SWG
Surge wave generators

- **Surge generators for most voltages and output up to 3500 J**
- **Optimized surge energy for switchable capacitors**

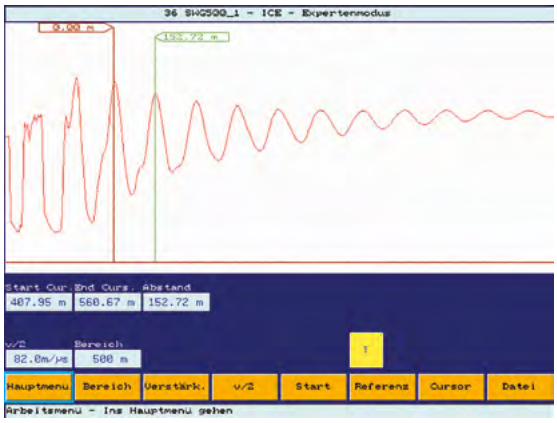
DESCRIPTION

Together with reflectometers, surge generators are the central component of cable fault location. They are used for both pre-location and also pinpoint location.

Prelocation

Prelocation can be divided into transient methods and Arc reflection prelocation, which differentiates between passive, semi-active and active methods.

ICE – Impulse Current Method (ICE-Method = Impulse Current Equipment)
This method is particularly ideal for fault location in long ground cables and wet splices.



Teleflex picture of the ICE method (current decoupling)

The surge wave generator ignites an arc at the fault. This results in a transient wave (i.e. a spreading and repeatedly reflected travelling wave) between the fault and the surge wave generator. An inductive coupler records this transient wave using the Teleflex reflectometer. The length of one full oscillation wave corresponds to the direct distance to the fault.

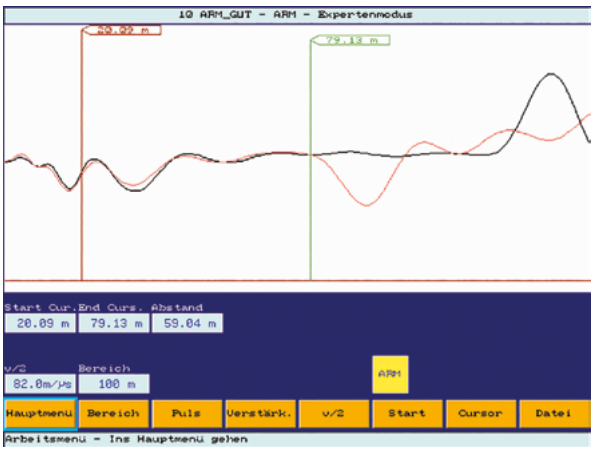
A coupler for recording the transient current wave is fitted as a standard feature in all surge wave generators with a surge energy of 1000 J or more.

ARM – Arc Reflection Method (HV-supported reflection method)
All reflection prelocation methods offer the advantage of a very detailed measurement rresult. The result corresponds to the picture of a normal reflection measurement, making reflection prelocation the preferred method for fault location. Differences occur with variations in technology, which can result in advantages such as a lighter system thanks to more simple structures being in place. More complex technologies are more efficient, but also have to be integrated into the wider measuring system.

The simplest method is the passive ARM method (previously called the arc stabilization or short-term arc method). This extends the discharge of the surge generator and with it the burning duration of the arc by means of a series resistor in the discharge path.

In the semi-active ARM method, the discharge is extended through inductivity. Use of inductivity means that the level of voltage is not affected, making it much easier to locate faults with a high ignition voltage.

With the LSG 3-E, Megger offers an active ARM method with an integrated 2 kV surge unit for excellent extension and stabilization of the arc. Additionally, this device can be used as an independent 2 kV prelocation and surge unit.



Teleflex picture of the ARM methode

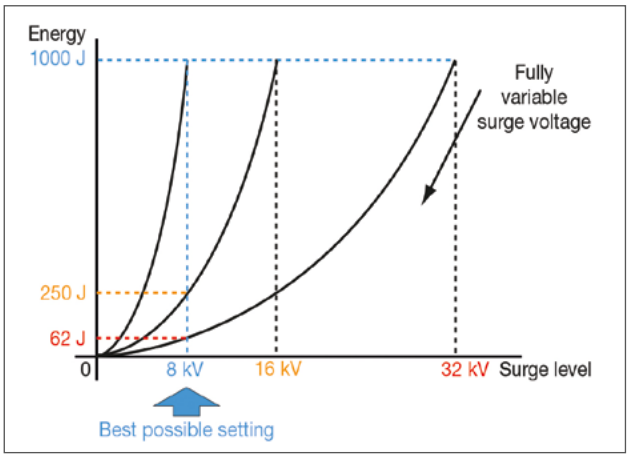
Pinpoint location

To precisely locate a fault it is essential to confirm its position along the cable, because prelocation with the Teleflex only visualizes the absolute distance. But the position and path of the cable in the ground, and thus the actual position of the fault, will not be accurately displayed. However, absolutely precise pinpointing is necessary to limit expensive excavation work and resulting surface damage to an absolute minimum.

The surge generator solves this problem through a direct discharge, which produces an arc at the fault. The direct connection means that this discharge takes place very quickly, generating a loud flashover sound which can be easily located using a corresponding acoustic receiver at the surface, such as the digiPHONE$^+$.

It is important to always use the maximum available surge energy, given the proportional behaviour of volume and discharge energy. All Megger SWG surge wave generators have switchable surge stages.

