PDStar

Intelligent Handheld Partial Discharge Detector with Thermal Imaging Camera

Superior, Cutting-Edge, Handheld Partial Discharge Detector for Electric Power Equipment with Thermal Imaging Camera, 100 MSPS HFCT Testing, a 4.3” Touch Screen, Multi-Sensor and Cloud Diagnostic Technology, 3G/4G/WI-FI Communication and Data Management Software

PMDT

Solutions for Condition-Based Maintenance
Our Mission
Utilize the latest hardware and software technologies to the operation and maintenance of electric power equipment.

Our Vision
Provide customers with cost-effective testing instruments and monitoring systems, and always lead in the field of intelligent operation and maintenance of power equipment globally.

Global Application
Our products and services have been widely adopted by major electric utilities and industrial end users in the United States, Canada, Germany, Switzerland, United Kingdom, France, Poland, Australia, Mexico, Bolivia, Colombia, Uruguay, Saudi Arabia, Oman, South Africa, Egypt, Singapore, India, Malaysia, Indonesia, Vietnam, Sri Lanka, South Korea, Philippines, Pakistan, Thailand, Bangladesh, Turkmenistan, China, Hong Kong, Taiwan, and more.

Our proven, high-quality products and complete solutions have been adopted by customers in various industries including oil & gas, metals & metallurgy, chemical, industrial manufacturing, commercial building maintenance, government and more.

Customer Oriented
Customer satisfaction is of the utmost importance to PMDT. We strive to provide increased operational reliability and safety of power systems and are devoted to providing superior user experiences and consistently reliable customer support.

We aim to pursue long-term strategic partnerships with our customers and to create added value for them now and into the future.

About PMDT

PMDT provides solutions worldwide for condition-based maintenance to the power industry. Our company has knowledgeable and experienced personnel that utilize the most advanced resources for online testing. Over 25 years of ongoing research and development into power asset condition assessment aids for our wide array of diagnostic and monitoring systems for medium and high voltage substations.

Our headquarters and manufacturing facility is located in San Jose, CA, US, which provides local access to high quality American-made components. We provide reliable and robust equipment with state-of-the-art capabilities for online testing of energized power equipment.

PMDT meets ISO9001: 2015 Quality Management System requirements and our products have passed laboratory tests and possess CE certifications.

PMDT continuously puts forth an abundant R&D investment to provide perpetually better solutions for condition-based maintenance programs.
PDStar

Intelligent Handheld Partial Discharge Detector with Thermal Imaging Camera

PMDT is proud to present one of our latest innovations, the PDStar. It integrates On-Line Partial Discharge (OLPD) testing and Infrared testing for MV and HV equipment, which combines UHF, AE, Ultrasonic, HFCT, TEV and Infrared testing technologies. It is applicable for online PD testing, as well as abnormal heating and defect detection on all types of substation equipment. PD amplitude, PRPD, PRPS and Infrared spectrums provide critical data for determining the operational condition of electric power equipment.

The PDStar features advanced local diagnostics and cloud diagnostics functions. It connects to the PMDTCloud via WI-FI/3G/4G to upload test data, download test tasks and receive diagnostic results in real time. The PDStar also provides advanced capability to communicate with the user’s asset management system in the private network for secured data transmission.

The PDStar promotes a standardized, efficient way of online testing via the intelligent patrol, cloud data/job management, local and cloud diagnostic functions, automatic reporting, and paperless testing, which has made a major advancement in the concept of online condition assessment. It is the most powerful and helpful tool for electric utilities to conduct routine testing in a substation quickly, to determine what the issue is and where it is located.


