

# The **new Variant:** **cable fault location, testing, and diagnosis** with one **modular system**



## Variant

- Modular setup
- Integrated user guidance
- Ergonomic design
- Highest safety standards

# The Variant – SebaKMT's new all-rounder

With the new Variant, SebaKMT has developed a new fault location system based on approved and reliable technologies.

**The new Variant is designed for cable fault location as well as for testing and diagnosis.**

In the development phase we considered the individual needs of our customers and focused on ergonomics, optimum system speed and user-friendliness, redundancy, and service.

Like its predecessor, the Variant test and fault location system is composed of individual units. For service purposes, these components can be removed from the desk/rack.



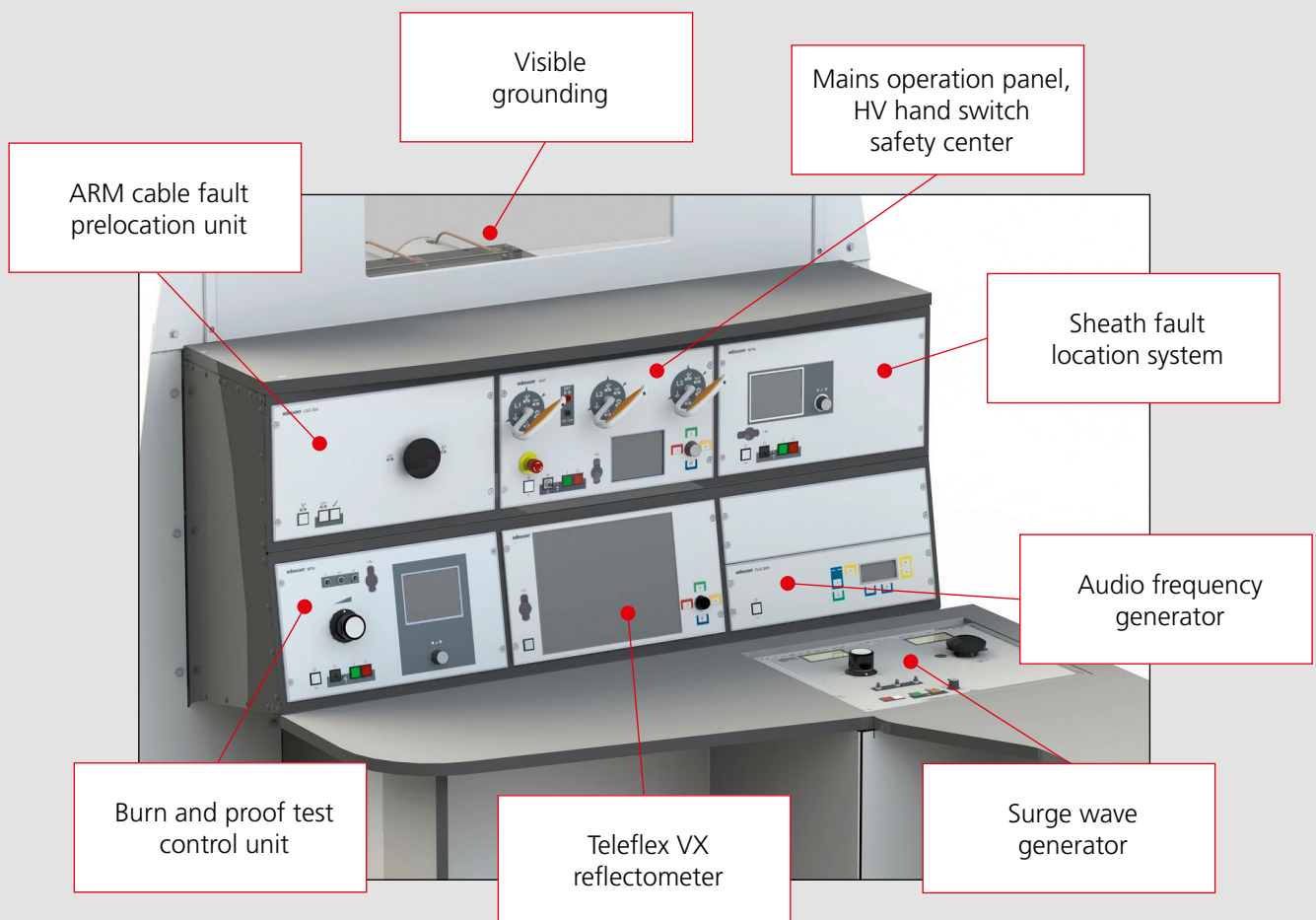
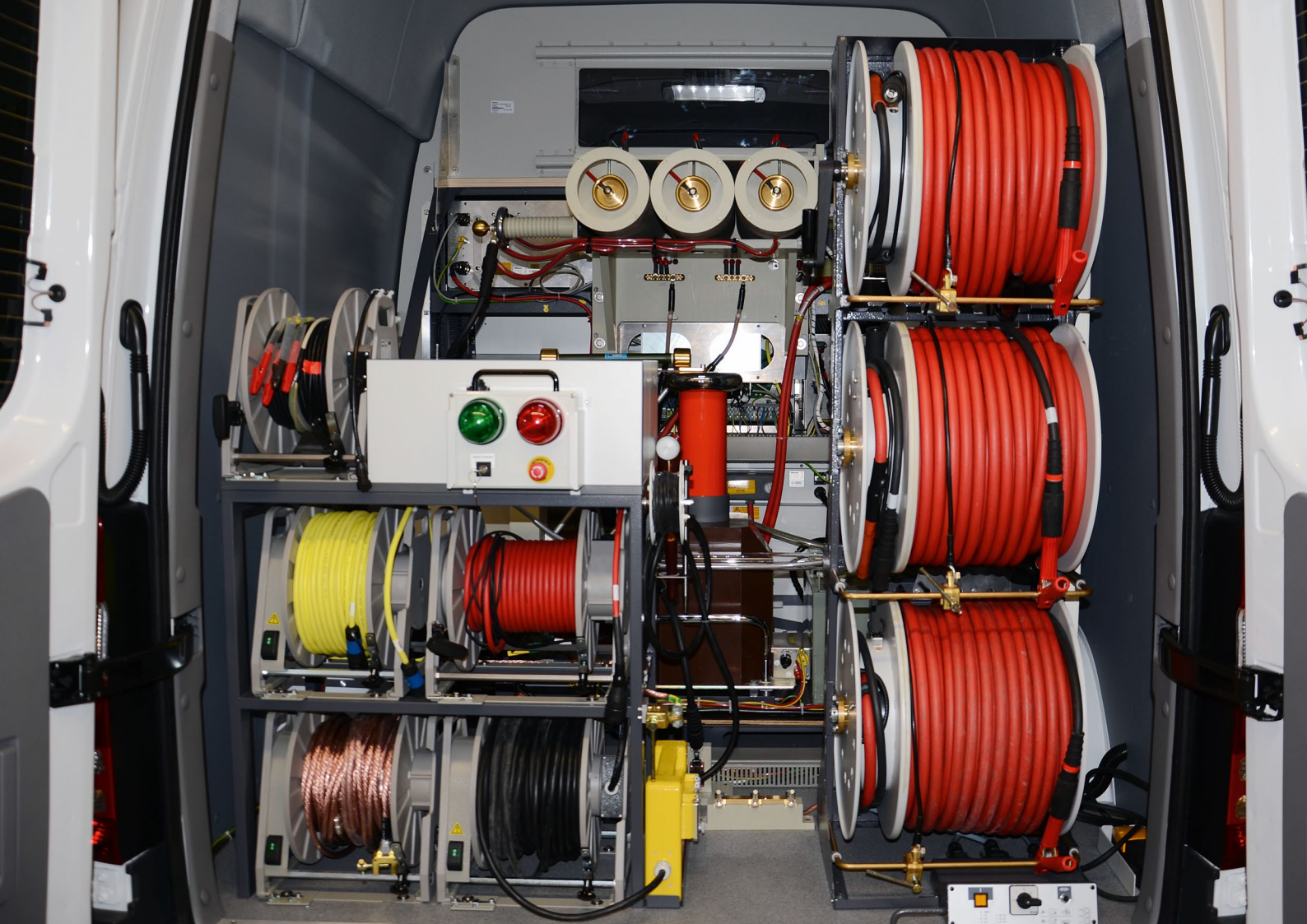
## Base system components

The base system consists of a rack which can accommodate up to seven units for fault location, testing and diagnosis.

