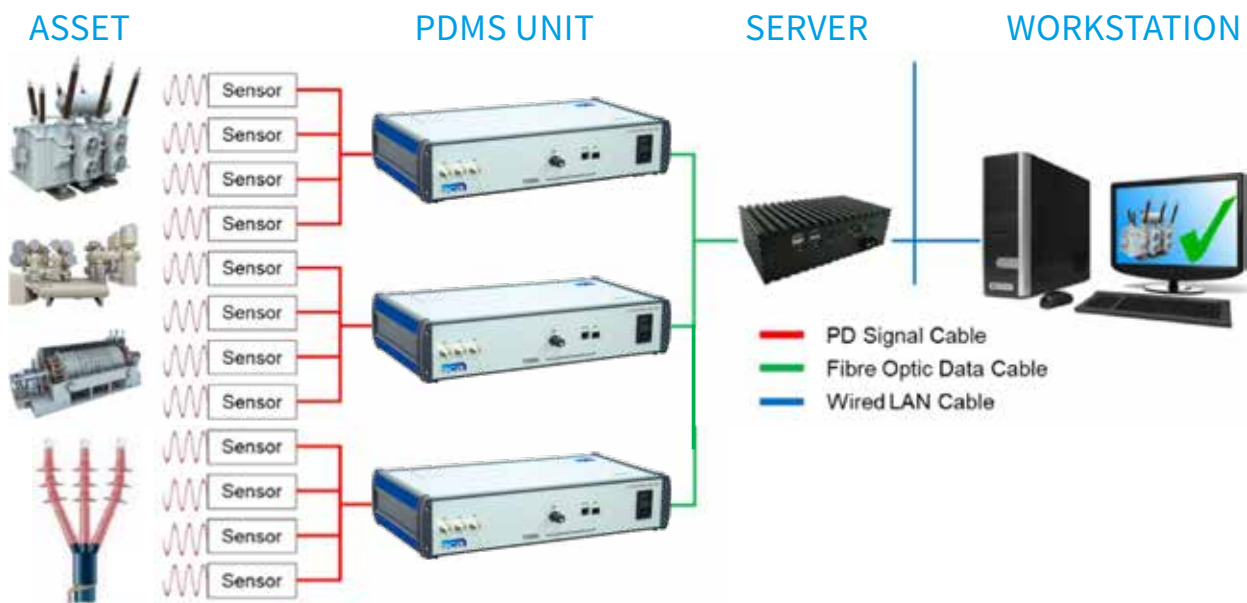


» PDMS Profile

The online Partial Discharge Monitoring System (PDMS) from **aca - Advanced Cable Accessories AG** is a comprehensive monitoring system for assessing performance of the dielectric condition in rotating machines, transformers, GIS and cables. By way of long-term monitoring of partial discharge behavior, the operational reliability of the insulation in critical assets can be assessed on real-time basis. And it helps generate valuable information for maintenance planning and repairs when they are required. Or in many cases PD assessment can help avoid or postpone the inspection and maintenance plans to prioritize the operational availability of the assets.

The key element of the PDMS is the partial discharge data acquisition (DAQ) unit which detects the high frequency PD impulses from the sensors, converts them into data packages sending them via fiber optic cable to the server. The partial discharge data acquisition unit consists of a multiplexer with several inputs as per application, signal conditioning, an analogue/digital converter, a digital signal processor converting the PD impulses to time stamped PD and voltage data.



A PDMS generally includes data acquisition units with sensors and a server together with data visualization, storage and connectivity facilities, such as a workstation or an interface to a SCADA or DCS system. The specific configuration and topology strongly depends on the as-

sets to be monitored and requirements to data acquisition and analysis.

The DAQ unit are integrated in a single housing. They are assembled in a weatherproof Ingress Protection (IP) class IP55 cabinet.