Applications
- MV & HV Switchgear
- Transformers
- Power Cables
- Gas Insulated Switchgear (GIS)
- And Other Equipment

Main Features
- Conducts OLPD testing with UHF, HFCT, TEV, AE, and Ultrasonic Sensors
- Conducts Infrared testing by simply attaching the Thermal Imaging Camera to the PDStar main unit
- 100 MSPS (Mega-Samples per Second) sampling rate available with a HFCT Signal Processor that features time and frequency analysis / cluster analysis capabilities for advanced OLPD testing and diagnostics for power cables
- The Intelligent Patrol Function is used to create a test task with a set standard test procedure to improve testing efficiency
- RFID tags are used to standardize the field OLPD testing procedure to greatly improve testing efficiency and achieve asset management
- Provides local diagnostic results of noise or PD and PD types automatically on screen
- The PMDTCloud analyzes the data by utilizing Deep Learning Technology to provide diagnostic results of noise or PD type in real time
- 4.3” touch screen and on-board data storage
- Eco-friendly paperless testing technology
Multi-Sensor OLPD Testing

Enjoy OLPD Testing with the New Larger Touch Screen PDStar! OLPD Testing is Now Like Operating a Smart Phone!

Features

- OLPD testing with UHF, HFCT, TEV, AE, and Ultrasonic Sensors
- PRPD, PRPS, Single-Cycle, Phase, Waveform and Amplitude spectrums are used to determine PD types
- Wireless connection to UHF and HFCT sensors
- Power/Light frequency synchronization functions
- Records up to 5 minutes of video while in the PRPS/PRPD Detection Modes of the UHF/HFCT Sensors
- Records ultrasonic sound in the AE detection mode
- Employs the Intelligent Patrol Function and the RFID Patrol Function
- Supports local/cloud data diagnostics and PC-based data management software
- Acoustic-Electromagnetic Combination Testing Technique is utilized by viewing the UHF PRPD & PRPS spectrums while listening to the sound of the acoustic signals using a headphone at the same time for more accurate PD location
- Easy to operate, ideal for quick and efficient PD testing for an entire substation
The core issue for analyzing the severity of the PD signal is to first determine what type of PD signal is present. PMDT utilizes PD type determination techniques based on time domain characteristics of signals together with frequency domain analysis. Each PD type has unique characteristics which are useful in determining the PD’s developing progress and severity level. The PDStar provides multiple kinds of data spectrums which are useful for data analysis and determining PD types.
Advanced Solution for Power Cables OLPD Testing with 100 MSPS High Sampling Rate

For substation operators, conducting OLPD testing on power cables has always been a challenge due to the dangerous aspects involving the close proximity to the online equipment the tester would have to be in order to perform the testing efficiently and accurately. The PMDT’s PDStar provides an advanced solution for this issue.

The PDStar features the superior Cluster Analysis (CA) function with a 100 MSPS HFCT Signal Processor that enables the user to conduct advanced OLPD testing and diagnostics on power cables. The PDSS (Partial Discharge Signals Separation) technology is employed to separate noise from PD signals, and to separate different types of PD signals into different groups. Waveforms, PRPD & PRPS, and Pulse spectrums are provided for data analysis to determine the PD type.

Features

- Conducts Partial Discharge signal sources separation under cluster analysis mode automatically or manually
- Three detection modes: Waveform, PRPD-PRPS, and Pulse
- 8 sampling rate options available: 500KHz / 1MHz / 2MHz / 5MHz / 10MHz / 20MHz / 50MHz / 100MHz
- Adjustable sampling length, gain and threshold
Thus far, infrared testing and OLPD testing have been important but independent for condition-based maintenance programs of power equipment. Substation operators have been conducting the two routine testing methods separately for many years. The PMDT’s new innovative PDStar now makes it possible to test PD and IR together in one single tool, which allows for a more productive, efficient and cost-effective online testing and maintenance program for customers.

The PDStar’s Thermal Imaging Camera is convenient to use by simply attaching the Thermal Imaging Camera to the PDStar main unit. It has high resolution and can detect any abnormal heating and defects effectively.

Features

- 320 x 256 native resolution
- 4.3” HD LCD touch screen, shares the same screen of the PDStar main unit
- Images can be edited on the PDStar main unit directly. Tap the screen or buttons to quickly access temperature measurement tools, parameters, image modes and more.
- Measure the temperature of one specific point or area
- Supports PC-based data management software
- Compact design and convenient to use
The PMDT’s Field Test Procedure

Intelligent Online Testing System Based on IoT

PMDTCloud

Test Job Management Microservice
Power Equipment Condition Analysis and Early Warning Microservice
Data Display Microservice
Deep Learning Diagnostic Microservice

4G Private Network, APN Channel

Test Job Download

Data Upload

Diagnostic Result

RFID Electronic ID Tag
GIS
Switchgear
......

