

GLOBAL MONITORING for Rotating Machines



ALTANOVA
GROUP

Advanced testing and monitoring solutions

TECHIMP

isa

intelliSAW

Partial Discharge Testing and Monitoring on Rotating Machines

Motors and Generators are complex electro mechanical systems exposed to different **stress factors**: thermal, electrical, ambient and mechanical (TEAM).

These factors cause the aging of the insulation. By **increasing the stress** due to load changes, overvoltages or hazardous ambient areas, the **ageing can be accelerated**.

In order to **prevent a break down** of the machine before the end of the design life, monitoring will help to identify and to implement the right operation and **maintenance strategy**.

TECHIMP - ALTANOVA GROUP offers a wide range of testing services and continuous monitoring solutions from individual motors up to complete power plants.

Benefits of PD monitoring

- Early detection of incipient insulation faults
- Asset Maximization of productivity & availability
- Avoid high repair costs due to unpredicted failures
- Assets' extended life cycles
- Maintenance plan optimization

Causes of insulation degradation

The causes that can lead to a faster aging of insulation are different. We classified them as

TEAM stresses:

THERMAL stress

Thermal cycles (expansion and contractions) due to different load conditions

ELECTRICAL stress

- Breaking of polymeric chains
- Insulating material degradation aging

AMBIENT stress

Possible ingress of moisture and/or external contaminants

MECHANICAL stress

Vibration and mechanical forces due to both external causes and electromagnetic forces caused by flowing current

Superior data analysis with Techimp T/F - Map®

Techimp - Altanova Group technology allows different Partial Discharge (PD) phenomena to be classified on the basis of their pulse shape and split in different clusters (**T / F - Map®**), so that further analysis can be carried out on each dataset, separately. This enhances the likelihood of PD source identification, even for non - skilled operators. These tools are based upon the **SID (Separation, Identification, Diagnosis)** strategy which allows noise and disturbance rejection, PD source separation and identification, risk assessment to be achieved.

Main features of T/F - Map®

- Mitigates the noise, enhancing the accuracy of the diagnostics
- Discriminates the PD signals from the heavy noisy environment, (higher testing sensitivity)
- Recognizes the PD signals from different sources.
- High quality recommendations for the proper maintenance planning





