MONTESTO 200
Portable on-line partial discharge measurement and temporary monitoring system for various electrical assets
Periodic on-line assessment of insulation condition

Early defect detection prevents failures

The insulation system of all medium-voltage (MV) and high-voltage (HV) assets is continuously subjected to electrical, thermal, mechanical and environmental stress factors. These cause insulation defects over time, which can eventually lead to dielectric failure and costly outages. To prevent this from happening, it is important to know the insulation condition of these assets over their entire service life.

Insulation assessment based on partial discharge

Partial discharge (PD) activity is a reliable indicator of insulation condition, and it is often a sign of insulation defects that can cause failure in electrical assets. That is why it is an important diagnostic parameter used in the factory acceptance testing, commissioning and in-service testing of various MV and HV assets.

On-line PD measurement and monitoring

On-line PD measurement evaluates PD activity and offers a snapshot of insulation condition status when the asset is in operation. Temporary on-line PD monitoring indicates changes in PD activity over specified periods of time during an asset’s service life.

The data gathered during on-line PD measurement and monitoring enables engineers to determine when electrical equipment is at risk of failure. This vital condition-based information helps to optimize maintenance strategies, asset management and investment planning.

Clarify asset installation issues within the warranty period

Periodically check asset insulation condition state

Identify assets that require immediate intervention

Observe assets at risk over extended periods of time

Identify assets that require permanent monitoring

Plan maintenance and investment based on asset condition
MONTESTO 200 at a glance

MONTESTO 200 is a portable, two-in-one solution for on-line PD measurement and temporary PD monitoring. Designed for both indoor and outdoor use, it performs synchronous, multi-channel PD and voltage data acquisition on various MV and HV electrical assets under load, such as:

> Motors and generators
> Power transformers
> HV cables, terminations and joints

IP65 rated
MONTESTO 200 is IP65 rated for long-term outdoor use. Its rugged design protects it from dust particles and precipitation.

Plug-and-play connections
MONTESTO 200 is designed for use with a variety of capacitive and inductive PD sensors for the entire frequency range relevant to PD signals, including the ultra high frequency (UHF) range.

MONTESTO 200 can be connected to permanently-installed PD sensors via a terminal box. This allows safe and easy plug-and-play connections while the asset is online to prevent unnecessary downtime during setup.

Built-in computer
A powerful built-in computer enables continuous on-site data collection and storage. The computer can be remotely accessed and configured by the user to forward periodic reports, alarms and scalar values via universal protocols.

Convenient web interface
PD monitoring sessions can be quickly set up in less than 10 clicks of a mouse. The collected data can be visualized and analyzed remotely using the software’s web interface.

Alarm notification via email
The system can be configured to send email notifications when user-defined PD thresholds are violated and warnings and alarms are triggered. The system’s event log and the corresponding real-time and historical PD data can be instantly viewed via the web interface.

User-friendly data analysis
Software features, such as 3PARD (3-Phase Amplitude Relation Diagram) and Automatic Cluster Separation, separate noise from PD signals to help users quickly and reliably determine the signal source.

Your benefits

> Two-in-one solution for on-line PD measurement and temporary monitoring
> Compact and lightweight for easy transport
> Designed for indoor and outdoor use
> Built-in computer for continuous, long-term data collection and archival
> Web-based interface for convenient remote data access
> Automated software features for easy data analysis and reporting

www.omicronenergy.com/montesto200
Front panel features at a glance

- **Built-in computer** for continuous data collection and storage
- **IP65 rated enclosure** designed for indoor and outdoor use
- **Device handles on both sides**
- **Local Area Network (LAN) connection**
- **A variety of interfaces for data communication:** WIFI, LAN, USB, fiber optics, HDMI
- **Local asset status indication; automatic alarm notification via email (when configured by the user)**
- **Four PD measurement channels**
Local device status indication tells you the operating condition of the measurement unit.

- Connection port for UHF sensor control
- Connection port for UHF sensor control
- Universal 12 V battery connection
- AC power connection
- Measurement device grounding connection
- Start/stop button
- Protection bumpers on both sides
One solution for on-line PD measurement and monitoring

Plug-and-play connections
MONTESTO 200 can be easily connected to permanently-installed PD sensors via a terminal box. This enables a safe and convenient plug-and-play set up when electrical assets are on line. As a result, unnecessary downtime can be avoided and the asset can be evaluated under operating conditions.