SENSING FEATURES

- » Meets applicable IEC and IEEE standards
- » Covers IEC, broadband and UHF frequency range
- » High sensitivity, excellent signal to noise ratio

» PDMS DAQ Specifications



PARAMETER NAME	VALUE
CONFIGURATION	
DAQ Timing	Multiplexed
PD Input Channels	3 or 4 or 6 channels
SYNCHRONIZATION	External/Internal (Option)
DATA ACQUISITION	
Input Impedance	50 Ω
Measuring Range	0,2 pC...100 nC (IEC) 300 μ V...500 mV (UHF)
Sensitivity	0,1 pc 50 μ V (UHF)
Frequency Range	100 kHz...1 MHz (IEC 60270)/50 kHz...5 MHz/50 kHz...20 MHz (IEC) 50 MHz...2 GHz (UHF)
Sampling Rate	105 MS/s 105 MS/s (after internal UHF conversion)
Vertical Resolution	12 bits
PD event time resolution	9,5 ns
Max double pulses resolution	150 μ s/configurable
OPERATION	
Interfaces	PD input BNC Sync 1 x BNC (option) Data/Control 1 x Fiber Optic
Power Supply	105 – 230 VAC, \leq 20 W
Temperature Range	-20 to +50 $^{\circ}$ C
Humidity Range	0 to 90% relative Humidity (rH), non-condensing
Housing	For integration in outdoor/indoor cabinet

SENSING FEATURES

- » PDMS DAQ Unit includes Sensors & Accessories
- » Operating Manual
- » Software
- » Models: PDM-2-XyMz000, where X= No. of channels, y= No. of sync. inputs, z= IEC /UHF frequency range

» PDMS for rotating machines

PDMS-400

Nowadays, PD detection for rotating machines is based on electrical PD measurement principles as per IEC 60270. The PDMS uses very sensitive on-site PD measurement of insulation defects from generators and motors. These measurements principles are used worldwide.

The bandwidth of the monitoring devices is configurable. The recommended settings are 100 kHz...1 MHz as IEC 60270 and IEC 60034-27 for better sensitivity as well

as higher coverage ratio of generator/motor windings. The DAQ hardware and software is user configurable depending on the specific monitoring requirements. Among the options are number of channels, frequency range and measurement cycle schedule.

The PDMS-400 with 4 PD input channels can be configured with any installation package like PD Coupling Capacitors for PD measurement for generator or motors.

PARAMETER	CD-17	CD-24	CD-36
RATED VOLTAGE	17.5 KV	24 KV	36 KV
Insulation	Reinforced	Reinforced	Reinforced
	Epoxy	Epoxy	Epoxy
Voltage divider ratio	1:750	1:1650	1:2200
Frequency Bandwidth	≥25 MHz	≥25 MHz	≥25 MHz
Signal Output	TNC female jack	TNC female jack	TNC female jack
Weight	2.2 kg	7.5 kg	7.5 kg
Dimension, appr. (mm)	155 X 140	345 X 180	345 X 180
height x diameter			
Additional Items	Installation kit for HV and LV assembly		
High voltage fuse integrated	No	Yes	NO

PRODUCTS:



» CD17



» CD24

RELATED PRODUCTS:

» PD Calibrator C-1

Calibrator for PD Calibration acc. To IEC 60270



» Connection Box CB-3

3 Phase termination and connection box with over voltage protection



» PDMS for transformers and GIS

PDMS-600

Nowadays, Ultra High Frequency (UHF) technology is used for online PD detection for transformers, GIS bays with greater immunity to disturbances and noise to conventional PD detection (IEC 60270) and increases the probability of achieving reliable results, according to IEC 62478-2016.

The recommended bandwidth is 50 MHz...2000 MHz for better sensitivity. The DAQ hardware and software is

user configurable depending on the specific monitoring requirements. Among the options are number of channels and measurement cycle schedule.

The PDMS-600/UHF with 6 PD-UHF input channels can be configured with any installation package like UHF Drain valve Sensor, Bushing Sensor, Hatch Sensor, or other UHF sensor for PD measurement for Transformers and GIS bays.