Field Test with PDstar

PD Test
Infrared Test

Auxiliary Diagnostics
Corona / Flashing Electrode / Void / Surface
High Temperature / Heating
Innovative, Standardized, and High-Efficiency

01 Create Test Jobs
02 Select the Test Instrument

PMDTCloud

Download and Load Test Jobs via 3G/4G/Wi-Fi Communication

03 Intelligent Test Instrument

04 Field Test Intelligent Patrol

05 Data Analysis

06 Automatic Reporting

Upload Test Data via 3G/4G/Wi-Fi Communication
PMDTCloud

Asset Condition Monitoring Management Platform

The PMDTCloud is a cutting-edge, cloud-based asset condition monitoring and diagnostic data management platform that communicates with our various products to collect and analyze the data. It is developed based on the innovations in internet technologies and the Internet of Things. It employs a multi-dimensional cloud diagnostics algorithm developed by PMDT through the utilization of the latest big data computing, cloud calculation and deep learning technology based on our abundant on-site test data collected through the years.

The PMDTCloud provides users with a faster method to access the latest data and condition of the power assets from any authorized web enabled device via a login with a user ID and password. Diagnostic results with PD types are provided automatically.

The PMDTCloud service can be rented, or the PMDTCloud Software can be installed on the user’s local server as needed.

Multiple Statistics Charts
Shows the important information for users to understand the status of power equipment effortlessly.

Abnormal Alarm
Provides early warning for abnormal activity from power equipment to alert plant operators that the equipment is in need of attention.

Test Job Management
Manages and controls the online testing process of power equipment, along with checking the progress of each test job in real time, and also conducts data management, inquiry and statistical analysis.
Test Point Management
To standardize the test points for each method used (TEV/Ultrasonic/AE/UHF/HFCT), test at the same point for each method available every time with high efficiency and improved data management.

Cloud Diagnostic Function
PMDT has developed a cutting-edge cloud diagnostic technology based on big data mining and deep learning diagnostic algorithms that we use for data collected in the field. The data can be sent to the PMDTCLOUD for data analysis and the Cloud provides diagnostics results with PD types automatically. This provides advanced and reliable technological support for the condition evaluation of power equipment.

Automatic Reporting
The PMDTCLOUD generates detailed, proficient test reports automatically after the test data is uploaded with one simple selection on the PMDTCLOUD webpage. Say goodbye to writing reports manually!
Improve Test Efficiency and Condition-Based Asset Management with the Intelligent Patrol Function

Are you still performing OLPD testing the traditional way? Spending an extensive amount of time testing all the power equipment in the substations and recording the data by pen and paper?

PMDT presents new, intelligent OLPD testing methods that will truly simplify your testing process!

Routine Patrol - Efficient PD Testing

Create Test Jobs
Create a new test job with all test points in a list on the PMDTCloud/PC-Based software and download it to the PDStar main unit.

Patrol the Substation and Test for PD Efficiently
Patrol the substation and test each programmed test point for the power equipment; the test data is then stored in the onboard memory.

Data Management, Analysis, and Report
Upload the test data to the PMDTCloud/PC-Based software after all tests are completed for data management and analysis.
RFID Patrol - the Most Accomplished OLPD Testing and Asset Management Technique

The PDStar provides an innovative PD asset management solution via RFID tagging based on the Internet of Things. With the RFID Patrol program, the OLPD testing procedure is standardized; thus, PD testing efficiency is greatly improved, data flow and accuracy are ensured and your power assets are better managed.

Create Electronic IDs for Your Power Assets via RFID Tagging

The RFID tags can be affixed to your power assets and store the power equipment information such as asset name, asset ID #, substation name, and provides prompts for the appropriate tests for that asset. Each test is recorded with a unique test ID number and date/time stamp to ensure reliability, consistency and credibility.

