SMART CABLE GUARD*

For accurate on-line fault and partial discharge detection and pinpointing exact locations in MV power cables

Improving the SAIDI and SAIFI can be achieved by using 2 patented features of Smart Cable Guard* (SCG) makes this the all-in-one monitoring system for MV power cables.

Feature 1 is SCG’s on-line real-time fault detection, including pinpointing exact fault locations
SCG will detect and locate any fault, independent of the network grounding and short circuit level even if there is no short circuit current flowing. Immediate knowledge of the fault location within a 1% accuracy helps to reduce the repair time and with that the SAIDI. In case a fault occurs in a network with an isolated neutral (where the first fault does not result in an outage - but is detected and accurately located by SCG), a quick repair can even help to avoid a cross-country fault. This contributes to reducing both the SAIDI and SAIFI.

Feature 2 is SCG’s on-line partial discharge detection, including pinpointing exact defect locations
SCG will detect and locate the development of partial discharges from any defect and will monitor its growth. Knowing the location of a defect also within a 1% accuracy can inspire a network owner to replace the weak spot before it results in a breakdown. This will help to reduce both the SAIDI and SAIFI, will enable network owners to plan repair work (at optimal cost) and in most cases enables them to better/faster identify the root causes of defects (compared to analyzing the situation after a complete power failure).

*Smart Cable Guard is registered under the trade mark KEMA Smart Cable Guard®
SCG is installed at both cable circuit ends as shown in the illustration above. The circuit length can be 4 to 12 km (depending on the cable type and local situation). There can be up to eight substations in the monitored cable circuit.

The SCG systems at both cable circuit ends collect the data and transfer it via internet to the SCG server. Via a secured web interface, the network owner can check on partial discharge development or faults at any moment of the day. In case of a fault or intense partial discharge activity, the customer will receive a warning, including the accurate location of the fault or partial discharge activity.

Crucial for the accurate pinpointing of the location of the above mentioned phenomena is the SCG time synchronization, which is based on a practical and patented solution.

The illustration below shows the partial discharge development over time in an XLPE cable. An overheated conductor connector in a joint results in growing partial discharge intensity. In this case the joint was replaced before a fault occurred.

Much like partial discharges, faults are associated with high frequency travelling current waves that pass the sensor with almost the speed of light before the 50 Hz short circuit current appears. By accurately logging the arrival time of the high frequent travelling waves at each cable circuit end, precise and reliable detection and pinpointing of the fault is achieved. The illustration below shows that a fault has occurred pinpointed at 360 meters.

**KEY BENEFITS**

**Concerning the fault detection and location:**
- immediate warnings about a failure location
- reduction of SAIDI, faster repair after a fault
- potentially reducing both SAIDI and SAIFI in networks with an isolated neutral by detecting and locating the first fault
- immediate location of intermittent (self-restoring) and hidden (high ohmic) faults

**Concerning the partial discharge detection and location:**
- partial discharge activity accessible through customer web interface
- warning in case of intense partial discharge growth
- reduction of SAIDI and SAIFI due to removal of weak spots before they develop into a breakdown

**General:**
- reduction and spread of maintenance cost
- no power interruption during installation or daily use
- preventing negative publicity in the media and reducing claims
- increasing the image of innovative and reliable grid management