SPECIFICATION UHF DRAIN VALVE SENSOR

PARAMETER	VALUE
Bandwidth	100...2000 MHz
Dimension of the UHF Sensors	Oil drain valve to be assessed
UHF Connector	N-f-Typ
UHF Output Impedance	50 Ω
Oil Pressure	0...5 bar (0...0.5 MPa)
Temperature Range	-15 °C...+120 °C

» UHF Drain Valve Sensor



SPECIFICATION UHF BUSHING SENSOR

PARAMETER	VALUE
Bandwidth	100...900 MHz
Dimension of the UHF Sensors	Bushing bottom trunk to be assessed
UHF Connector	TNC female jack
UHF Output Impedance	50 Ω
Temperature Range	-20 °C to +60 °C
Environment	Weatherproof

» UHF Bushing Sensor



SPECIFICATION UHF CT-1 SENSOR

PARAMETER	VALUE
Bandwidth	100...900 MHz
Dimension of the UHF Sensors	Oil drain valve to be assessed
UHF Connector	TNC female jack
UHF Output Impedance	50 Ω
Temperature Range	-15 °C...+120 °C

» UHF CT-1 Sensor



RELATED PRODUCTS: » **Pulse Generator PG-1:** UHF Pulse injector

» PDMS for AIS and GIS cables PDMS-400

Nowadays, PD detection for cables is based on electrical PD measurement principles as per IEC 60270. The PDMS uses very sensitive on-site PD measurement of insulation defects from cables and cable accessories. These measurements principles are used worldwide. The bandwidth of the monitoring devices is configurable. The recommended settings are 100 kHz...1 MHz as IEC 60270 for better sensitivity to measure PD's on cables, cable terminations and cable joints. The DAQ hardware

and software is user configurable depending on the specific monitoring requirements. Among the options are number of channels, frequency range and measurement cycle schedule.

The PDMS-400 with 4 PD input channels can be configured with any installation package like high frequency current transformers HFCT to measure the PD on cables and cable accessories.

SPECIFICATION HFCT SENSOR

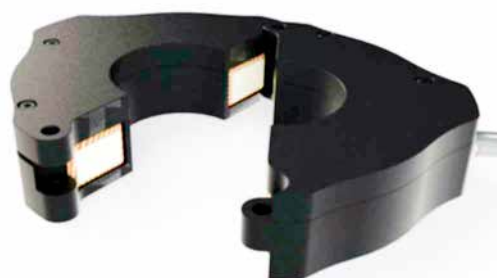
PARAMETER	VALUE
Bandwidth	50 kHz...20 MHz
Dimension of the UHF Sensors	Split core for easy installation
Connector	N-f-Typ
Output Impedance	50 Ω
Rated Current	Up to 300 A
Temperature Range	-15 °C...+120 °C
Inner diameter	Approx. 52 mm

PRODUCTS:

» HFCT Sensor



» HFCT Sensor



» PDMS-Server, PDMS Suite features GUI interface

The server for controlling the PDMS DAQ units and processing their raw data is an industrial, passive cooled industrial PC with sufficient processing power to serve up to 5 PDMS or more depending on customer's request. The server could store PD Data for PDMS more than 5 years.

The Server installed PDMS software allows a separate PC to connect to the web interface via IP address on web browser. The IP address for the PDMS website was provided along with the project specification.

SERVER INCLUDES ACCESSORIES:

- » Indoor cabinet
- » Media communicating devices
- » Relay cards with alarm contacts or led indicators for server and PD condition for all monitored assets of the project, depending on request



THE PDMS SYSTEM CONSISTS OF:

- » DAQ units corresponding to the monitored assets (PDMS-400/600, number depends on specific project)
- » Sensors (type and number depends on specific project)
- » Accessories (like Connection box, Splitting box.... depends on specific project)
- » Server (processing unit) including software to serve up to 8...10 PDMS DAQ (servers with better configuration could be used for more than 10 PDMS DAQ)
- » Relay card with user configurable alarm contacts (potential free/led indicator) depending on the specific project
- » Cabinets IP 54 with air conditioner as option
- » Cables and wires as per local substation situation.
- » Workstation (optional supply by aca)

» PDMS-Server, PDMS Suite features GUI interface

The PD Data from the monitoring device at monitored asset are transferred to the substation control room via TCP/IP protocol using fibre optic (FO) cables.

The storage capacity of the server is sufficient to store data of least 5 years regular operation with the default timing schedule.

The PDMS includes a PC workstation which is to be in the control room. It is fitted with necessary hard- & software. The optional by ohv supplied workstation has at least 500 GB hard drive, Ethernet port 1000 Mbps.

Critical spare parts are included in the scope of delivery as well as instructions for their replacement procedure. The datasheet for the components used in the system are part of the delivery.

The monitoring device (DAQ units) are installed in suitable cabinets which meet ingress protection IP54 or better.

