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Qualification of a highly electrically and mechanically stressed ac cable system

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ABB has performed a prequalification test according to IEC62067 for a cable system where part of the cable was subjected to high mechanical stress.

The test circuit contained more than 100 of cable, three different joint types and one dry type termination. The electric field strength during AC cycling was 26kV/mm at the conductor screen and 17 kV/mm at the insulation screen. These field strengths qualify design stresses comparable to, or exceeding, the ones for design of 400kV XLPE cable systems. For the accessories the electric stress is, to our knowledge, higher than previously qualified. The high electric stress at the insulation screen was controlled through the of use of field control compounds.

Roughly a third of the circuit length was subjected to high mechanical stress. In cable terminology, the bending radius is connected to mechanical stress. A generally cited lower limit for a cable with metallic screen is $R > 15D_e$ where D_e is the external cable diameter, for a cable without metallic screen $R \geq 8D_e$ is usually used. The current prequalification was successfully performed for a cable without metallic screen at $R/D_e = 4$, to our knowledge the highest mechanical stress ever utilized during a prequalification test.

The underlying reason for the prequalification is the requirements posed by the high voltage generator Powerformer™. The obtained results are, however, directly usable for HVAC XLPE cable systems in general. We conclude that the results set new limits for for XLPE cable systems for HVAC applications. The paper will describe the qualified system, the test and the test conditions in detail