Separation

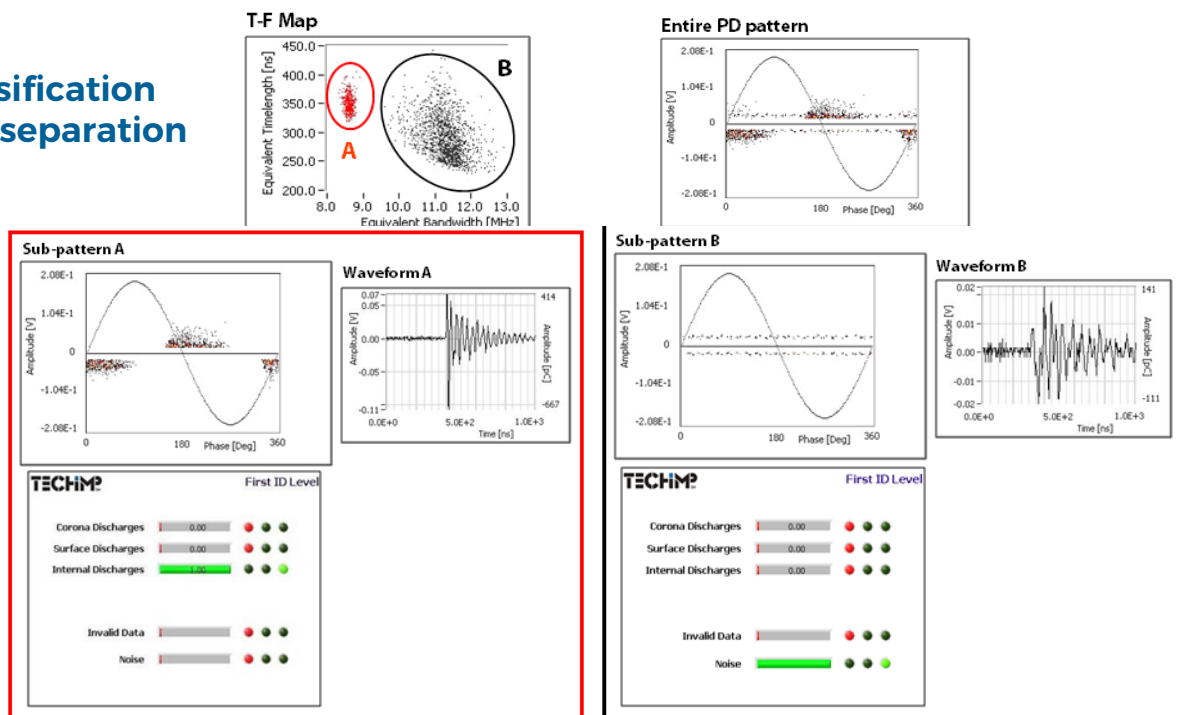


Identification



Diagnosis

Classification and separation



A modular system

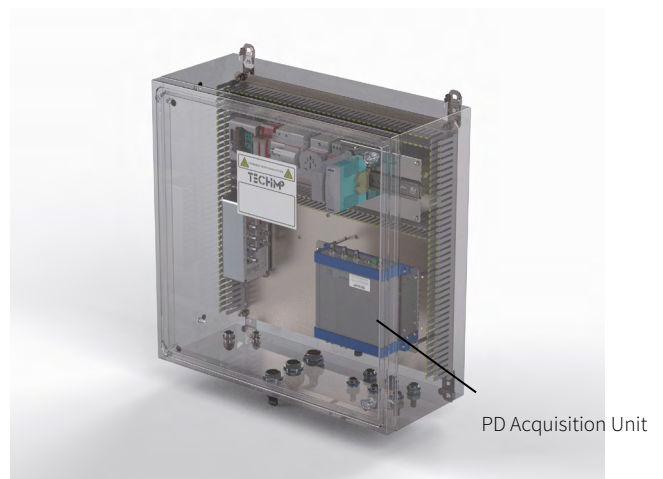
Techimp - Altanova Group Global Monitoring Systems has modular and flexible architecture that allows to design the global monitoring according to the customer requirements and the type of asset.

The Global Monitoring system for Motors and Generators includes:

- **PD Hub** including the **PD Acquisition Unit**
- Different kinds of **sensors** according to the type of application
- A **Central Unit** with monitoring software **TiSCADA** that shows data, trends and current profiles and it allows data analysis.

PD Hub and Cabinet

The PD Hub is the core of the PD monitoring system and is available as a 3, 6, 9 and 12-channel device. Its UWB acquisition unit operates from 16kHz to 30MHz with a fast sampling rate of 100MS/s and it captures the entire waveform of a large number of signal sources. The T - F map allows to differentiate between different pulses with different shapes (T-F map) hence improving the Signal to Noise Ratio (SNR) and collect mainly pulses related to PD activity. The unit is powered and protected by a LV switchboard. The PD Hub is available in IP65 as well as IP68.



PD HubTM

Sensors

Coupling capacitors are high performance sensors used specifically for testing and monitoring motors and generators. These types of sensors offer both the PD and SYNC signals references, allowing a thorough investigation of the signal

originating from inside the asset they are connected to Techimp Couplers. Techimp Couplers are individually tested according to the following international standards: IEC60358, IEC60694, IEC60270. Coupling capacitors are available in different sizes:



