Suitability of test voltages applied to high and extra-high voltage extruded cables for quality acceptance during commissioning and for condition assessment during operation

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While the test voltage shape and the test voltage level at manufacturers of power components are determined by the standards of insulation coordination grown in a century, high voltage on-site tests are sometimes selected according to their easy feasibility and not according to their aim. Often the difference between a quality acceptance test of a new, on-site assembled power system component and a diagnostic test of a service-aged cable system is neglected. The aim of an on-site test should determine the selection of voltage shape and test voltage level.

A new cable system must be assembled on-site and consequently tested with very similar voltage shapes as applied during factory testing. Consequently high voltage (HV) and extra high voltage (EHV) cable systems shall be tested by AC voltages preferably combined with partial discharge measurement.

With a successful commissioning- / acceptance test the cable system is handed over to the end customer. For risk assessment network operators conduct diagnostic tests and measurements later on. In opposite to the quality acceptance tests there are no standards for diagnostic tests, in the best case recommendations for the selection of test voltage shapes and test voltage levels.

The paper deals with the differences in terms of the test voltages, their conformity to relevant standards and the physical behaviour of the insulation material at different types of test voltages. The author focuses of test voltages with alternating current (AC), very low frequency (VLF) and damped alternating current (DAC). The differences between quality acceptance and diagnostic tests are explained on the basis of standards and comparisons.

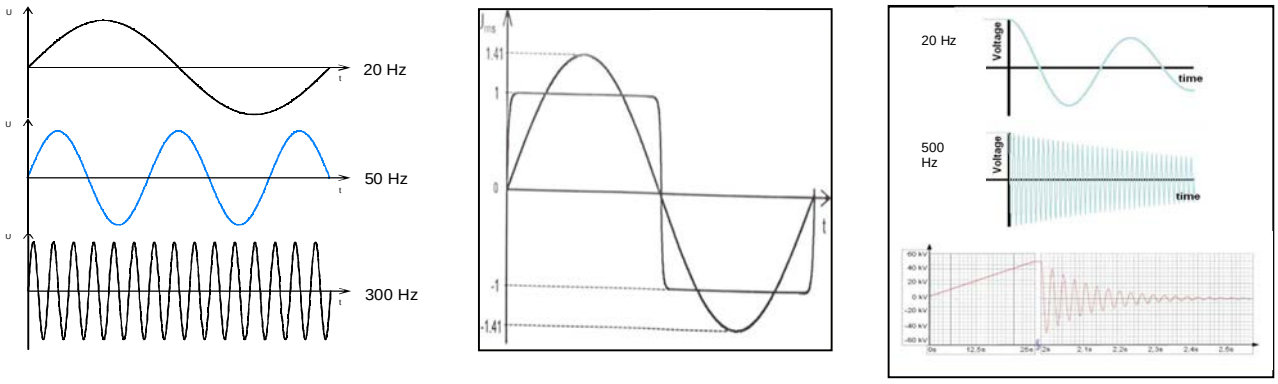

Figure 1. AC voltage / VLF sinusoidal and rectangular / DAC