The system has two intuitive operational modes:

- » the **NSF 8** mains operation panel with device selection switch, FU/EP safety system with corresponding signalisation
- » separation transformer
- » the **Teleflex VX** with ARMSlide technology
- » **SWG 1750 C** surge wave generator
- » discharge and earthing module
- » **BPS 5000 C** HV control unit
- » DC generation of up to 80 kV DC
- » **LSG 300** Arc Reflection Measurement
- » Decay prelocation
- » ICE prelocation





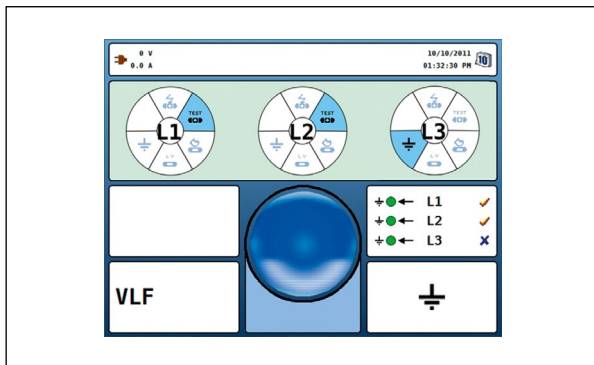
# System description Variant

The central component is the mains operation panel **NSF 8** which allows central monitoring and operation. It consists of a manual single- or three-phased selector switch, the FU/EP safety system and a 5.7" color TFT display that provides an excellent overview of all important system and status information (including the monitoring and display of all essential safety system data).



*NSF 8 Mains operation panel*

The integrated user guidance provides even new or inexperienced users quick and intuitive training on the system(s) and its/their functions.

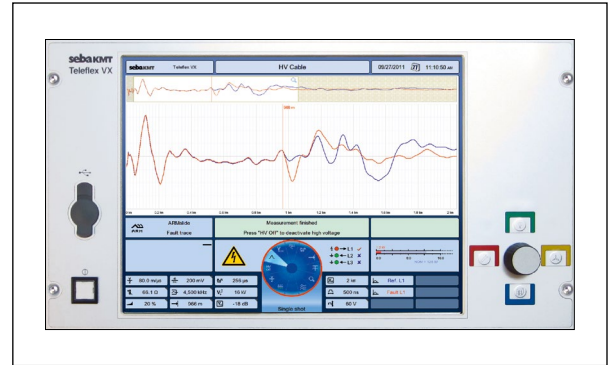


*User guidance at the NSF 8*

There are two operational modes:

- » the **expert mode** (for the experienced user) leaves all decisions to the operator, as is usual for all conventional manually operated systems.
- » the **semi-automatic mode** (for the inexperienced user) informs the operator of the required switch positioning, thus guiding and training him.

Another main component of the Variant system is the **Teleflex VX**, developed by **SebaKMT** and **currently the most powerful reflectometer world-wide**. Equipped with an integrated insulation tester and reflection measurement, it provides fast and easy fault classification and supports all current fault location technologies.



*Reflectometer Teleflex VX*

In the Variant, as in all systems, the Teleflex VX features **ARMslide** technology with 15 individual trace recordings per ARM shot, **ProRange** distance-dependant de-attenuation, and the reliable **ΔU-Trigger function**.

The **SWG 1750** surge generator is used for prelocation and pinpointing of cable faults. With its powerful 1750-Joule surge energy and adjustable voltage stages of 8, 16, and 32 kV, it fulfils most requirements of LV and MV systems.

For extended application, the SWG 1750 C4 with extra 2 and 4 kV voltage stages or the SWG 1750 CD with double high surge energy of 3500 Joules are available.

In combination with the optional VLF Sinus and the TanDelta attachment, and/or the partial discharge measuring system, the Variant serves as diagnostic system.





## Safety concept

An essential feature of all SebaKMT fault location systems is the safety system, which monitors all parameters relevant to safety (i.e. rear door switches, safety key interlock, emergency shutoff etc.) and displays the information on the 5.7" NSF 8 display as a clear text message:

- » Loop resistance: operational earth to station earth
- » Loop resistance: auxiliary earth to station earth
- » Step voltage: earth to vehicle chassis
- » Fast voltage increases

According to DIN EN 50191 / VDE 0104, the status of the system is indicated with corresponding red and green signal lights in the HV room. The lights are placed in such a way that they are visible through the rear door windows as well as from the operation compartment. The safety-compliant partition into an operation and an HV area enables absolutely safe use of the system.

An external safety unit with signalisation of the HV status and an external emergency OFF switch are part of the DIN EN 50191 / VDE 0104 (CENELEC!) („Erection and operation of electrical test equipment“) and its actualised release in 2011 for all units with output voltages exceeding dangerous contact voltages of 65 V, which are in the sense of the norm a test station; test laboratory or experimental station or temporary test installations.



