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Single-phase lcl solar grid-connected inverter

Overview

The inductor-capacitor-inductor (LCL) filter is used to lower the high-frequency switching noise of a grid-connected inverter (GCI). However, a robust design of the LCL filter is a challenge due to its complex model, variations in the operatin. The inductor-capacitor-inductor (LCL) filter is used to lower the high-frequency switching noise of a grid-connected inverter (GCI). However, a robust design of the LCL filter is a challenge due to its complex model, variations in the operating conditions of the grid, and its stability gain margin. Therefore, this paper designs an optimal LCL filte.

••LCL filters are applied to reduce the total harmonic distortion of grid-injected current by inverters.••The stability margins of the LCL-filtered grid-connected inverter will be affected by the resonance frequency of LCL filters.••This paper design optimal active damping of capacitor current feedback and optimal proportional resonant controller.••Metaheuristic.

Lcl-filterMeta-heuristic techniquesMulti-objective optimizationTotal harmonic distortion.

LCL filters are frequently utilized in distributed power generation systems due to their excellent high-frequency (HF) attenuation characteristics, smaller footprints, and reasonable prices. A precise and dependable LCL filter design is crucial for cost savings, improved filtering performance, and grid-injected current quality [1,2].Among the design approaches, the parameters of the LCL filter are conventionally selected by the trial-and-error technique. First, the limits of each parameter are determined by constraints such as total harmonic distortion (THD), current ripples [3], and reactive elements [4]. Subsequently, a set of LCL-filter parameters is selected based on real-world engineering knowledge of the application.

Fig. 1(a) displays a grid-tied LCL-type single-phase voltage-source inverter (VSI) system. The VSI is energized by a renewable energy source linked to the input side in the form of a DC power source. The inverter generates an output ac voltage (vi), which is then fed to the LCL filter to reduce the inverter current ripple. The LCL filter contains an inverter-side inductor (L1), a capacitor (C), and a grid-side inductor (L2). The sign i1 signifies the inverter-side current, i2 represents the grid-side current, and ic is the filter capacitor current. Since the grid voltage (vg) is assumed to be equal to the PCC voltage (vpcc), the grid inductance (Lg) is combined with the grid-side inductance of the LCL filter into L2 for simplicity. To simplify the stability analysis and

consider a worst-case scenario, the equivalent series resistances of the filter.

What is sliding mode control (SMC) in a single-phase grid-connected inverter?

we demonstrate the Sliding Mode Control (SMC) of a single-phase grid-connected inverter with an LCL filter using MATLAB/Simulink. The LCL filter is crucial for reducing harmonics and improving power quality, while SMC ensures robust and stable control performance even under system uncertainties and disturbances.

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Is a single-phase grid-connected multifunctional converter a current-controlled voltage source inverter?

Thus, this work presents the modeling and control of a single-phase grid-connected multifunctional converter, which operates as a current-controlled voltage source inverter using an LCL-type output filter.

What is the control design of a grid connected inverter?

The control design of this type of inverter may be challenging as several algorithms are required to run the inverter. This reference design uses the C2000 microcontroller (MCU) family of devices to implement control of a grid connected inverter with output current control.

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TIDM-HV-1PH-DCAC reference design , TI

This reference design implements single-phase inverter (DC-AC) control using the C2000(TM) F2837xD and F28004x microcontrollers. Design supports two modes of operation for the ...

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Optimal LCL-filter design for a single-phase grid-connected inverter

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Thus, this work presents the modeling and control of a single-phase grid-connected multifunctional converter, which operates as a current-controlled voltage source ...

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In order to solve the above problems, this paper designs a single-phase inverter parallel system that can be used for grid-connected power generation systems. The system ...

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Grid Connected Inverter Reference Design (Rev. D)

Description This reference design implements single-phase inverter (DC/AC) control using a C2000TM microcontroller (MCU). The design supports two modes of operation ...

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LADRC-based grid-connected control ...

Modeling of single-phase grid-connected inverter As depicted in Fig 1, the primary components of the single-phase photovoltaic grid ...

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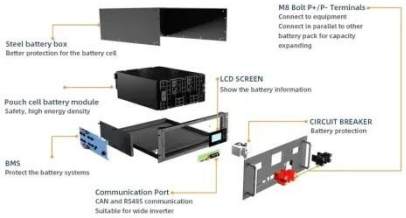

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