

DC-DC CONVERTER WITH BIPOLAR OUTPUT AND ITS USE FOR CONNECTION OF A DISTRIBUTED GENERATION SYSTEM TO A BIPOLAR DC GRID

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The invention is related to a DC-DC converter capable of generating bipolar voltage with a suitable novel topology for distributed generation connection to a DC bipolar grid. The proposed topology uses only one power switch, unlike other DC-DC converters which employ two or four switches. Thus, the complexity of the converter is reduced. The DC-DC converter with bipolar output has an input for the connection to a monopolar DC source and a bipolar output voltage with a positive terminal and a negative terminal. The DC-DC converter can be applied to bipolar DC grids because it allows the connection of a monopolar DC source to such networks. The present invention is especially applicable in the industrial sector and renewable energies. Mainly this network type is an alternative to classic electric system, currently of special interest in the industry. In this sector, the proposed converter can control the voltage level and possible unbalances of the DC voltage network. On the other hand, in the renewable energy sector, the proposed scheme enables the connection of generation and storage systems to a bipolar DC network in a reliably way. The proposed topology is a solution for these applications with sufficient guarantees of reliability, quality and performance. An experimental prototype based on a combination of SEPIC (Single Ended Primary Converter) and Cuk converter has been implemented to validate the patented system.

Among the different topologies of DC microgrids for low voltage, the bipolar type is the most versatile. In this system, DC power is distributed through three-wire lines, Fig. 1. They are positive wire, neutral wire and negative wire. Loads can be connected to the network at different voltage

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levels, +V, -V or 2V volts depending on which wires are connected. This topology has a higher technical complexity and cost than others DC microgrid topologies.

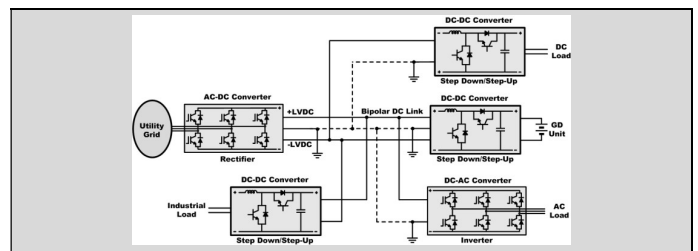


Figure 1. Bipolar DC microgrid scheme.

By inspection of single-switch converters, it can be observed that some configurations show an identical front end; this allows to provide multiple-output configurations when some basic topologies are modified or combined. These can be obtained using a single-switch and only an input inductor. In this sense, if SEPIC and Cuk configurations are compared it is observed that both also have identical front end and therefore they can be combined as Fig. 2 shows. The Cuk converter provides a negative-polarity output voltage regarding the common or ground terminal of the input voltage; while the SEPIC is a positive output converter. Both converters provide the same conversion relation.

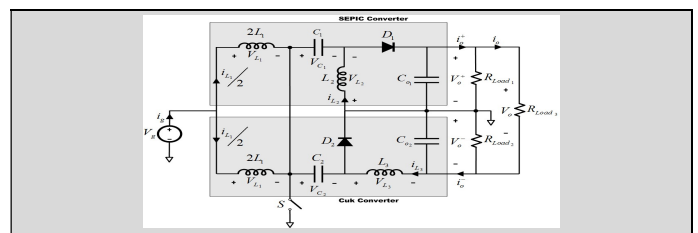


Figure 2. SEPIC-Cuk combination converter.

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