TCC 7.2

Rated voltage 7.2kV



TCC 12

Rated voltage 12kV



TCC 17.5

Rated voltage 17.5kV



TCC 24

Rated voltage 24kV

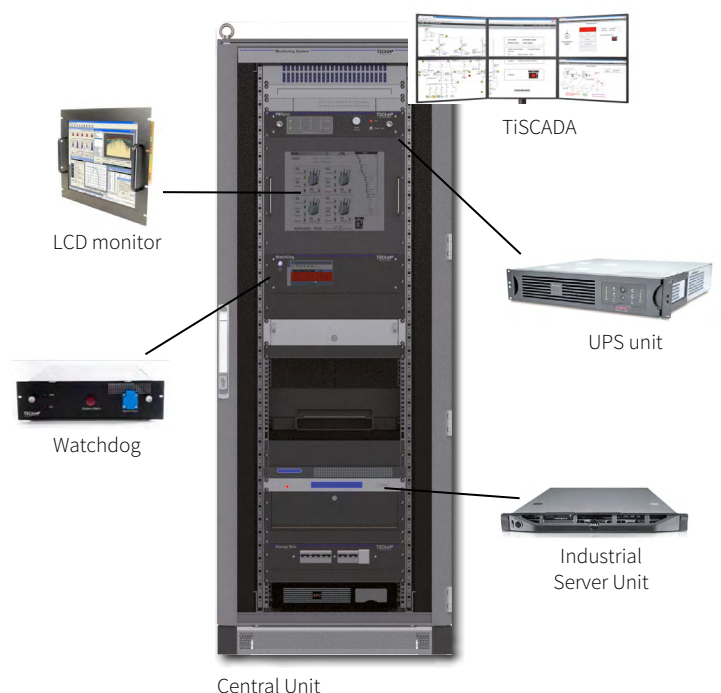
Central Unit

The central unit is a 19" rack cabinet containing the server and the processing software. The server is an industrial PC with redundant hard drives and power supplies, to ensure maximum reliability.

The software is supplied as virtualized system (Virtual Machine), so it can be easily restored and moved to other machines. The central unit contains also an industrial monitor and a keyboard/mouse. It can be provided with an UPS and a WatchDog unit capable to notify system alarms.

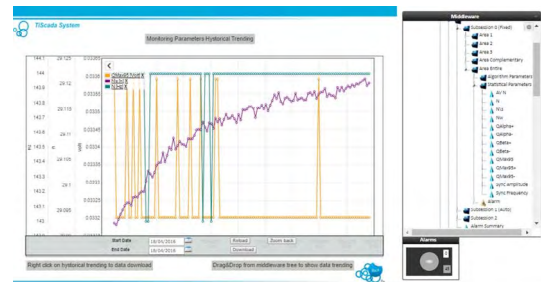
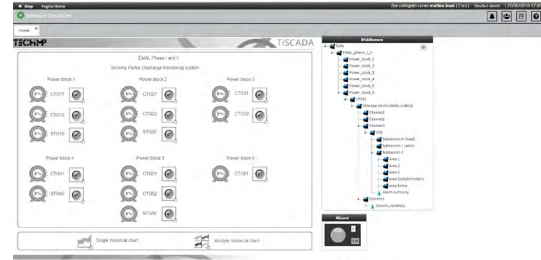
Central Unit's "Rack configuration" consists of:

- Industrial rack 42U
- Industrial Server unit
- WatchDog unit & Managed Ethernet switch
- 17" LCD monitor + keyboard (rack mounted)
- UPS unit
- TiSCADA Software Suite



