894 - Earth fault localization in isolated uninterruptible power supply (UPS) networks – a new approach

Georg Achleitner
APG, Austria

Lothar Fickert
TU Graz, Austria

Christian Raunig
APG, Austria

Wolfgang Huska
APG, Austria

Introduction

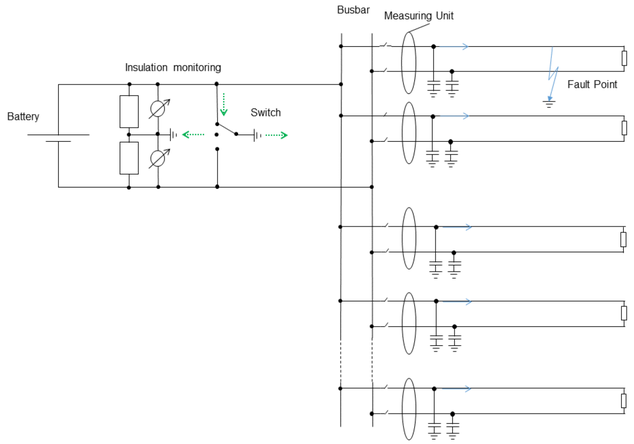
Uninterruptible power supply networks are used in numerous areas, such as traffic control, substations, power plants and in areas with high demands on security of power supply or personal safety.

Battery systems are usually designed as isolated networks which enable continuous operation even during a single earth-fault (for example from cable insulation faults caused by carefree handling during cable laying, animal bites or water treeing). Nevertheless, this fault has to be located and cleared quickly in order to avoid consequential faults, failure of the system and to keep personal safety.

New Approach

The new approach is based on well-known insulation monitoring systems. As shown in the figure the new approach uses a voltage divider with a middle point grounding connection, a switching device of temporarily grounding and differential current measurement equipment in each branch.

Principle of the fault localization



In the event of an earth-fault, the insulation monitoring detects the faulty phase and temporarily connects the faulty phase near the feed-in to earth. This switching leads to a temporarily decreasing of the fault current at the fault location/branch which can be detected trough the current measurement units.

Test results

Fault resistances up to 40kΩ, which cause very small fault currents, could be detected.

Nr.	Fault resistance	Fault current
1	3,89 kΩ	24 mA
2	7,78 kΩ	14 mA
3	19,45 kΩ	6,0 mA
4	27,23 kΩ	4,2 mA
5	38,90 kΩ	3,0 mA

Advantages

- No active current infeed and additiona localization current needed
- Decrease fault current at fault point
- As mobile unit possible
- Works independently from the fault distance
- Minimize switching operations to find the fault