# The functionality of the Variant

## Prelocation

For prelocation, the Variant base system is equipped with a capacitive voltage coupler for Decay travelling wave decoupling and a current coupler for ICE single-phase current decoupling. The three-phased ICE current decoupling technology is optionally available and especially designed for branched/teed medium voltage distribution systems.

For the arc reflection technologies, the Variant offers two alternatives:

- » the **LSG 300, a passive ARM filter for short-term Arc stabilisation**. This lightweight technology is especially favourable for modern systems that must be often built into vehicles with a maximum payload of 3.5 tons.
- » the **active ARM with the LSG 3-E**. In contrast to the passive ARM filter, the SWG is directly discharged into the faulty cable, and the LSG 3-E follows with a delayed 2 kV discharge impulse. This large, powerful impulse, easily overcomes even long fault ignition and trigger delays.

## Pinpointing

With a comparatively low weight, the Variant provides with the high power surge generator a high surge energy of 1750 or 3500 Joule and voltage ranges from 2 to 32 kV. Together with the ground microphone **digiPHONE+**, the acoustic pinpointing becomes an easy and reliable fault location process. The high sensitivity of the digiPHONE+ combined with its BNR (back noise reduction) capability provides excellent performance also at significantly reduced surge energies.

The pinpointing technologies are complemented by a 200 W integrated, powerful **FLG 200 Audio Frequency Generator**, which supports the patented SignalSelect procedure and the direct galvanic DC step voltage or the capacitive audio frequency method.

For the Variant test van system, the above-mentioned options are supplemented with tailor-made solutions that we accordingly adjust to meet the needs of our customers.

## Cable testing and diagnosis

A high-voltage test system controlled by the **BPS 5000 C control unit** permits DC testing up to 80 kV. This HV source also powers the optional **0.1 Hz VLF cosine rectangular test set** for standard-compliant testing of XLPE cables and all other cable types with a cable capacity of up to 5  $\mu$ F at 0.1 Hz.

As an alternative to the 0.1 Hz VLF CR technology, SebaKMT offers **0.1 Hz Sinusoidal VLF test sets**, which can be used for standard-compliant testing, but can also serve as power source for the optional **Tan Delta attachment**. This attachment is especially designed for the evaluation of the condition of the cable insulation. A further option is a **Partial Discharge Measuring System** for the detection of local defects, such as defects in cable accessories. A PD diagnosis is nowadays one of the most important tests to check the quality of workmanship and is highly recommended to be part of the commissioning test.

## Burning

Faults can also be converted to lower resistance by burning, for which the Variant provides two optional solutions.

The first option is the BPS 5000 HV, which in combination with the 80 kV DC source and the **BPS 5000 C control unit** forms a platform. With its high burn current of up to 110 A, this system fulfils all demands.

The second alternative is the **T 22/13** with a burn current of maximum of 25 A and the **M 212 energy separation filter**. This process allows the **Arc reflection burning**, during which the fault response can be directly observed. The burn current stress to the test object is kept as short as possible. After burning, the fault prelocation is automatically performed.





*Rear View of the HV compartment*



*Individual interior arrangement*

## Sheath faults

The new fully automatic **MFM 10 sheath fault location System** in a 19" housing allows testing, prelocation, and pinpointing of sheath faults from the Variant system operator desk.

The measurement can be performed from inside the vehicle via a special sheath fault location cable drum.

For pinpointing, the MFM 10 uses either the DC step voltage method with the **ESG NT** or A-Frames based on 4.8 Hz technology. Optional the MFM 10 offers an audio frequency option which allows route tracing during the sheath fault pinpointing process.

## Service

During the development of the Variant, one focus point was easy service and fast maintenance.

Heavy devices are installed so as to be easily extractable. Electronic modules are placed in such a way that the system calibration and troubleshooting can be conducted mostly from inside the operating area.

## Connection technology

A wide variety of cable drums and accessories are available. This includes cable drums ranging from manual operation to motor-drives to slip-ring cable drums.

## System options

- » VLF PZ 54kV – 0,1 Hz Cosine rectangular wave
- » VLF Sinus 54kV
- » Tan Delta diagnosis
- » Burning BPS 5000-HV
- » ARM Burning T 22/13
- » LSG 300 (19")
- » LSG 3-E (19")
- » 3-phased ICE
- » FLG 200
- » MFM 10-M (19")
- » OWTS M
- » external HV unit (customer specific)
- » ISO measurement
- » Own power supply
- » Tools and small equipment

