

Conventional back-electromotive force (EMF) and flux linkage-based indirect rotor position detection methods have limitations, specifically poor position accuracy and inability to operate at low as well as at high speed. However, practical motor drives require precise operation over a wide speed range, which widens the application areas while increasing reliability compared to direct position sensor-based drives. The method proposed and demonstrated in this paper uses only terminal voltage measurements to estimate the flux linkage increment in six separate sectors of an electrical cycle. This is used to determine the rotor position while avoiding the accumulated position error that is a characteristic of flux linkage-based techniques. This paper also addresses the common problems associated with the practical implementations, such as low-pass filter delay, integrator offset error, and noise sensitivity at low speed. The theoretical explanation of the method has been given in detail and analytical solutions for the flux linkage threshold of both sinusoidal and trapezoidal permanent-magnet (PM) machines is provided, avoiding trial and error tuning commonly utilized in the literature. This paper provides a range of experimental data to verify both the operational robustness and position accuracy of the method.