



### A9.3

## Partial discharge measurement with freely oscillating resonance voltage

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### **Résumé**

*L'identification précoce des décharges partielles dans des installations de câbles haute tension à isolation en matière synthétique est d'une importance déterminante pour la sécurité de fonctionnement. La mesure sur site des décharges partielles se heurte toutefois à des difficultés particulières en raison du niveau de perturbations élevé. Les efforts faits pour séparer les signaux TE à partir des signaux globaux à l'aide d'un traitement électronique (assisté par ordinateur) butent contre des limites physiques. Les installations de contrôle à résonance offrent de nouvelles possibilités pour réduire les perturbations à un niveau acceptable. Les décharges partielles peuvent être mesurées avec un circuit à résonance libre, hors des perturbations réseau. Les résultats obtenus prouvent la bonne aptitude pratique de cette méthode.*

### **Abstract:**

Early detection of partial discharges in plastic-insulated high-voltage cable systems is of decisive importance for operating safety. On-site measurement of partial discharges in installed cable systems meets with particular difficulties owing to the high level of disturbance. Efforts to separate the PD signals from the total signals by means of additional electronic (computer-aided) processing are confronted with physical limits. Resonance testing systems offer new possibilities for reducing the disturbance to an acceptable level. The partial discharges can be measured in the freely oscillating resonant circuit free from mains disturbance. The results obtained demonstrate the usefulness of the method.

### **1. Introduction**

Plastic-insulated high-voltage cable systems form a vital part of power transmission systems. Evaluation of the insulating status of systems of this kind is of the utmost importance to ensure security of the power supply and because of the high costs of failure and repair of an unexpected defect. Possible transport, laying and installation defects in newly laid or repaired cables and the progressively dangerous alteration process in cables that have aged in operation, must be detected before failure. Partial discharges, which quickly and irreversibly destroy the insulation ultimately resulting in breakdown and system failure, represent one of the most dangerous kinds of interference for shortening the service life. While all individual components are now tested during manufacture for freedom from partial

discharge, one important factor, the installation or assembly of the components can only be tested on-site. A corresponding voltage test and with it a combined partial discharge test on-site has long been a desirable and important feature of quality assurance.

Although the ageing process in plastic-insulated cables rarely leads to partial discharges, relative motion, lifting, formation of gaps, etc., can occur between individual components owing to operating stresses. With high field strengths present, the destructive effects of partial discharges then occur at such points. A sensitive measurement of partial discharge on-site is therefore an extremely important measure for preventing failures, even in systems which have aged in operation.