

Abstract

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Digital hysteresis current control for grid-connected converters with LCL filter

Current controlled inverter using hysteresis controller is popular due to the simplicity of the algorithm implementation with a robust dynamic response. However, the controller action requires the use of analogue circuitry to maintain its characteristics which lacks the interfacing, maintenance, flexibility, and integration of a digital system. In this paper, a digital hysteresis controller based on sampling the feedback signal and applying control action at a fixed interval is investigated. The controller is applied on three proposed configurations for a single phase grid connected inverter with a designed LCL filter and a primary control loop on the filter inductor current. Parameters affecting the hysteresis controller primary characteristics are investigated and a Selection criteria of filter parameters is derived. To eliminate performance issues arising from parameters mismatching and variable switching frequency, adaptive hysteresis band calculation and a secondary control loop is proposed. By means of simulation and experimental implementation, the performance of the configurations is evaluated.