On-line PD measurements
The portable MONTESTO 200 is easy to set up for on-line PD measurements directly at the asset. It can be quickly and safely connected to permanently-installed PD sensors via the terminal box. A portable PC or tablet can be used for measurement setup, viewing live PD data and recording PD data measurement streams for analysis.

Temporary on-line PD monitoring
MONTESTO 200 can also be mounted on or near the asset, connected to permanently-installed PD sensors via the terminal box, and left unattended for PD monitoring. Users can remotely connect to the system anytime with the convenient web interface.
**Power transformers**

3b Bushing tap sensors and adapters

3c UHF drain valve sensor

3d High-frequency current transformers

**Power cables and accessories**
On-line PD monitoring from remote locations

Convenient web interface
For performing temporary on-line PD monitoring sessions from a remote location, users can set up monitoring sessions as well as view and analyze collected data from anywhere using the MONTESTO 200 software’s web interface.

MONTESTO 200 web interface overview screen

Fast remote monitoring session setup
Users can set up and run temporary on-line PD monitoring sessions in six easy steps (less than 10 clicks of a mouse).
2. Automatic alarm notification

The system can be configured to send email notifications when measured PD values exceed pre-defined PD thresholds and trigger an alarm. Supporting data can be viewed anywhere using a smartphone, tablet or PC.

3. See triggered warnings and alarms

The event log shows which PD events triggered a warning (yellow) or alarm (red). By clicking on an event, the corresponding real-time or historical PD trend data can be viewed.

4. Trend data

See PD trend charts for each phase or channel. Scroll over points to see PD values and zoom in to see more detail.
Comprehensive analysis and reporting

**Automatic cluster separation**

The advanced, web-based MONTESTO 200 software automatically stores PRPD (Phase-Resolved PD) patterns and the corresponding 3PARD (3-Phase Amplitude Relation Diagram) for each point in the PD trend diagram.

All signal sources are automatically separated as clusters in the 3PARD to quickly differentiate between noise and PD for each phase.

By clicking on a separated cluster, its individual PRPD pattern is shown. The most probable phase of origin is also identified after the separation is made.
Defect location in power cables

A unique, patented technology based on statistical Time Domain Reflectometry (sTDR) pinpoints the location of PD defects along the entire length of power cables.

Frequency sweep diagram (UHF)
Several measurements are made for each frequency and the minimum (lower curve) and the maximum (upper curve) measured values are displayed. This method is used to detect any sources of interference in order to avoid them in a subsequent PD measurement.

Pattern classification for motors and generators
With just one click of a mouse, the MONTESTO 200 software generates a report indicating the probable cause and location of PD-related defects in rotating electrical machines.

Defect location indication
MONTESTO 200 ordering information

**MONTESTO 200**

<table>
<thead>
<tr>
<th>Order no.</th>
<th>Includes the system components listed below</th>
</tr>
</thead>
<tbody>
<tr>
<td>VEHZ4184</td>
<td></td>
</tr>
</tbody>
</table>

**Hardware**

- 1 x 4-channel PD data acquisition unit and an integrated Industrial PC (IPC) in a rugged case
- 1 x Transportation case
- 1 x Mounting kit (includes mounting plates and magnets)
- 1 x Media converter

**Pre-installed software on integrated Industrial PC (IPC)**

- 1 x Advanced monitoring and PD analysis software
- 1 x Operating system software

**Cables and accessories**

- 1 x Duplex fiber optic cable (10 m / 32.81 ft)
- 1 x Grounding cable (6 m / 19.68 ft)
- 1 x Grounding clamp
- 4 x Signal cable with TNC connectors (4 m / 13.12 ft)
- 1 x Power supply cord (2 m / 6.56 ft)
- 1 x Battery cable (2.5 m / 8.20 ft)
- 2 x Small crocodile clamps for battery cable
- 2 x Large crocodile clamps for battery cable

**Documentation**

- 1 x MONTESTO 200 hardware user manual
- 1 x Software user manual
- 1 x OMS system software user manual

**Optional accessories**

**Hardware**

- CAL 542 – PD calibrator
  - 1 pC ... 100 pC
  - 0.1 nC ... 10 nC
- Rogowski coil – Current signal reference for measurements on power cables
- UPG 620 – Pulse generator for UHF signal verification
- UHF 620 – UHF bandwidth converter
- WiFi modem

**Software module**

- Pattern classification for rotating machines

**Application-specific accessories**

1. **Terminal box**

   For use when PD sensors are permanently installed on various assets to enable plug-and-play, on-line PD measurement and monitoring.

