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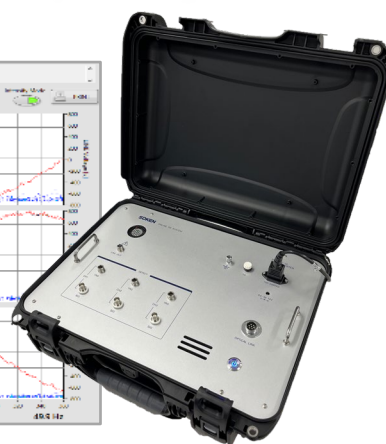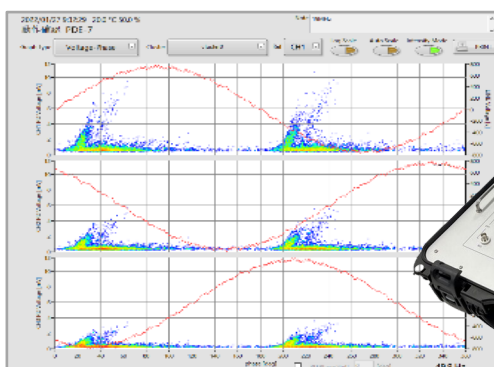
ONLINE PARTIAL DISCHARGE MONITORING & DIAGNOSIS SYSTEM
DAC-PD-10

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 Testing

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.
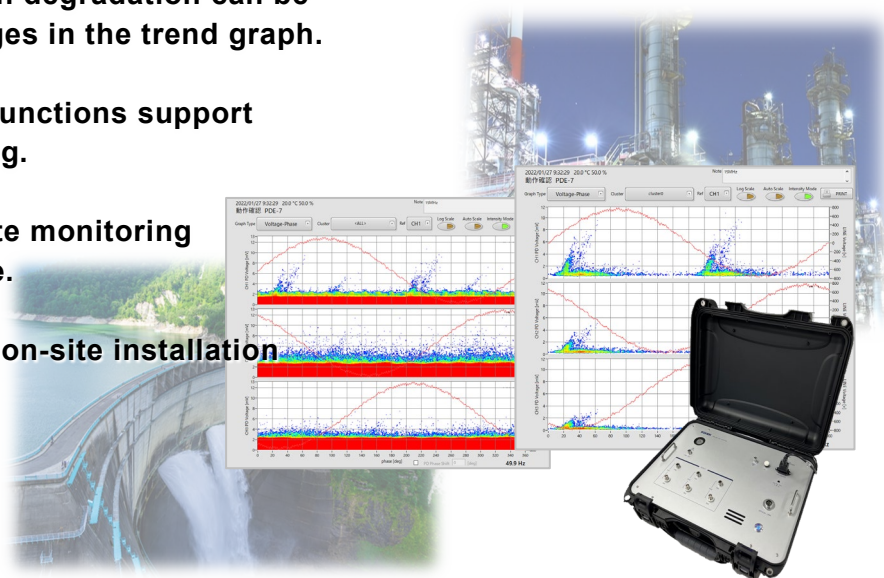
Features of DAC-PD-10

