

Switch over to
reliability.



Intelligent systems for
cable fault location

sebaKMT

Know how to do it. And what happens next.

The SebaKMT concept for reliable cable fault location

Your network quality –
is our duty.



Today, energy producers, providers and service companies in the fields of cable maintenance and fault location are obliged to ensure a high quality supply of energy to customers.

When a fault arises, it costs both time and money. On the one hand the consumers must be reconnected to the network as quickly as possible to keep the financial and goodwill damages as low as possible, on the other hand it is necessary to make the cost-intensive work of service units as efficient as possible.

The use of the right technology, a high level of reliability and components that are easy to operate means that SebaKMT can locate faults in cables and overhead lines quickly, reliably and efficiently.

SebaKMT – reliable cable fault location for efficient network operation.

SebaKMT's product range:
Simple, complete, safe.



► **Simple!**

SebaKMT systems are characterised by simple, intuitive user guidance, modern, easily legible displays and interfaces for data processing. This expands the number of employees who can work in the field of cable fault location – this increases the flexibility and therefore the efficiency of our customers' organisations.

► **Complete range!**

A range for all purposes – the SebaKMT range meets all requirements in terms of testing, pre-location and pinpointing, as well as tools for selecting energy cables. This applies for low, medium and high voltage networks. Please also read our separate information on the subject of testing and diagnosis.

► **Safe!**

Your safety is our utmost priority. Fault location systems make switching operations and are therefore subject to the same safety specifications as our customers' equipment. In addition, our technology and our strict quality assurance system guarantee the highest possible levels of safety for device users.



Pre-location and fault identification in medium-voltage networks.

Hot on the heels of faults...

As fast as possible, as accurately as possible

The aim of pre-location is to localise a fault in a cable as fast and accurately as possible to ensure an optimum basis for subsequent pinpointing.

Flexible: several paths to the target...

SebaKMT offers a wide range of solutions in the field of pre-location. These can be used in an application-specific manner.

The major advantages are:

- ▶ Easy to use



- ▶ Triggering without problems
- ▶ Arc reflection pre-location up to 80 kV
- ▶ High-availability for pre-location
- ▶ Double reflection procedure
- ▶ High levels of accuracy
- ▶ Optimum performance, especially in difficult cases
- ▶ Verification with alternative measurement methods

Our professional team of engineers works continuously to improve existing products as well as working on new innovative technologies.



Teleflex MX



TDR Miniflex

T 30-E

SebaKMT's product range

SebaKMT meets all requirements in the field of pre-location from 2 kV to high-voltage applications up to 400 kV. The central element of fault location is always the reflectometer. The products on offer range from simple, handheld reflectometers, such as the Miniflex or the battery-operated T 30-E, which is easy to use with an intuitive user guidance system, to the top-of-the-range device – the Teleflex. This is used as an MX component in modular systems and as a fully integrated system reflectometer and central operating module in our Centric measuring system.

SebaKMT specialities

The advantages of SebaKMT technology are particularly useful when handling faults that are difficult to locate or which require high ignition voltages due to the great distances involved.

- ▶ Decay voltage method up to 400 kV
- ▶ Current catching to 80 kV
- ▶ ARM* up to 50 kV
- ▶ ARM* arc reflection pre-location up to 50 kV
- ▶ ARM* Plus up to 32 kV
- ▶ Decay Plus up to 80 kV

With the ARM* Plus method a particularly high energy impulse of up to 1.5 kV is used, this allows for trouble-free pre-location especially in the case of longer cable lengths and distances to faults.

Decay Plus – active arc reflection pre-location up to 80 kV. Decay Plus is the logical enhancement of the ARM* Plus technology. Here the fault ignition is conducted using a DC voltage.

One major advantage of ARM* and Decay Plus is the SebaKMT dual pulse process, whereby fault ignition takes place with a higher voltage. Afterwards the combustion duration of the arc is extended by discharging the second pulse module with considerably less voltage, meaning accurate results are possible even with faults which are difficult to trigger.



