

# Applications - Cables



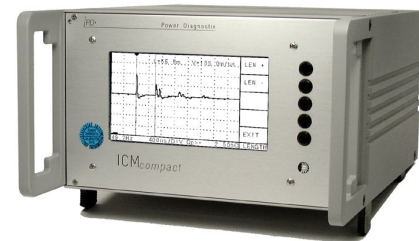
Polyethylene is a 'non-forgiving' insulation system. Thus, close attention must be paid to partial discharge activity during factory testing, commissioning, and service. On-site measurement techniques have to cover the needs of an aging polymeric cable distribution net as well as an increasing application of polyethylene extra high voltage cables.

## Extra High Voltage (EHV) Cables

Cables are generally factory-tested. The accessories of high voltage (HV) and extra high voltage (EHV) cables are usually also pre-tested. However, mechanical forces during the laying, hidden imperfections, and flaws caused by improper handling, for instance, require partial discharge commissioning tests. Ideally, the cable accessories of such transmission-class cables are equipped with embedded sensors. Power Diagnostix introduced this cost-effective principle in 1994 and numerous cable manufacturers have implemented it since then. The ICMsystem, especially if enhanced with the FOsystem for optical isolation, offers powerful tools for the

## Medium Voltage Cables

As with HV and EHV cables, the ICMcompact is used for shop-floor production testing on medium voltage cables. During the past decade numerous cable manufacturers have changed to this instrument during the modernization of their test room.



PD fault location display



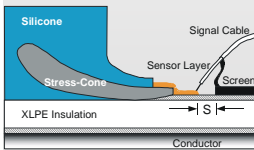
ICMsystem

analysis of the cable insulation system. Additionally, different pre-amplifiers and embedded or external spectrum analyzers complete the instrumentation.

A large population of service-aged medium voltage or distribution-class cables has reached their projected service life, as polymeric cables were increasingly introduced since the 1970ies. The ICMcompact is available in a ready-to-use package for field testing and partial discharge location with any external high voltage source. Especially the combination with very low frequency (VLF) sources and the combination with variable frequency resonant test sets provide lightweight and cost-effective solutions to keep the distribution grid reliable. The package includes a combination of T-filter and coupling unit to de-noise the HV source.



DFS for cable joints



Cable PD sensor



400 kV cable joints



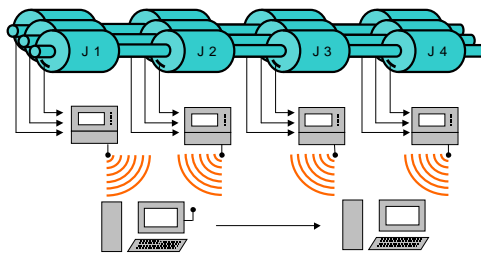
Cable monitoring



CT100 & RPA1

## Special Sensors

Coupling capacitors, as used for factory testing and for off-line testing, are not applicable for on-line testing. Power Diagnostix offers several types of external sensors for PD measurements. The differential foil sensor (DFS) makes use of the stray capacitance of cross-bonding joints and offers comparable low-noise measurements at higher frequencies. The CT100 is a clamp-on HF current transformer that can be used to pick up partial discharge signals on ground leads and on cross-bonding connections. Further sensors including Rogowski coils can be tailor-made for any application. Power Diagnostix also assist with the design and implementation of embedded sensors.

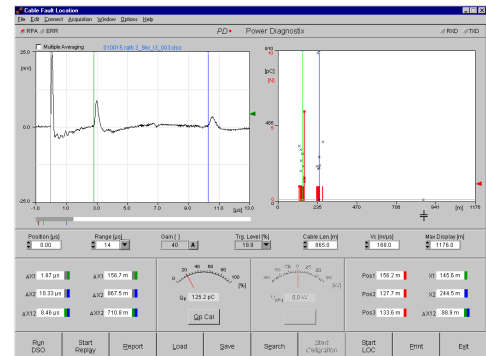


Monitoring system in a cable tunnel with WLAN interconnection

## PD Monitoring

Generally, partial discharge monitoring can take care of any high voltage insulation system to detect incipient breakdown and on-going degradation. The defect mechanisms for cable accessories and for the cable itself differ due to different material properties, for example. When monitoring EHV cables

systems, a comparable long pre-warning time applies to EPR and EPDM accessories, while the cable insulation of a 400 kV XLPE cable, for instance, has a much shorter pre-warning time.



ICMcompact PD fault location software

Further, an installed monitoring system can be used of course also for the commissioning testing of the cable system. Besides using fiber optic TCP/IP interconnection, accessing the instruments via WLAN offers an effortless installation.

## Typical Packages

Mobile PD fault location system consisting of:

- 1x Portable ICMcompact with built-in DSO board
- 1x Software ICMcompact with fault PD fault location
- 1x Coupling capacitor CC25D/V
- 1x Impulse calibrator CAL1B
- 1x Preamplifier RPA1H
- 1x Preamplifier RPA1
- 1x Set of cables

Combining the lightweight ICMcompact for partial discharge location with portable VLF high voltage sources or variable frequency resonant test sets offers cost-effective survey testing of a distribution grid.