

NEW

SOKEN

ONLINE PARTIAL DISCHARGE MONITORING & DIAGNOSIS SYSTEM

DAC-PD-10

DAC-PD-10 is an on-line monitoring and diagnostic system for partial discharge (PD) that occurs in three-phase rotating machines. Diagnosis can be performed while the machine is in operation, and trends under operating conditions can be checked to detect potential risks at an early stage. With noise-resistant configuration and advanced diagnostic software, DAC-PD-10 can suppresses and isolates noise signals that interfere with on-line measurement.

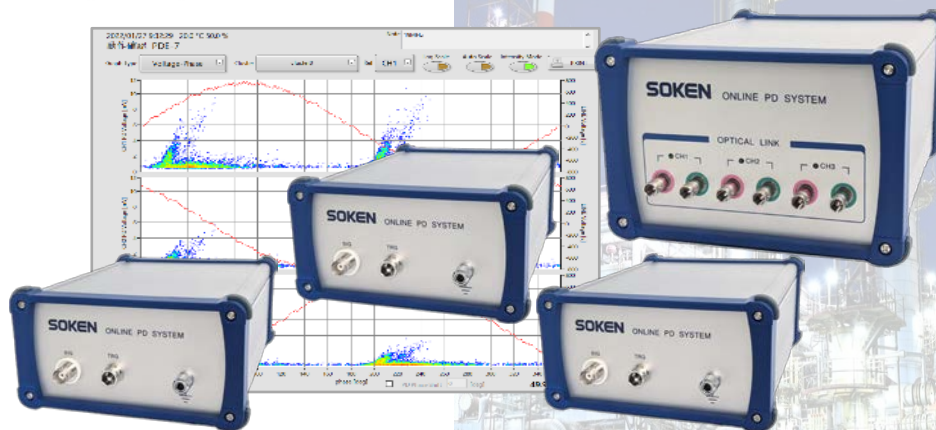
Accurate PD pattern analysis enables estimation of the cause and location of PD occurrence. Reliable risk assessments contribute to safe machine performance and operation.

Application

Online PD measurement on:

- Hydroelectric Generators
- Thermal power generators
- High-voltage electric motors

- Easy diagnosis without shutting down the facilities.
- Monitoring diagnosis enables early detection of insulation defects.
- Diagnosis can be performed even during full operation of the facilities.
- Locations where PD is occurring are identified with PD waveforms.
- Accurate risk perception enables effective maintenance planning.



SOKEN ELECTRIC CO., LTD.

ONLINE PARTIAL DISCHARGE MONITORING & DIAGNOSIS SYSTEM DAC-PD-10

Need for Online Analysis

In order to support social life, it is essential to properly maintain and renew infrastructure. The rate of aging infrastructure is expected to accelerate rapidly in the future, and a shift to "Preventive maintenance" is required to ensure safety and security while saving management costs. On-line diagnostics enable easy risk assessment without shutting down facilities, effectively supporting preventive maintenance.

Importance of Partial Discharge

Partial discharge testing is an effective method to check the condition and defects of insulation materials that cannot be determined from the external appearance. Particularly, partial discharges that occur during operation in high-voltage rotating machines contain information caused by insulation degradation. By diagnosing and analyzing these PD signals with DAC-PD-10, it is possible to identify defective locations, detect potential risks before they lead to failure, and realize stable operations.

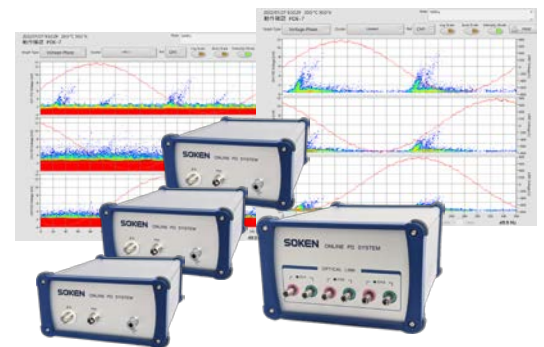
Features of DAC-PD-10

On-line monitoring partial discharge in high-voltage rotating machines.