TISCADA

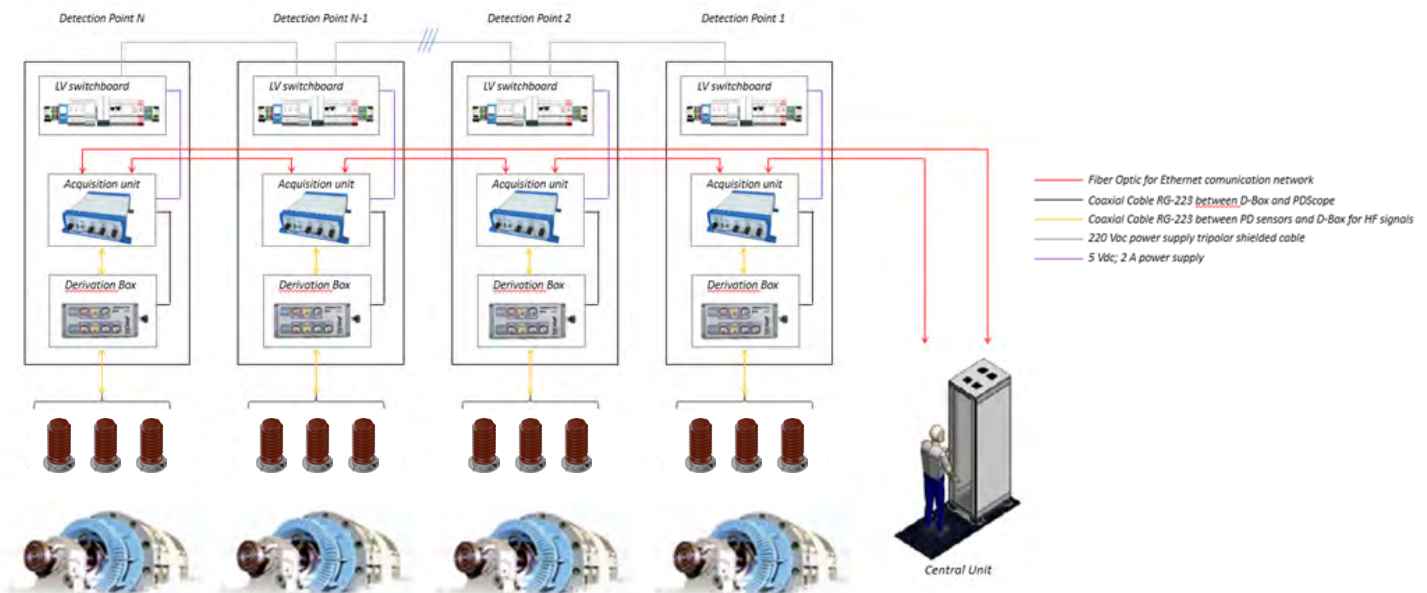
The graphical interface of the TECHIMP PD Monitoring System (TiSCADA) reports the status of the monitored electrical assets in a single synoptic screen (named “synoptic view”). This screen allows to spot any part of the insulation system affected by partial discharges. In addition it is possible to analyze acquired data, to plot data trending and to perform advanced queries to the Database (e.g. comparing data among equipments of the same plant, among the phases of the same EUT, the PD data can be correlated with the trend of other monitored quantities such as temperature, load, etc...). Thanks to the Web Server, the graphical interface of the system can be accessed locally or by any other user connected (by means of LAN or modem) to the Central Control unit, with proper login credentials, allowing maintenance personnel and asset management to access the PDM data with no need of dedicated software.