   - 3-channel terminal box
   - 4-channel terminal box

2. **Coupling capacitors**

   - MCC 117: 17.5 kV, 2.0 nF
   - MCC 124: 24 kV, 1.0 nF
   - MCC 117 permanent installation kit
   - Includes 3 x MCC 117, 1 x terminal box and 3 x tri-axial cables (5 m) with pre-installed connectors.
   - MCC 124 permanent installation kit
   - Includes 3 x MCC 124, 1 x terminal box and 3 x tri-axial cables (5 m) with pre-installed connectors.

**Included components**

- VEHZ4184
- VE004210
- VE004230
- VEHZ0623
- VE004242
- VEHZ4185
- VEHZ0094
- VESM4109

**Application-specific accessories**

- VEHZ4176
- VEHZ4175
- VEHZ4157
- VEHZ4158
- VEHZ4177
- VEHZ4178
Application-specific accessories

3 **CPL 844 permanent installation kit for bushings**
Includes 3 x bushing tap sensors with adapters, 1 x terminal box and 3 x triaxial cables (10 m) with pre-installed IP 65 connectors.

Current rating of the bushing sensors:
- 9 mArms ... 30 mArms
- 30 mArms ... 60 mArms
- 60 mArms ... 100 mArms

Order no.:
- CPL 844: VEHZ4180
- 9 mArms ... 30 mArms: VEHZ4181
- 30 mArms ... 60 mArms: VEHZ4182
- 60 mArms ... 100 mArms: VEHZ4183

4 **UHF 620 bandwidth converter**
Includes 1 x UHF 620 and connection cables in an IP65 case

Order no.:
- UHF 620 bandwidth converter: VEHZ4185

Application-specific accessories

5 **UHF drain valve sensor for oil-filled power transformers**
UVS 610: 150 MHz to 1 GHz

Order no.:
- UHF drain valve sensor: VEHZ4131

6 **High-frequency current transformers**
MCT 120: 80 kHz to 40 MHz, split ferrite core

Order no.:
- High-frequency current transformers: VEHZ4179
Technical specifications

**MONTESTO 200**

### Acquisition unit

- **Number of input channels**: 4
- **Connector type**: TNC
- **Frequency range**:
  - AC: DC ... 16 kHz
  - PD: 16 kHz ... 30 MHz
- **Sampling rate**:
  - AC: 31.25 kS/s
  - PD: 125 MS/s
- **Peak input levels**:
  - AC: 200 mA
  - PD: 80 V
- **Measurement accuracy**:
  - AC: ±0.25%
  - PD: ±5%
- **Maximum double pulse resolution**: < 200 ns
- **PD event time resolution**: < 2 ns
- **PD filter bandwidth**: 9 kHz ... 5 MHz (10 bandwidth settings)
- **System noise**: < 1 pC
- **Power consumption**: max. 50 W

### Power supply

- **Mains**:
  - AC: 100 V ... 240 V
  - DC: 110 V ... 150 V
- **External battery**: DC: 12 V battery

### Operating conditions

- **Operating temperature**: -30 °C ... +55 °C
- **Storage temperature**: -40 °C ... +80 °C
- **Humidity**: 0 % ... 95 % (non-condensing)
- **Protection class**: IP65

### Mechanical data

- **Dimensions (W x D x H)**:
  - MONTESTO 200: 427 x 405 x 150 mm
  - Transportation case: 540 x 550 x 550 mm
- **Weight**:
  - MONTESTO 200: 12 kg / 26.45 lbs
  - With transportation case and accessories: 28.50 kg / 62.83 lb

### Internal PC

- **Processor**: Intel Core i5-6300U CPU
- **Memory RAM**: 8 GB DDR4
- **Storage**: 500 GB, SSD
- **Operating system**: Windows 10

### Application-specific accessories

1. **Terminal box**
   
   Used for convenient plug-and-play connections of permanently-installed PD sensors to MONTESTO 200 without service interruption.

