ContainerPower Energy Solutions

Based on dual-loop control of three-phase inverter

Overview

This paper presents a reactive power and voltage (Q/V) control strategy of three-phase photovoltaic (PV) system to offering reactive power based on the typical dual-loop control topology.How is a three-phase PV Grid-connected inverter designed?

The three-phase PV grid-connected inverter was designed based on the LQR method, where the tracking error was adjusted to zero through integration (Al-Abri et al., 2024). The disturbance rejection ability of the PV GCI was improved by designing the linear state inaccuracy feedback control policy (Zhou et al., 2021).

How does a three-phase inverter work?

In this test case, STS is open () and the inverter caters to the power demand from the three-phase load. The three-phase loads are configured to operate in constant power mode with the current limit of 8 A. Measured data from the spectrum analyser are fetched and plotted for controller performance analysis.

What is unified control for inverters?

This article proposes a unified control for such inverters with current control, voltage control, and power control loops, including the PLL impact on - transformations as the building blocks. Small-signal-based linearization techniques are adopted to achieve the resultant linear time-invariant model.

What is a power control loop?

The power control loop is designed to have low bandwidths, slower than the voltage control, thereby ensuring the power quality in both modes of operation. Eigenvalue trajectory of different modes based on the perturbation intensity of PCC voltage.

Is a unified controller suitable for a 5 kW inverter set-up?

Moreover, a systematic definition of the unified controller is proposed to ensure the easy portability of the controller code in a model-driven development set-up. Model verification and experimental results of a 5 kW inverter set-up approve the efficacy of the proposed design approach.

What is grid-following inverter control?

The primary objective of grid-following inverter control is to deliver the power to the grid based on the set-points provided. Figure 11 depicts the per unitized power set-point tracking of inverter-based on Piccolo controller real-time data-logging in Simulink interface.

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