Global monitoring system layout

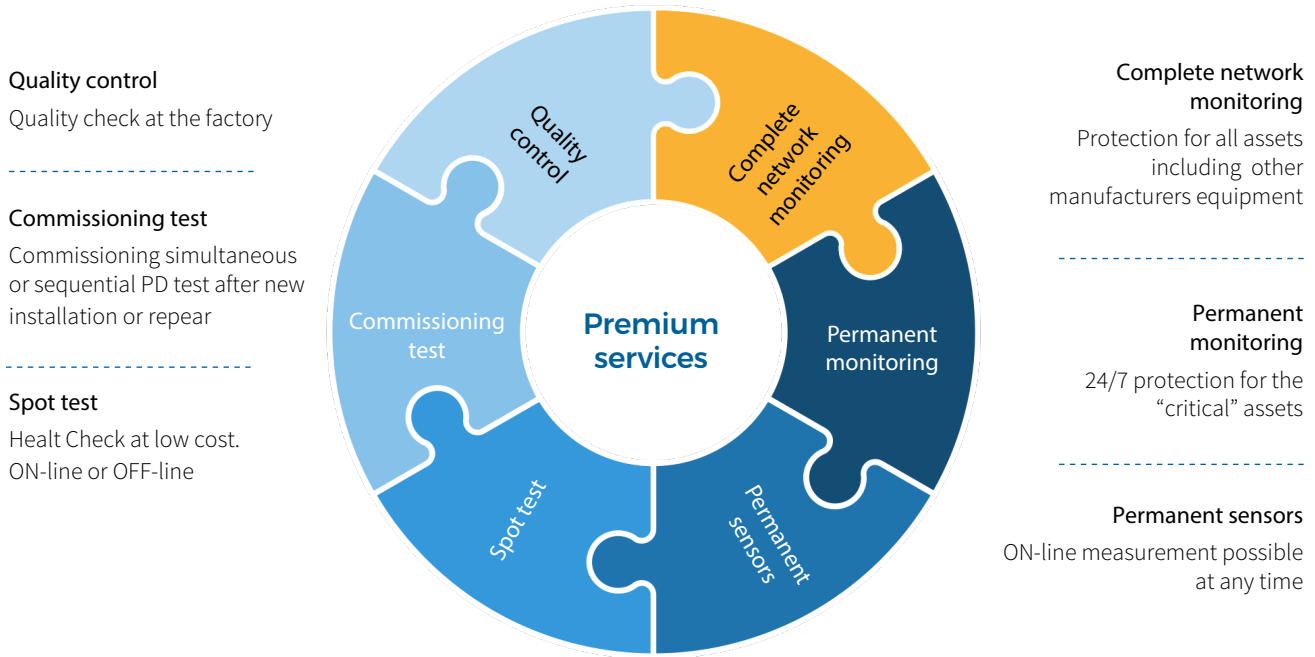
The PD Hub shall be powered by a low voltage power feeder through the protection switchboard installed inside. All PD Hub and the central unit are connected together by means of a fiber optic network. This network is designed as a ring, in order to

prevent a failure in the communication in case of interruption of one segment of fiber. The fiber optic can be either single-mode or multi-mode, terminated with ST connectors.



Premium Services on Motors & Generators

With **more than 4000 services and installations** in any type of electrical asset and for any electrical apparatus Techimp has reached the excellence in converting research and innovation into practical, field-proven applications.



Off-line measurements and laboratory analysis

AQUILA all-in-one portable PD Acquisition Unit



AQUILA has been designed for being a robust and compact portable all-in-one PD detection station providing a full range of options ideal for on field applications. It can cope with the toughest outdoor conditions while taking measurements on any electrical asset. 15 years of service experience has been condensed in this unit integrating TECHIMP innovative PD detection technology with multiple connectivity (Wi-Fi, Fiber Optics) and power supply. The battery-powered unit allows testing activities for up to 10 hours without auxiliary power available. The setup of the unit is simple and fast allowing for taking measurements within minutes. The most outstanding feature is that it can be used for testing of MV and HV cables, power and distribution transformers, motors and generators, GIS and MV switchgears together with the right combination of sensors and filters. AQUILA can be used to measure on-line and off-line any electrical asset at any level of voltage and for any voltage waveform. It can be also used to install a permanent monitoring system, maintaining the needed degree of safety. The connection via fiber optic allows a network of acquisition units to be checked in different measurement points.

PDBASE II® Laboratory and factory test analysis



PDBase II® has your PRPD (Phase Resolved Partial Discharge) ever been effected by two or more PD activities and overlapping noise at the same time?

PDBase II® has been designed as a system able to collect a large number of PD pulses and separate them according to their waveform. It is common that PD activities overlap the noise at the same time. Techimp technology is based on the principle that efficient separation and identification of PD data can be achieved collecting PD pulses themselves and not only, as digital instrumentation commonly available does, PD pulse peak and phase.