The basic equation of the surge energy is: $W = 0.5 \times C \times U^2$



For example with a required surge voltage of 8 kV, the full 1000 Joule surge energy is obtained with 100% surge voltage in the 8kV surge range. A setting of 25% surge voltage in the 32 kV surge range (kV) would be useless, producing only 62 Joule surge energy.

Therefore it is always recommended as follows: first select the optimum range, i.e. the lowest necessary voltage level, and then adjust the SWG to the maximum possible voltage. This is the only way to guarantee the maximum energy and sound at the arc. If only half the voltage range is used, then only one quarter of the surge energy is available.

digiPHONE$^+$ – receiver for combined acoustic and electromagnetic pinpoint location

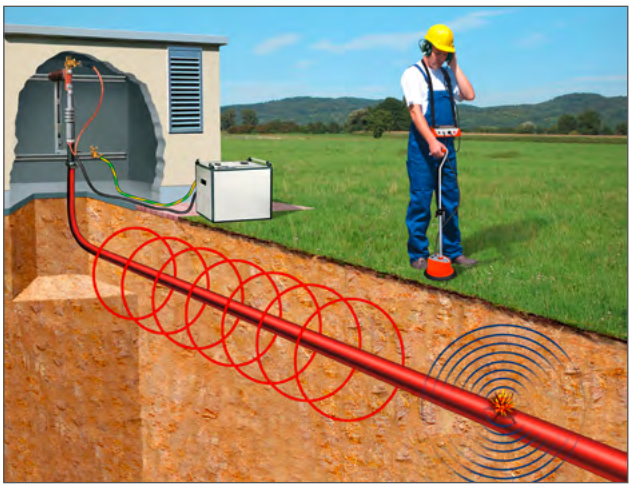
The digiPHONE$^+$ works according to the principle of the coincidence or difference method. It automatically measures the time difference between the electromagnetic signal of the surge voltage and the acoustic bang of the arc flashover.

SWG and digiPHONE$^+$

The digiPHONE$^+$ operates like a stopwatch. The electromagnetic pulse starts a counter and the much slower propagating sound stops the counter afterward. The displayed time, or the time difference between the sound and the magnetic pulse, corresponds to the distance to the fault. The shorter the time, the closer you are to the fault.

The display shows the difference in time as a numerical value, while a bar graph shows the electromagnetic field strength. The field strength display also acts as a locating facility of the cable position. The bar graph display is broken down into individual segments to give a very accurate indication of where the cable is running. As long as you keep your bearings on this maximum value, your longitudinal axis is already exactly on top of the cable. As a result, the position over the cable is so precise that you almost cannot miss the fault, even when faults are very difficult to hear.

This location principle also works for secondary noises and is particularly useful in situations where cables are installed in protective ducts or under solid road surfaces (concrete, asphalt, etc.).



Fault location with SWG and digiPHONE^{+}

Product*	**SWG 505**	**SWG 500**	**SU 2/4/8**	**SWG 1750 C / SWG 1750 CI with leakage current measurement**	**SWG 1750 C-4 two-part**	**SWG 1750 CD two-part 3.500 Joule**
Range (n)	I II III	I II III	I II III	I II III	I II I II III	I II III
Voltage (kV)	3 4 5	0 ... 2.5/5/10 0 ... 4/8/16	0 ... 2 0 ... 4 0 ... 8	0 ... 8 0 ... 16 0 ... 32	0 ... 2 0 ... 4 0 ... 8 0 ... 16 0 ... 32	0 ... 8 0 ... 16 0 ... 32
Energy (Joule)	180 320 500	195 500	1000 1000 1000	1750 1750 1750	1130 1130 1750 1750 1750	3500 3500 3500
Capacity (µF)	40	62.5 15.6 3.9	500 125 31,3	54.4 13.6 3.4	566 142 54.4 13.6 3.4	109 27.2 6,8
Voltage adjustable	no	yes	yes	yes	yes	yes
Cycle (Single imp)	1.5 ... 6 yes	1.5 ... 6 yes	2,5 ... 6	2.5 ... 10 yes	2.5 ... 10 yes	2.5 ... 10 yes
DC testing I_{max} (mA)	129 172 213	185 300	1400 700 500	210 105 53	3650 1850 210 105 53	210 105 53
Dimension (W x D x H)	520 x 255 x 530	520 x 280 x 530	520 x 266 x 600	520 x 430 x 630	520 x 430 630 520 x 430 x 460	520 x 430 x 630 520 x 270 x 410
Weight (kg)	43	47	70	97	104 + 69	99 + 30

ORDERING INFORMATION

Product	Order no.
SWG 500 Surge generator 4/8/16 kV, 500 J; set of cables; HV connection cable	**813396**
SWG 505 Surge generator 3/4/5 kV, 500 J; set of cables; HV connection cable	**813397**
SU 2/4/8 Surge generator 2/4/8 kV, 1000 J; set of cables; line terminal (2 pcs); terminal; accessory bag; HV connection cable	**820008625**
SWG 1750-C Surge generator 8/16/32 kV, 1750 J; set of cables; HV connection cable	**813393**
SWG 1750-CI (with leakage current measurement) Surge generator 8/16/32 kV, 1750 J; set of cables; HV connection cable	**820010551**
SWG 1750-C4 (in two parts) Surge generator 2/4 (1200 J); 8/16/32 kV, 1750 J; set of cables; HV connection cable	**813394**
SWG 1750-CD (in two parts) Surge generator 8/16/32 kV, 3500 J; set of cables; HV connection cable	**813395**

* We reserve the right to make technical changes.

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