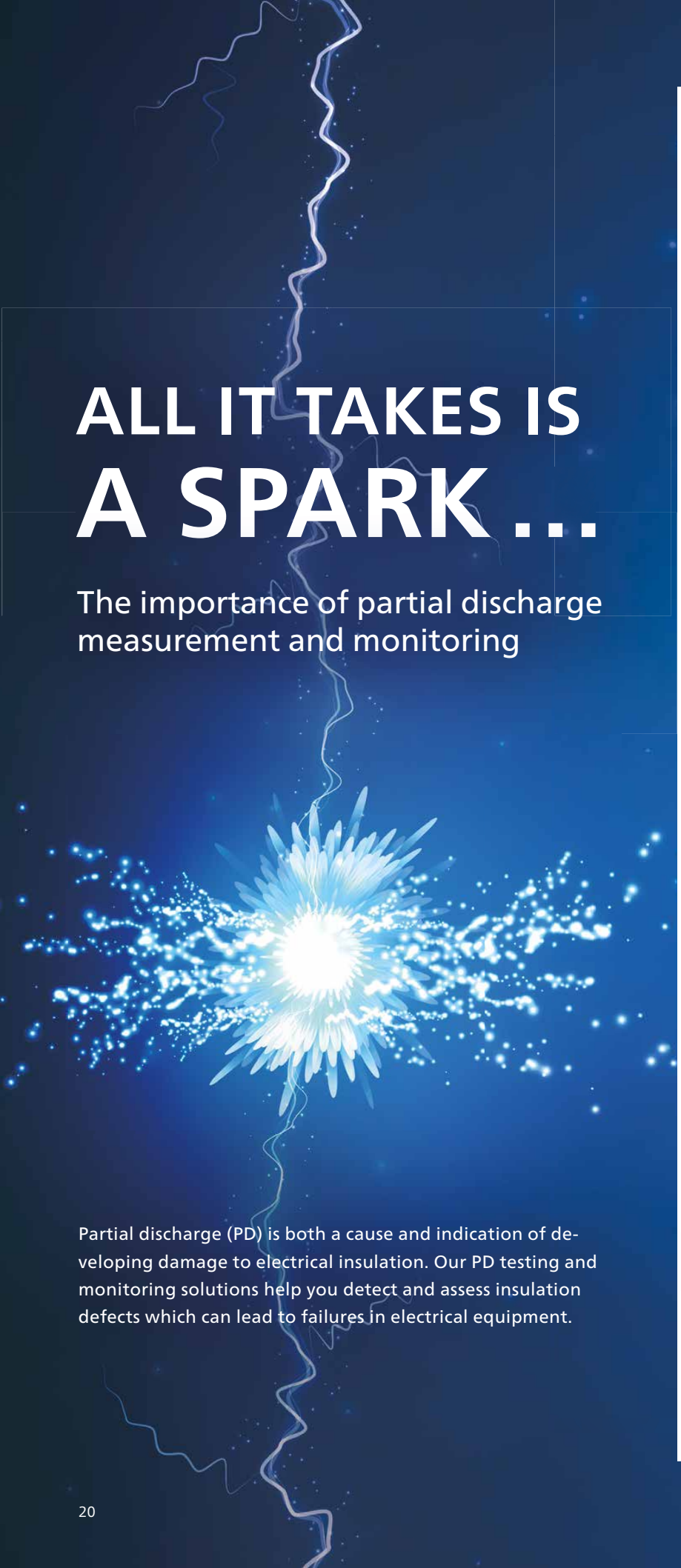

ALL IT TAKES IS A SPARK ...

The importance of partial discharge measurement and monitoring

Partial discharge (PD) is both a cause and indication of developing damage to electrical insulation. Our PD testing and monitoring solutions help you detect and assess insulation defects which can lead to failures in electrical equipment.

Samuel Scheller, our PD monitoring solutions product manager, explains how PD plays a role in assessing the insulation condition of electrical equipment, as well as when and how our different PD detection solutions are used to keep your electrical equipment running reliably throughout its entire life cycle.

How do insulation defects affect electrical assets?

Insulation defects are a major cause of failure in electrical assets, such as power transformers, rotating machines, power cables, and circuit breakers among others. These defects, such as voids and cracks, can occur in the manufacturing process as well as during transport and onsite installation.

The insulation in electrical equipment also experiences accelerated aging from thermal, electrical, ambient and mechanical stress when in service. Sooner or later, these defects will lead to asset failure. However, performing time-based maintenance will not detect a rapid deterioration in insulation condition, which could lead to a failure that causes an unforeseen outage and costly downtime.

