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Comparison of bipolar sub-modules for the alternate arm converter

Research on dc-fault tolerant multilevel converters has gained noticeable attention over recent years. The alternate arm converter (AAC) is one of such emerging multilevel converter topologies, and a hybrid topology of the two-level converter and the modular multilevel converter (MMC). Bipolar sub-modules (SMs) that can produce both positive and negative voltages are the building blocks of the AAC. This paper analyses the operation of an AAC with the full-bridge SM (FB-SM) and the cross-connected SM (CC-SM). The conduction and switching losses of the two SM configurations are evaluated and compared, in order to identify the suitability of CC-SM for AACs and its performance compared to the FB-SM. The CC-SM with identical semiconductor devices has reduced losses compared to the CC-SM with higher rated devices in the cross-connected path. It is concluded that the CC-SM does not offer advantages in the losses, construction, and application to the AAC, compared to FB-SM.

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