RFID Patrol Function - Provides Efficiency by Utilizing the Internet of Things

Following the routine patrol procedure to perform field testing will vastly improve the testing efficiency. Use the PDStar to scan the RFID tags and it will obtain the asset’s information automatically. All the test data will then be imbedded with the asset’s information after the scan is complete. This allows the system to automatically identify and link the data to each specific asset.

Dedicated to Asset Management

Achieves accurate management of the asset’s ID, physical status, and test point information. Standardizes the field OLPD testing procedure and retains the PD test data accurately, consistently and comparably.

Test PD Environmentally-Friendly

Eliminates the need to write down all the asset information and test data with the paperless OLPD testing realized with PMDT’s innovative RFID function.

*Note: The Intelligent Patrol function is supplied with the PDStar. The RFID tags are additionally priced and programmed for your custom application. Please inquire for more information.
Wireless Sensor Connections and Frequency Synchronization

Wireless Sensor Connection
The most convenient feature of the PDStar is the wireless connectivity of the UHF and HFCT sensors. The sensors are equipped with wireless signal processors that transmit the test data wirelessly to the PDStar main unit.

Light Frequency Synchronization
Not only do the signal processors allow for wireless transmission of the UHF and HFCT sensor signals to the PDStar, but they can also reference the frequency of the power supply through a light sensor on the signal processors. This allows you to sync your signals up to the actual frequency, instead of having it fixed at either 50 or 60Hz.

Wireless Power Frequency Synchronization
Additionally, the USB charger also functions as a wireless transmitter of the local power frequency to the main handheld unit. Simply plug the charger into an outlet, which is fed by one phase of the power system under test. The PDStar automatically detects and syncs the UHF/HFCT Single-Cycle, PPRD and PRPS spectra with the referenced local power frequency.

The frequency synchronization functions have enhanced the resolution of the PDStar and given us the ability to determine the exact type of PD activity.

Data Management Software
The PDStar data management software is a powerful, PC-based tool that stores, manages, analyzes the test data and manages the test jobs.

Main Features
- Test File Management: Manages the online testing data files of the power equipment and substations.
- Test Job Management: Creates, assigns, manages test jobs and archives the test data.
- Test Data Management: Stores and manages the test data spectra collected by the PDStar and provide trend analysis. There are 19 kinds of PD and infrared test data including spectra, audio and video.
- Intelligent Patrol Function: Create a new test job on software and download it to the PDStar main unit. Patrol the Substation and test for PD Efficiently.
# Configurations

## Hardware & Software Configurations
- Main Unit
- Internal TEV Sensor
- Internal Ultrasonic Sensor
- UHF Sensor with Wireless Signal Processor
- HFCT Sensor with Wireless Signal Processor and 100 MSPS HFCT Signal Processor
- AE Contact Sensor
- Ultrasonic Parabolic Dish with Laser Sight
- Ultrasonic Extension Wand
- Ultrasonic Contact Sensor
- Thermal Imaging Camera
- PDStar Software

## Standard Accessories
- Vacuum Grease for the AE Contact Sensor
- Magnetic Holder for the AE Contact Sensor
- Basic Headphones
- Mini USB Cable
- Coaxial Cables for UHF and HFCT Sensors
- Battery Charger & Synchronizer
- Back up Lithium battery for the Thermal Imaging Camera
- Carrying Case

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## Eight Recommended Kits Configured with Optional Combinations of TEV, Ultrasonic, AE, UHF, HFCT Sensors, and Thermal Imaging Camera

<table>
<thead>
<tr>
<th>Kit No</th>
<th>Application</th>
<th>Sensors</th>
<th>Optional Modules</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Internal TEV</td>
<td>Internal Ultrasonic</td>
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<tr>
<td>Kit 1</td>
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<td>Kit 5</td>
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Thermal Imaging Camera
100 MSPS HFCT Signal Processor