   **Technical Data**
   - **Protection class**: IP 66 (EN 60529)
   - **Input**: 3 or 4 channels equipped with 5m tri-axial cable and connectors
     - TNC 50 Ω female connectors with short circuit dust cap
   - **Output**: 3 or 4 channels
     - Cable glands with outer shield connection
     - Connection point for grounding

2. **MCC coupling capacitors**

   Different MCC coupling capacitors are available for various voltage levels.

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>MCC 117 (Option C)</th>
<th>MCC 124 (Option C)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Uₚ (phase-to-phase)</strong></td>
<td>17.5 kV</td>
<td>24 kV</td>
</tr>
<tr>
<td><strong>Cₚₚ (nominal)</strong></td>
<td>2.0 nF (+/- 15%)</td>
<td>1.0 nF (+/- 15%)</td>
</tr>
<tr>
<td><strong>Withstand Voltage (1 min.)</strong></td>
<td>38 kV</td>
<td>50 kV</td>
</tr>
<tr>
<td><strong>Qₚₚ</strong></td>
<td>&lt; 2 pC @ 20.7 kV</td>
<td>&lt; 2 pC @ 27.6 kV</td>
</tr>
<tr>
<td><strong>Output connector</strong></td>
<td>TNC</td>
<td>TNC</td>
</tr>
</tbody>
</table>
3 CPL 844 bushing tap sensors

A variety of bushing tap sensors are available with adapters for PD measurements on various bushing types. They are included with the Terminal box as part of the CPL 844 Permanent installation kit for bushings.

**Technical Data**
- **Current ranges**: 9 mArms ... 30 mArms, 30 mArms ... 60 mArms, 60 mArms ... 100 mArms
- **Max. output voltage**: 25 V
- **Frequency range**: 16 kHz ... 10 MHz
- **Output connector**: TNC
- **Protection degree**: IP 66
- **Operating temperature**: -40°C ... +90°C (-40°F ... +194°F)
- **Humidity**: up to 95% relative humidity (non-condensing)

4 UHF 620 bandwidth converter

Extends the measuring frequency range up to the VHF/UHF range and makes the detection of partial discharge more sensitive.

**Technical Data**
- **Frequency range**: 100 MHz ... 2000 MHz
- **PD filter bandwidth**: 9 kHz ... 600 kHz (narrow band), 70 MHz (wide band), 1.9 GHz (ultra wide band)
- **Protection class**: IP 66
- **Connection cables**: Included
- **PD event time resolution**: < 2 ns

5 UVS 610 drain valve sensor

Allows PD measurements to be taken in liquid-insulated power transformers via the vent of an oil drain valve (DN50 or DN80).

**Technical Data**
- **Protection class**: IP 66 / IP 67
- **Frequency range**: 150 MHz to 1000 MHz
- **Tightness**: up to 5 bar pressure (at -15 °C to +120 °C / at 5 °F to 248 °F)
- **Insertion depth**: 55 mm to 450 mm / 2.2 inch to 17.7 inches

6 MCT 120 high-frequency CT

The MCT high-frequency current transformer (HFCT) picks up PD signals at a safe distance from high voltage. It is primarily intended for use on ground connections.

**Technical Data**
- **Frequency range (-6 dB)**: 80 kHz ... 40 MHz
- **Inner hole dimensions**: 53.5 mm / 2.11 inches
- **Ferrite core**: Split
- **Output connector**: TNC (including BNC adapter)
OMICRON is an international company serving the electrical power industry with innovative testing and diagnostic solutions. The application of OMICRON products allows users to assess the condition of the primary and secondary equipment on their systems with complete confidence. Services offered in the area of consulting, commissioning, testing, diagnosis and training make the product range complete.

Customers in more than 150 countries rely on the company’s ability to supply leading-edge technology of excellent quality. Service centers on all continents provide a broad base of knowledge and extraordinary customer support. All of this together with our strong network of sales partners is what has made our company a market leader in the electrical power industry.