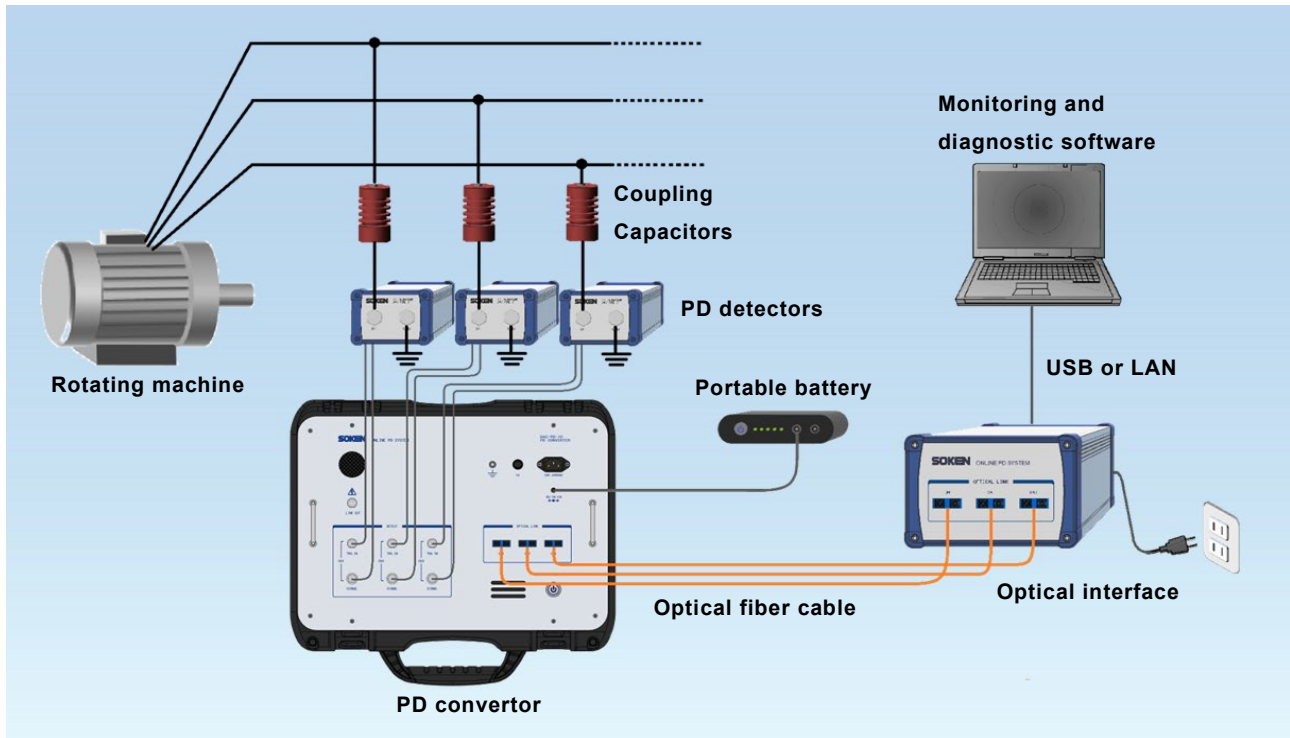**On-line monitoring partial discharge in high-voltage rotating machines.**

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.**

- **Compact design for easy on-site installation**

SOKEN

System Configuration (example)

Monitoring and diagnostic software

Coupling Capacitors

PD detectors

Rotating machine

Portable battery

USB or LAN

Optical interface

Optical fiber cable

PD convertor

PD Convertor

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 converter and performs fully synchronous measurement. Transmit signals from optical fiber to a PC.

Coupling capacitor

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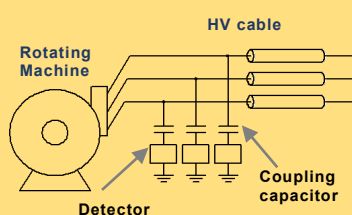| 12kV | / | 150 pF |
| 24kV | / | 125 pF |
| 36kV | / | 83.3 pF |

High frequency CT

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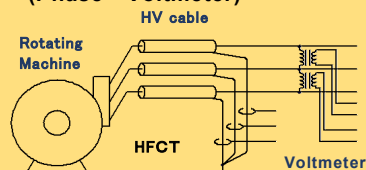Max current: 39.3A
Aperture: φ31mm

Detection Method

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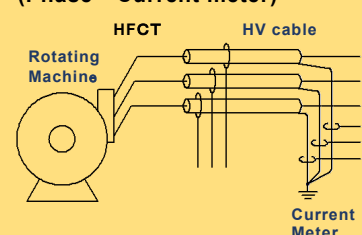

