C.8.1.2.

Design of single core cable installations exposed to short-circuit stresses.

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Single core cables and terminations are subjected to combined electromechanical and thermo mechanical stresses at short-circuit conditions. There is at present no international recommendation concerning these aspects. Some manufacturers give guidelines, but they differ to a great extent. This is partly due to lack of standard testing methods and to the variety in the design of cables, cleats and supports. A draft (prEN 50368) concerning cable cleats, which is submitted to CENELEC enquiry, consider short-circuit testing of cable cleats. The draft does not give practical recommendations.

The paper presents results from short-circuit test programme with a wide spectre of different fabricates of cleats and a variety of cable dimensions and voltage levels. It is established well-founded knowledge to design cable installations exposed to short-circuit currents. This work has been supported by cable manufacturers, fabricators of cleats, industry and power utilities.

The test results show that the design of the cleat is essential in order to ensure safe operation of the cables. Full scale short-circuit testing of cable runs consisting of cables, cleats and supports is therefore necessary both in development of components and as background for rating of components and for design of complete cable runs.

For practical installations it is necessary to distinguish between the different fault locations close to and far from generator, voltage level, duration of fault currents, automatic or non automatic enclosure of breakers, cable configuration including grounding alterative of screens and the restrictions to the environment. The operation philosophy of the installation must be clarified. The installation can be designed to withstand one fault, several faults without repair or it may be acceptable to replace the whole installation. Of course a fault must not cause any risk for personnel, other part of the installation and the environment.

The main challenges have been on offshore and ship installations, which are characterized with compactness and high maximum peak fault currents. However, the duration of these high fault current are mostly restricted to some few periods. Onshore installations are normally designed with rms fault currents limited to 50 kA. The total breaking time of the fault current onshore is in most cases longer and have often larger time constant than for offshore plants.

It may be necessary to make measures in order to limit the fault currents. Tests have shown that the terminations (end connections) are mechanically stressed, and breakdown can cause damage to other parts of the installation as busbars and termination cabinets.