- Innovative instrument for Partial Discharge recording & processing
- Ultra Wide band, fast integrated processing capability
- Up to 6 PD Channels, external or line
- Powerful, PD Pulse detector and Waveform analyzer
- Fuzzy logic diagnostic tools and statistical processing
- IEC 60270 compliant

Technical Specifications

PD HUB		PD SCOPE	
Material	Steel, painted RAL 7035 (other colours and materials available)	PD Channels	3 based UWB Channels (expandable to 6)
Communication	Ethernet RJ45 and/or fiber optic ST	Bandwidth	16kHz-30MHz, built in UWB filter (extendable to 3GHz with external Frequency Shifter, installed in the PDHub)
Protection degree	IP 65 - IP 68	Resolution	10 bit
Dimensions	600x600x221mm (PDHub-3&6CH) ; 800x800x250mm (PDHub-12CH)	Input Impedance	50 Ohm
Weight	Approx. 35kg (PDHub-3&6CH) ; Approx 50kg (PDHub-12CH)	Connectors type	BNC
Power requirement	50W MAX for standard configuration ; 240VAC 50/60Hz (other on request)	Sampling rate	100 MS/s
Working temperature range	Standard -5°C ÷ +50°C - Extended with heating option: -20° ÷ +50°C - Extended with cooling option: -5°C ÷ +65°C - Extended with heating and cooling option: -20° ÷ +65°C		

Capacitive Coupler TCC 7.2		Capacitive Coupler TCC 12	
Capacitance	1100 pF ±20%	Capacitance	1200 pF ±10%
High voltage frequency range	50÷60 Hz	Capacitor type	Ceramic
Rated Voltage (phase-to-phase)	7.2 kVrms	Body material	Epoxy resin
VOU @ Rated voltage	1.1 Vrms	High voltage frequency range	50÷60 Hz
High pass cut frequency (-6dB)	150 kHz	Rated Voltage (phase-to-phase)	12 kVrms
AC voltage withstand	20 kVrms	VOU @ Rated voltage	2.0 Vrms
DC voltage withstand	45 kVrms	High pass cut frequency (-6dB)	85 kHz
Lightning pulse withstand	65 kVpeak	AC voltage withstand	28 kVrms
Creepage distance (IEC60815)	>140 mm (medium level pollution)	DC voltage withstand	75 kVpeak
Tan delta	< 1.0 %	Lightning pulse withstand	75 kVpeak
PD level @8kV / 50Hz	<5 pC	Creepage distance (IEC60815)	240mm (medium level pollution)
		Tan delta	<0.3%
		PD level @11.1kV / 50Hz	<2pC

Capacitive Coupler TCC 17.5		Capacitive Coupler TCC 24	
Capacitance	1000 pF ±10%	Capacitance	1000 pF ±10%
Capacitor type	Ceramic	Capacitor type	Ceramic
Body material - Coating varnish	Epoxy resin	Body material - Coating varnish	Epoxy resin
High voltage frequency range	50÷60 Hz	High voltage frequency range	50÷60 Hz
Rated Voltage (phase-to-phase)	17.5 kVrms	Rated Voltage (phase-to-phase)	24 kVrms
VOU @ Rated voltage	1.5 Vrms	VOU @ Rated voltage	2.0 Vrms
High pass cut frequency (-6dB)	170 kHz	High pass cut frequency (-6dB)	170 kHz
AC voltage withstand	38 kVrms	AC voltage withstand	50 kVrms
DC voltage withstand	95 kVpeak	DC voltage withstand	125kVpeak
Lightning pulse withstand	95 kVpeak	Lightning pulse withstand	125kVpeak
Creepage distance (IEC60815)	351mm (medium level pollution)	Creepage distance (IEC60815)	481mm (medium level pollution)
Tan delta	<0.3%	Tan delta	<0.3%
PD level @11.1kV / 50Hz	<2pC	PD level @11.1kV / 50Hz	<2pC

ALTANOVA is a leading company in the field of condition based monitoring and diagnostics of electrical apparatus. ALTANOVA has its roots in two strong and long experienced companies well set in the market of testing and monitoring: ISA and TECHIMP. The merger of the two companies provides synergies for the benefit of our customers in terms of giving access to new solutions and technologies.

ALTANOVA serves customers in more than 100 countries and operates with local offices in Germany, US, India, Singapore, Brazil and U.A.E.

We provide solutions covering a wide spectrum of industrial segments such as, transmission and distribution, oil & gas, process industries, EPCs, power generation, renewables, marine and transport and OEMs.

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