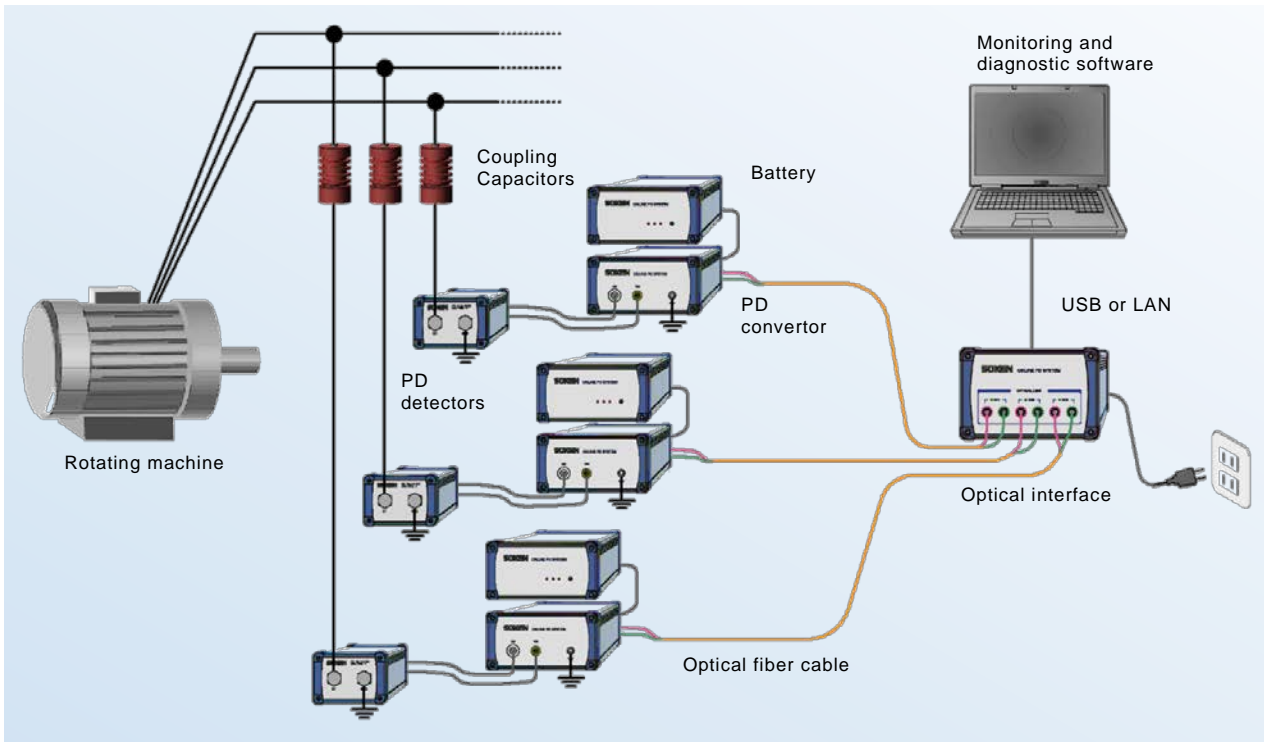
Separates partial discharge from noise and accurately assesses risk.

Reduces maintenance costs, contributing to higher equipment productivity.

- Adapting fiber-optic cable and battery operation realizes safe operation and improves signal-noise ratio.
- PD can be separated from noises by software processing.
- Center frequency and bandwidth can be specified from a wide frequency range.
- Accurate risk assessment is possible by analyzing the discriminated PD signals.
- The progress of insulation degradation can be predicted based on changes in the trend graph.
- Alarm and report output functions support estimation of failure timing.
- Data collection and remote monitoring through LAN are available.



System Configuration (example)



PD Convector (3 units)

Converts measurement signals from each phase into digital data.



Detector (3 units)

Detects signals from coupling capacitors. (Also used as a voltage divider)
 Frequency bandwidth: 600kHz to 40MHz
 Max current usage: 50mA
 Test frequency: 10Hz to 400Hz
 Voltage-divider capacitor: 0.47μF



Optical interface (1 unit)

Controls each PD convector and performs fully synchronous measurement. Transmit signals from optical fiber to a PC.



Battery (3units)

Power for driving PD converters.



Coupling capacitor

Capacitors made of highly reliable epoxy.
 Rated voltage / Capacitance
 12kV / 150 pF
 24kV / 125 pF
 36kV / 83.3 pF



High frequency CT

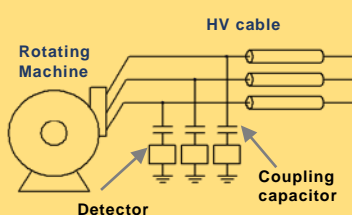
Split type CT supporting wide frequency bandwidth.
 Frequency bandwidth: 10kHz to 100MHz
 Max current: 39.3A
 Aperture: φ31mm



Detection Method

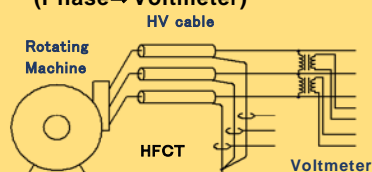
The detection method can be selected according to the target machine.

