial Port | RS-485 with Modbus RTU and Can Port with CANBUS protocol |
| Configuration Port | Ethernet Port for configuration |
| Operating Temperature | -30 to 75 °C |
| Storage Temperature | -40 to 85 °C |
| Dimensions | 4.92" x 4.92" x 1.89" (125mm x 125mm x 48mm) |
| Humidity | 95% Non Condensing |
| Power Input | 12 - 24V DC (Default) |
| Power Consumption | 15W |
| # of Relays Outputs | 01 x Fail Safe Relay for System Failure |

Ordering Code

Number of Channels
04 = 4 Channels;
08 = 8 Channels

P D 2 0 1 - [] []

M x — **Memory**

- 0 = No Internal Memory
- 1 = for 64GB Memory
- 2 = for 128GB Memory
- 3 = for 256GB Memory
- 4 = for 512GB Memory

PD211

Rugged Partial Discharge Monitoring Module for OEMs



Rugged Monitoring PD211 is a compact design, designed for reliable Partial Discharge (PD) Monitoring Module for Transformers, Switchgears, GIS and Power Cable Terminations.

PD211 is based on the UHF (Ultra High Frequency) technology for PD signal acquisition and analysis. The Monitor is a combination of reliability and user-friendly configuration software. It has two variants with 04 channel and 08 channels, that can connect to 4 and 8 UHF-PD sensors respectively. The system can be integrated with any UHF PD sensors that are having response between 100MHz to 2000MHz.

The PD211 connects to the UHF PD sensors installed at the MV/HV assets. It measures the Ultra High Frequency (UHF) signals emitted by the PD Faults in HV/MV assets. The UHF signals are then analyzed for PD activity and categorization of Internal PD, External PD and Noise Signals. Internal PD signals are captured and stored for further analysis such as PRPD, PD Amplitude, Discharge Rate and trending. The PD amplitude and discharge rate is sent to the third-party system via Modbus (RTU) protocol using built-in serial (RS-485) port. The PRPD data is stored into the module and sent to third party system via CANBUS protocol using built-in CAN port.

Applications

- Online continuous partial discharge monitoring
- Online PD measurement during HV AC testing
- Multiple point PD monitoring
- PD monitoring in Transformer using UHF PD Sensors
- PD Monitoring in GIS using UHF PD Sensors
- PD Monitoring in MV Switchgear using UHF PD Sensors
- PD Monitoring in Power Cables Terminations UHF PD Sensors

Benefits

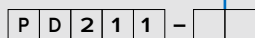
- Suitable for OEM-type applications (TMS, Gateways)
- Robust datalogging and Analytics
- Multiple mounting options - Din-Rail and Direct (Bare-board)
- Customizable according to customer specific applications
- Cost optimized solution for Partial Discharge monitoring
- Most accurate PD analysis with advanced noise gating
- Software designed for integration into monitoring systems /gateways
- Highly robust and safe monitoring systems

Technical Specifications

| | |
|-------------------------|--|
| Number of Channels | 04 or 08 (Simultaneous acquisition, No Multiplexing) |
| Sampling Rate | 125 Ms/s |
| Acquisition Bandwidth | 300Mhz - 2000Mhz |
| Vertical Resolution | 12-Bit |
| PD Sensitivity | -80dBm |
| Noise Elimination | |
| - Bad Pass Filters | Tuneable for different frequencies including but not limited to 440Mhz, 800Mhz, 1100Mhz, and 1600Mhz |
| - Software Noise Gating | Advanced denoising algorithms |
| Data Storage (Memory) | MicroSD external memory slot (Up to 2 TB) |
| Compatible PD Sensors | Any Ultra High Frequency (UHF) PD Sensors with sensitivity 100Mhz - 2000MHZ. |
| Synchronization Inputs | 2 Inputs (Internal and External) |
| Serial Port | RS-485 with Modbus RTU and Can Port with CANBUS protocol |
| Configuration Port | Ethernet Port for configuration |
| Operating Temperature | -30 to 75 °C |
| Storage Temperature | -40 to 85 °C |
| Dimensions | 4.92" x 4.92" x 1.89" (125mm x 125mm x 48mm) |
| Humidity | 95% Non Condensing |
| Power Input | 12 - 24V DC (Default) |
| Power Consumption | 15W |
| # of Relays Outputs | 01 x Fail Safe Relay for System Failure |

Ordering Code

Number of Channels
 04 = 4 Channels;
 08 = 8 Channels



Memory

- 0 = No Internal Memory
- 1 = for 64GB Memory
- 2 = for 128GB Memory
- 3 = for 256GB Memory
- 4 = for 512GB Memory

Asset Monitoring : Enterprise Architecture

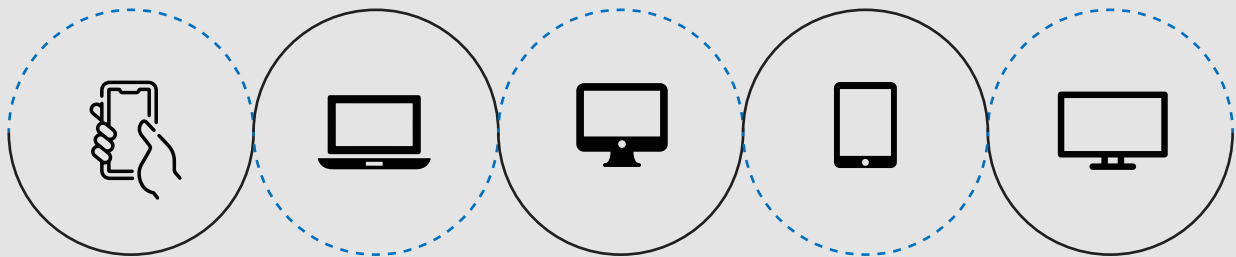
Compatible with Rugged Monitoring Enterprise Solution

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

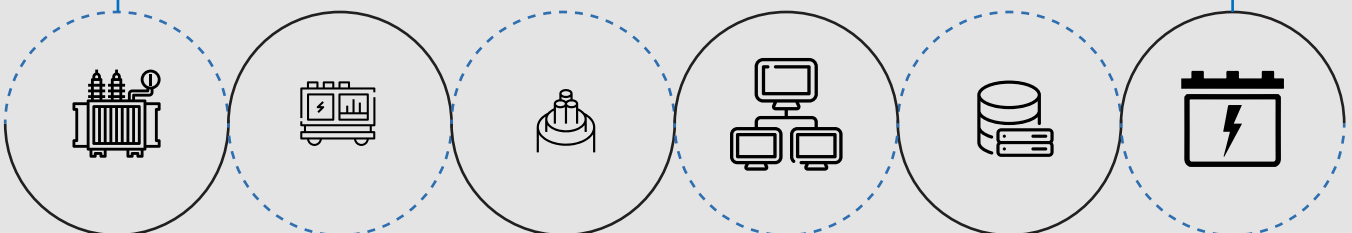
MODBUS

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 9000



ISO 14000



ISO 45001/
OHSAS 18000



Lloyd's
Register



ATEX
Certification


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