■Coupling Capacitor method

HV cable
Rotating Machine
Coupling capacitor
Detector

■HFCT Method (Phase⇒Voltmeter)

HV cable
Rotating Machine
HFCT
Voltmeter

■HFCT Method (Phase⇒Current meter)

HFCT
HV cable
Rotating Machine
Current Meter

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

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 singes of failure.
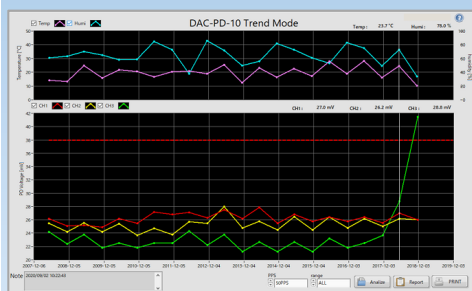

As insulation degradation progresses, partial discharge magnitude (Qm) becomes larger. When Qm shows a sharp increasing trend on the graph, plot the data on a tree-phase correlation diagram to identify whether the cause of increase is PD or noise.
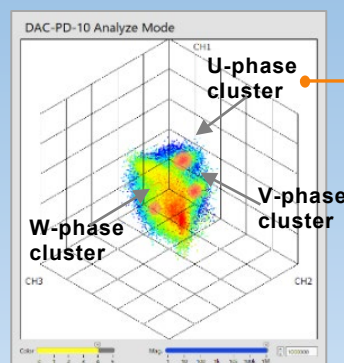
■3-phase correlation diagram

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.
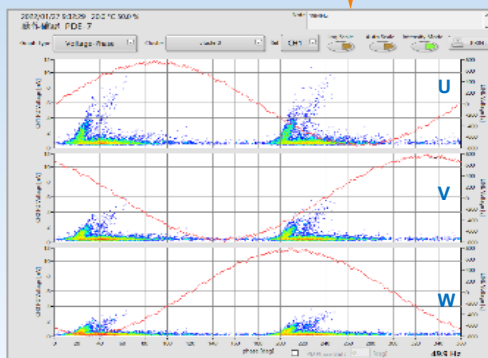
■Q-φ Graph (U-Phase)

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

Specifications

PD Convertor			
Partial Discharge Input	Input Impedance	50Ω	
	Input Voltage Range	0 to 25Vp-p	
		0 to 3.5Vrms	
	Center Frequency	3MHz to 40MHz	
	Frequency Band width	1MHz, 3MHz	
	Attenuator	-20dB	
	Peak Hold Time	5μS	
	Dynamic range	70dB	
	PD Resolution	38μV	
Test Voltage Input	Input Impedance	2MΩ	
	Input Voltage range	0 to 110Vrms	
	Input Frequency range	10Hz to 400Hz	
Interface	Light Wavelength	820nm	
	Transfer rate	25Mbps	
	Transmission distance	50m or more	
Size/Power	Dimensions/Weight	W474 x H178 x D373 (mm)/ About 6000g	
	Power Voltage	DC9V to 36V or AC100V-240V 50/60Hz	

Optical Interface		
USB Interface	Connector	Type-B
	Standard	USB2.0/1.1
	Number of Port	1
LAN Interface	Connector	RJ-45
	Standard	10BASE-T/100BASE-TX
	Number of Port	1
Size/Power	Dimension/Weight	W151 x H101 x D200 (mm)/About 1600g
	Power Voltage	DC12V

Basic Configurations
PD Convertor / Optical interface / Optical fiber cable (10m) / Measurement cables / AC adapter Analysis and Diagnostic Software / Hard-shell case with casters

Options
Coupling capacitor / Detector / High frequency CT / Portable battery / Laptop computer

SOKEN ELECTRIC CO., LTD.
www.soken-jp.com/en
1-34-22, Tobitakyu, Chofu, Tokyo 182-0036 JAPAN
TEL 81-42-490-6929 (Export dept.)   FAX   81-42-490-6806

Sep 2023