* Arc Reflection Method

Preventative action

Targeting faults

against cable faults



Pinpointing in medium-voltage cables

As an underground cable never runs in a straight line and tends to meander in depth and direction, an exact transposition of pre-location results to a site is not practically possible. Even with a possible pre-location accuracy of 0.1 % or better, the deviation in the field can be around 5 %. Exact localisation of the fault with pinpoint accuracy is essential for preventing unnecessary excavation work.

Pinpointing using shock discharge generators

In most cases shock discharge generators are used for pinpointing.

As a single device up to 32 kV or as integral component of a system up to 80 kV and up to 3500 joules, these shock discharge generators create a loud flash-over crack by means of a capacitive discharge at the location of the fault. This is pinpointed precisely using an acoustic pinpointing device such as the digiPHONE+. To do this, the time difference between the acoustic signal and the electromagnetic impulse of the shock discharge is evaluated. When searching the cable run in the pre-located fault area, the exact fault location is reached as soon as the shortest time difference is displayed.

Other pinpointing procedures

Short circuits or sheath faults do not cause audible breakdowns and require different technology for their location. For short circuits, audio frequency systems can be used, whereas sheath faults are mostly pinpointed using a pulsed, DC voltage and a step voltage receiver such as the ESG 80.



Sheath testing and fault location

Today, sheath testing is one of the most important tools in preventative maintenance of supply networks. A damaged sheath is a considerable hazard as sooner or later it will inevitably result in a cable fault, which will usually result in interruptions to supply. In addition, sheath damage accelerates water penetration and cable aging and reduces the cable's useful life. Quick detection and rectification of sheath defects can therefore contribute considerably to reducing maintenance costs.

Finding sheath faults. Simple, exact, efficient.

The leakage current is measured during sheath testing. Deviations, which may indicate a sheath fault, can be established using comparative values and previous values.

The subsequent sheath fault location determines the distance to the sheath fault. With the SebaKMT MFM 10, it is possible to quickly limit the location of the fault by specifying the cable length. During sheath fault pinpointing, step voltage measurement is used to exactly locate the sheath fault so that it can be rectified. A second method is to locate the sheath fault using audio frequencies.

A capacitive probe is used, enabling this method to be implemented quickly and effectively even with sealed surfaces with poor conductive qualities such as concrete or asphalt.

SebaKMT's product range

SebaKMT offers a wide range of products for sheath testing and sheath fault location.



Cable fault location in low-voltage networks

Reliable products – exact results

Pre-location

Low-voltage and lighting networks require smaller devices to ensure accurate results even with low voltages of 110 V to 6 kV. To do this the subdivisions of the setting and measuring ranges are adjusted to these network parameters.

SebaKMT offers small portable systems with integrated evaluation, testing, pre-location, pinpointing, fire and sheath fault functions which are suitable for your everyday needs.

SebaKMT specialities

The cable fault location methods in low-voltage networks largely correspond to those in medium voltage networks.

The challenge in low-voltage systems is the complex branching of the cables. In this case, the otherwise extremely accurate reflection measurement technique does not always yield useful results. Fortunately, SebaKMT's specially developed ICE-Plus® system has been designed for this purpose. It ensures that faults can be located reliably, quickly and simply even in networks with a large number of branches. In addition it is possible to specify certain cable

segments and their parameters, which considerably increases the accuracy of measurements.

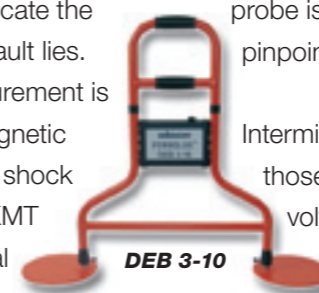


SPG 5-1000

Three ways to the target

Pinpointing

Pinpointing in low-voltage networks may also be performed using shock discharge generators and acoustic pinpointing. In branched networks, it is first necessary to pre-locate the branch where the fault lies. To do this, a measurement is taken using the magnetic field created by the shock impulse; the SebaKMT digiPHONE+ is ideal for this purpose.