The DAQ units is powered by AC/ DC Power supply The PD sensors are correlated with the corresponding monitoring device by proper identification labelling.

The installation and commissioning / standardized calibration process as per IEC is done by the contractor at the time of commissioning the asset.

The PDMS is designed for automatic operation within an unmanned substation. It generates an alarm and emails if suspicious partial discharge activity is measured or the system itself is malfunctioning.

Throughout the lifetime of the system upgrades and updates of the system software are possible to meet the ongoing developments and refinements in PD technology.

The graphical user interface (GUI) using web interface with English, German, Chinese, Vietnamese languages, allows to display the data from monitoring units simultaneously.

THE FOLLOWING CHARTS ARE AVAILABLE ON THE GUI.

» Alarm overview

Overview Trend Measurements Events Alarm overview About PDM database ▶ Testgroup ▶ 2001200011

Active Alarm

Source	Duration	Type	Details for alarm period
2001206011	2020-03-13 11:58:42 - ongoing	No connection (41000)	Events

IN 1 (Electrical) active

Shown measurement (measurement period from 2020-03-15 13:11:01 until 2020-03-16 13:11:13)

CIEC: **0.534 pC** U (RMS): **0.00 p.u.** U (peak max): **0.00 p.u.**

IN 2 (Electrical) active

Shown measurement (measurement period from 2020-03-15 13:11:13 until 2020-03-16 13:11:24)

CIEC: **0.557 pC** U (RMS): **0.00 p.u.** U (peak max): **0.00 p.u.**

IN 3 (Electrical) active

Shown measurement (measurement period from 2020-03-15 13:11:26 until 2020-03-16 13:11:36)

CIEC: **0.552 pC** U (RMS): **0.00 p.u.** U (peak max): **0.00 p.u.**

IN 4 (Electrical) active

Shown measurement (measurement period from 2020-03-15 13:11:38 until 2020-03-16 13:11:49)

CIEC: **0.550 pC** U (RMS): **0.00 p.u.** U (peak max): **0.00 p.u.**

» PDMS-Server, PDMS Suite features GUI interface

» Phase Resolved Partial Discharge Pattern (PRPDP) with highest resolution (0.5° phase resolution)

PD TREND AND PRPD PATTERN WITH HIGH RESOLUTION



- » Trend view of
- » PD maximum amplitude,
- » PD rate (impulses / min) with time,
- » Number of PD events

The trend view allows to freely choose the update period. The historical trends for the complete archived data accumulated over a user defined period can be viewed.

PD TREND WITH MAXIMUM AMPLITUDE, AVERAGE AMPLITUDE



» PDMS-Server, PDMS Suite features GUI interface

All trend plots, reports, PRPDP, views can be printed out. Report generation is available as Word reports. The data archive allows access to historical data and files with date and time stamp.

PDMS Suite has different password protected user configurable logins to view the status of the monitoring system and configure the settings and alarm parameters. Any items/accessories necessary to make the system fully functional for the trouble-free online PD monitoring

of the Asset installation shall be considered as included in the scope.

A burn in test is done to ensure trouble free installation at client's site.

The scope covers engineering, supply, installation, testing and commissioning of partial discharge continuous monitoring system, with all necessary auxiliaries and accessories to make a complete system as per technical specification, including site demonstration of successful operation at site.

PD EVENT

Source	Duration	Type	Details for alarm period
2001200011	2020-02-13 11:58:42 - ongoing	No connection (41000)	Events
2001200011 IN 1	2020-03-09 13:29:23 - 2020-03-11 13:53:23	HNQ limit reached (51001)	Events / Evaluations
2001200011 IN 4	2020-03-09 13:38:04 - 2020-03-11 13:48:52	HNQ limit reached (51001)	Events / Evaluations
2001200011 IN 3	2020-03-09 13:37:52 - 2020-03-11 13:32:49	HNQ limit reached (51001)	Events / Evaluations
2001200011 IN 2	2020-03-09 13:37:39 - 2020-03-11 13:53:23	HNQ limit reached (51001)	Events / Evaluations

DETAIL PD WITH PD RATE (IMPULSES/MIN) WITH TIME, PD STATISTIC AND PRPDP PD STATISTIC