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PMDT PDStar

14
### Main Unit
- **Display**: 4.3” touch screen
- **Dimensions**: 7.3” x 4.3” x 1.4”
  - 185mm x 110mm x 35mm
- **Weight**: 1.15 lb / 0.52 kg
- **Communication**: 3G/4G/WI-FI/USB

### Internal TEV Sensor
- **Bandwidth**: 3MHz – 100MHz
- **Measurement Range**: 0dB – 60dB
- **Resolution**: 1dB
- **Accuracy**: ±1dB
- **Max Number of Pulses/Cycle**: 2000
- **Data Spectrum Types**: Amplitude and Pulse Count Spectrums

### AE & Ultrasonic Sensors
- **Bandwidth of the AE Contact Sensor**: 20kHz – 300kHz
- **Center Frequency of the Ultrasonic Sensors**: 40kHz
- **Measurement Range**: -10dB – 70dB
- **Resolution**: 1dB
- **Accuracy**: ±1dB
- **Data Spectrum Types**: Amplitude, Phase, Waveform, and Fly Spectrums

### External UHF Sensor
- **Bandwidth**: 300MHz – 1.5GHz
  - (Customizable between 100MHz – 2.0GHz upon request)
- **Measurement Range**: 0dB – 70dB
- **Resolution**: 1dB
- **Accuracy**: ±1dB
- **Filters**: All pass, low pass, and high pass
- **Communication**: Wireless communication with the detection unit
- **Data Spectrum Types**: Amplitude, Single-Cycle, PRPD, and PRPS spectrums

### Technical Specifications
#### HFCT Sensor
- **Bandwidth**: 3MHz – 50MHz
  - (Customizable between 500kHz – 80MHz upon request)
- **Measurement Range**: 0dB – 80dB
- **Resolution**: 1dB
- **Accuracy**: ±1dB
- **Communication**: Wireless communication with the detection unit
- **Optional Part**: Signal processor with 100 MSPS sampling rate
- **Data Spectrum Types**: Amplitude, Single-Cycle, PRPD, and PRPS spectrums

#### Thermal Imaging Camera
- **IR Resolution**: 384 x 288 pixels
- **Focal Length**: 0.59” / 15 mm
- **Field of View (FOV)**: 25° x 19°
- **Image Frequency**: 10Hz
- **Object Temperature Range**: 
  - -4°F – 302°F (-20°C – 150°C)
  - -4°F – 662°F (-20°C – 350°C)
- **Thermal Sensitivity/NETD**:
  - <0.112°F (0.06°C) @ 77°F (25°C)
  - /60 mK@ 77°F (25°C)

#### Environmental
- **Operating Temperature**: 32°F – 131°F / 0°C – 55°C
- **Humidity**: 0-90% RH non-condensing
- **IP Rating**: 55
- **Certifications**: CE certified, IEC62478, EN60065-1, EN50666, EN62009-2, and EN50663 compliance

#### Power Supply
- **Internal Battery**: Lithium-ion
- **Operating Time**: Approx. 6 hours

#### Battery Charger & Synchronizer
- **Input**: 85V – 264V AC, 50/60Hz
- **Output**: 5V DC 1A
Global Testing Experiences

PMDT’s unique experiences consist of over 25 years of R&D combined with many years of field work: testing PD and Infrared for over 200,000 various power assets in thousands of substations globally for a variety of electric utilities, industrial end users, and power equipment manufacturers. PMDT has the expertise needed to provide the best Condition-Based Maintenance Programs for your power assets.
Find PD Defects Before Equipment Failures Occur
The PMDT Solution
Solutions for Condition-Based Maintenance

Intelligent Asset Data Management

Detection and Monitoring

PMDTiSmart
- HDGU (Handheld Data Collection Unit)
- Local Data Collection Unit
- Wireless Autonomous Online PD Testing

PDMonitor
- DSU (Diagnostic Server Unit)
- MEU (Monitoring Endpoint Unit)
- Permanent Online PD Monitoring

Diagnostic and Location

Online PD & IR Testing

Online PD Diagnostic and Location

Online PD Expert Diagnostic and Location

PMDT PDStar
Solutions for Condition-Based Maintenance

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