As low voltage cables often do not have a screen, the fault is most likely to be due to a lack of insulation against the soil. This can be used for accurate pinpointing by locating the fault over these relatively short distances using step voltage methods.

As most SebaKMT devices and systems supply the required pulsed DC voltage and many users are already equipped with an audio frequency system, only a pinpointing receiver such as the ESG 80, or a capacitive probe is required to accurately pinpoint the fault.

Intermittent faults, such as those that occur in low voltage networks, for example those caused by fluctuating faults, can be located with the Powerfuse. This technology uses an electronic fuse with adjustable triggering criteria instead of a normal fuse.

In the event of a fault, the Powerfuse can be used up to nine times. It also provides the option of storing the distance to

the fault at the moment of interruption using a normal reflection measurement, comparable with ARM technology. The comparison with a functional system indicates the distance to the fault. Its small sizes means that the Powerfuse can also be used in cable distribution cabinets, without needing to make sacrifices in terms of safety. As the Powerfuse works with normal mains voltage, consumers can remain connected to the mains during the fault location procedure.



Powerfuse



Ferrolux FL 10

Cable fault location in high-voltage networks



Earth-laid high-voltage cables

By comparison with low-voltage or medium-voltage cables, high voltage cable networks are usually much better equipped. This means that the network has been constructed with a much higher level of redundancy and operation of the installations is much more complex. Downtimes in this area are correspondingly less likely. On the other hand, these cables are much more important in terms of supply, in particular in densely populated areas. Consequently, technology is required for high voltage cables that enable quick fault location to allow speedy maintenance and reconnection.

The SebaKMT speciality

In the field of high-voltage systems, SebaKMT offers sophisticated systems for testing up to 850 kV DC and for cable fault location up to 400 kV, for example, as an integrated component of a fully equipped test van system.

This also includes the non-destructive partial discharge measurement and localisation with OWTS for rated voltages of up to 250 kV and aging diagnosis for cables with the Cable Diagnostic System. The CDS combines the proven insulation diagnosis technique using RVM

(return voltage method) and IRC (isothermal relaxation current) in a compact, three-phase, portable device.

For more details, please see our separate info brochure on the subject of testing and diagnosis.



850 kV DC test system

Overhead lines

Today, monitoring overhead lines is largely conducted on an optical basis using helicopters. The SebaKMT overhead line measuring unit provides an efficient alternative to this. This is a self sufficient measuring system with a range of up to 1000 kilometres that is also available as an add-on for existing fault location systems.

A safety element ensures that the very high voltages and currents induced on overhead lines can be reliably and safely conducted away to protect both the user and the device. This technology enables the immediate detection of defective insulators, cross-section changes, crossed lines and other faults and changes.

The SebaKMT Systems

Technologies become very effective, when they supplement each other. The SebaKMT test van concept is the heart of the product range. It combines all technologies required for testing and fault location in one system. In connection with the extensive safety concept, the individually

custom tailored test van presents the optimised solution. The Centrix presents the latest generation of these systems. Modern technologies in combination with a surprisingly easy central operation are flexible adaptable to any requirement.



Centrix test van system



Reliable:

Worldwide, we are the leading company for the development and manufacture of measurement equipment for diagnosing the state of a network and for fault location. Our market sectors include electricity supply networks as well as communications and pipe networks.

High performance:

By concentrating on four areas: diagnosis of the state of a network, cable fault location, leak location, CCTV inspection and line location, we are able to offer high performance in each of these areas.

Availability:

SebaKMT has representatives in 130 countries worldwide, with excellently trained staff and the latest technology. We have the densest service and consulting network in the industry. Wherever your international activities may lead you, we will be there to support you.

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