■ Coupling Capacitor method



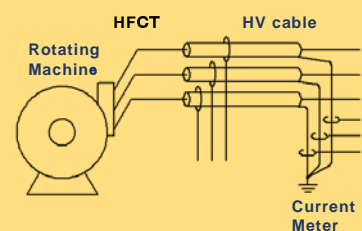
■ HFCT Method

(Phase ⇒ Voltmeter)



■ HFCT Method

(Phase ⇒ Current meter)

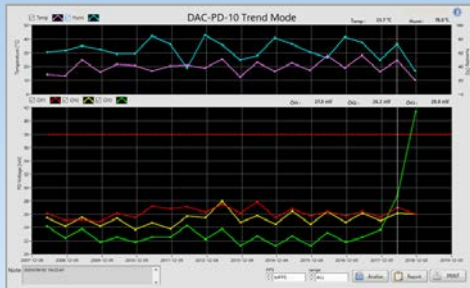


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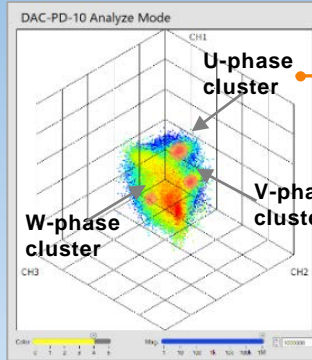
Analysis and Diagnostic Software

The measurement signal of each phase is converted to digital data, and noise and PD are identified at each point of occurrence.

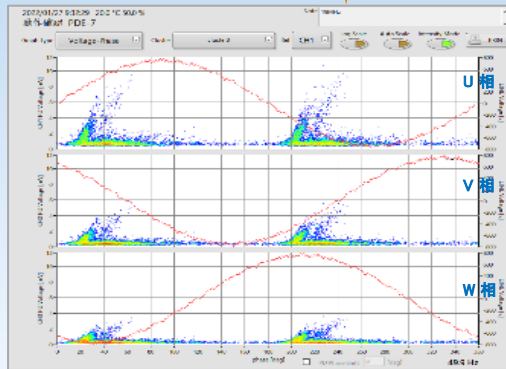
- Prediction of insulation degradation**
 Accumulates past measurement data and displays it as trend graphs. Changes in the graph enable early detection of trends in insulation deterioration and signs of failure.



As insulation degradation progresses, partial discharge magnitude (Qm) becomes larger. When Qm shows a sharp increasing trend on the graph, plot the data on a three-phase correlation diagram to identify whether the cause of increase is PD or noise.



- 3-phase correlation diagram**
 In the 3-phase correlation diagram, PD signals are concentrated near the axis of the generative phase, while the noise is centered or dispersed. By extracting the PD signals and plotting it on Q-φ graph, it is possible to evaluate the factors and risks of the PD.



Q-φ Graph (U-Phase)

Separated PDs can be extracted individually for further analysis. Accurate evaluation can be performed by assuming the location of partial discharge.

Specifications

| PD Converter | | | Optical Interface | | | |
|-------------------------|-----------------------|--|-----------------------|--------------------------------|-------------------------------|---------------|
| Partial Discharge Input | Input Impedance | 50Ω | Optical Interface | Connector | ST | |
| | Input Voltage range | 0 to 25Vp-p 0 to 3.5Vrms | | Number of Port | 3 | |
| | Center frequency | 5MHz to 40MHz | USB Interface | Connector | Type-B | |
| | Frequency Band width | 1MHz, 3MHz | | Standard | USB2.0/1.1 | |
| | Attenuator | -20dB | LAN Interface | Connector | RJ-45 | |
| | Peak Hold Time | 5us | | Standard | 10BASE-T/100BASE-TX | |
| | Dynamic range | 70dB | Number of Port | 1 | | |
| PD Resolution | 38uV | Size/Power | Size and weight | W151xH101xD200(mm) about 1600g | | |
| Test Voltage Input | Input Impedance | | 2MΩ | Power Voltage | AC100V ~ 240V±10% 50/60Hz | |
| Test Voltage Input | Input Voltage range | 0 to 110Vrms | Battery | | | |
| | Input Frequency range | 10Hz to 400Hz | Battery type | NiMH battery | | |
| Interface | Connector | ST | Output Specifications | Output voltage | DC12V | Nominal Value |
| | Light Wavelength | 820nm | | Capacitance | 3800mAh(45.6Wh) | Nominal Value |
| | Transfer rate | 25Mbps | | Life Time | Approx. 9 hours | Nominal Value |
| | Transmission Distance | 3.4km(typ. at25°C) 50/125um Fiber Used | Size/Power | Size and weight | W151xH81xD200(mm) about 1600g | |
| Size/Power | Dimensions/Weight | W151 × H81 × D200(mm) About 900g | | Power Voltage | DC9V to 18V | |
| | Power Voltage | DC9V to 36V | | Charging time | 3.2 hours | Nominal Value |



ISO9001:2015
HEAD OFFICE/FACTORY

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