What is partial discharge?

Partial discharge, or PD, is caused by local electrical stress in the insulation or on the surface of the insulation in electrical equipment. It not only indicates insulation defects but it is also responsible for developing them. PD is therefore a good indicator of dielectric condition and is present well in advance of insulation failure.

Over time, PD activity becomes more intense and dangerous, causing progressive damage to electrical insulation. This deterioration can develop to the point where an electrical breakdown, or flashover

occurs, which can result in costly asset damage and an unforeseen outage.

Why measure partial discharge?

PD measurement is the most effective, reliable and non-intrusive dielectric measurement method for early fault detection. It can be performed at any time from the factory to the end of the life cycle. Since PD measurement equipment is very sensitive to PD activity, it can effectively identify weak points in the insulation system and help you diagnose the insulation condition of an electrical asset.

Types of electrical PD detection

There are various methods for measuring PD activity during different stages of an electrical asset's life cycle. Beginning with the development and manufacturing of electrical assets and components, off-line PD measurements are performed with an external high-voltage source during routine and factory testing according to the IEC 60270 standard. These off-line PD measurements ensure that the electrical insulation meets specific quality and performance standards before the assembled asset is delivered and connected to the grid. Off-line PD measurements are also performed onsite during mandatory site acceptance tests in order to ensure that the insulation was not damaged during transport.

	Function / feature	MPD 800	MONTESTO 200	Permanent Monitoring MONCABLO MONGEMO
Off-line diagnosis	Standards compliant continuous real time interactive PD measurements (Inception/ extinction voltage, Q(v) diagnostic diagrams)	✓		
On-line diagnosis	Advanced tools for noise suppression and PD pattern analysis	✓		
	Real-time measurement and trending for hours to days of Q_{WTD}/Q_{IEC} over time (re-occurring PRPD)	✓	✓	
On-line monitoring	Trending over weeks to months of Q_{WTD}/Q_{IEC} over time (re-occurring PRPD)		✓	✓
	Monitoring over years of Q_{WTD} over time (re-occurring PRPD)			✓
Reporting and alarms	System and asset status and alarms		✓	✓
	Automatic PD clustering and asset specific reporting (e. g. RotM PatClass)		✓	✓
	Measurement report	✓		
Interfaces	API	✓		
	Interface to SCADA			✓

*«PD measurement offers a **reliable and non-intrusive method for effectively locating weak points in the insulation system.** It can be performed at any time from the factory to the end of the life cycle.»*

Samuel Scheller,
Product Manager, OMICRON

Thereafter, on-line PD diagnostics play a role in insulation condition assessment for the rest of the asset's service life. Using the grid voltage, PD measurements are performed during commissioning and in-service testing to see if the insulation is able to meet performance standards that can ensure reliable asset operation.

Regular in-service PD measurements help you assess the insulation's condition in order to make informed, strategic decisions about timely repairs or replacing equipment. This enables you to move from a time-based maintenance schedule to a more efficient condition-based one. This transition will save time and costs, while also helping you avoid unnecessary downtime. Post repair measurements that are taken over the course of a few days are able to confirm whether a repair was successful or not.

What role does PD monitoring play?

In addition to diagnostic on-line PD measurements, temporary and permanent PD monitoring both play an increasingly important role in ensuring the reliable, long-term operation of electrical equipment. PD monitoring lets you observe PD activity related to various operational conditions or loads in order to support your asset management decisions.

When an asset is critical or aging, PD monitoring also provides you with reliable indications across the time span of a developing insulation fault. This allows you to perform timely maintenance procedures that prevent failure and unexpected outages.

When it comes to temporary PD monitoring, on-line PD measurement is continued for a day, week, month or even a year in order to obtain a more detailed picture of potential progressive deterioration in the electrical insulation. Permanent, in-service PD monitoring follows the same procedure with long-term insulation condition assessments. This procedure is recommended for electrical assets towards the end of their service life.

What advantages do our PD monitoring systems have?

Our PD monitoring systems have many of the same features as our market-proven MPD PD measurement and analysis technology, including highly sensitive PD measurements, fiber optic connections for added safety; synchronous, multi-channel measurements; real-time data recording and playback; as well as highly effective noise suppression and PD source separation techniques that simplify analysis and defect localization.

In addition, the flexible and scalable system architecture can be easily adapted to various applications – for continuous PD monitoring on a single electrical asset, a complete fleet of assets or a complete cable system with several distributed measurement points. You can use the same software with the same user interface to compare PD data from all of the connected acquisition units. Automatic warnings and alarms immediately alert you when pre-set PD activity thresholds have been violated.