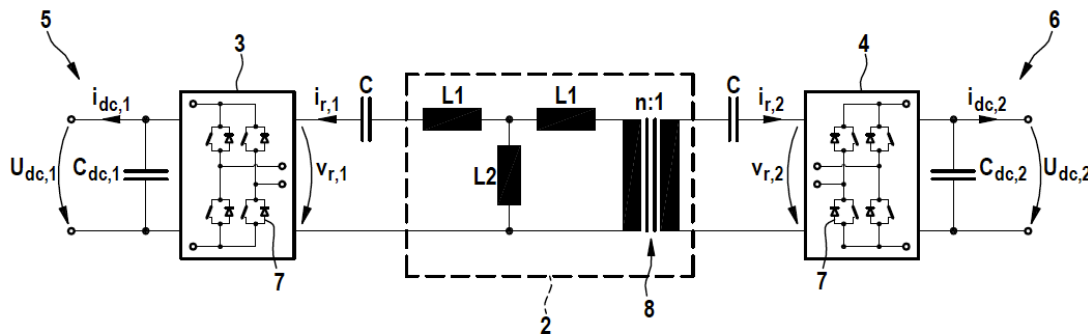


A Method for Operating a DC/DC Converter



An isolated DC-DC converter and method to achieve seamless power reversal between terminals

Ref. Nr

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Keywords

DC Transformer, DC-DC converter, power electronics, control method, power reversal

Intellectual Property

[WO 2022073757](#)

Publications

Smooth Power Direction Transition of a Bidirectional LLC Resonant Converter for DC Transformer Applications, IEEE Transactions on Power Electronics (2021)
[10.1109/TPEL.2020.3038467](https://doi.org/10.1109/TPEL.2020.3038467)

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Description

A method to operate Direct Current (DC) Transformer and achieve seamless power reversal between its terminals, without receiving external set-points or commands. The converter has two active power stages and medium/high frequency operated transformer, which provides galvanic isolation. The converter is of the resonant converter family and has resonant tank realized by means of discrete passive elements in conjunction with transformer. Only one power stage, on the source side, is actively switched in normal operation, while the other operates as simple rectifier. When conditions in the system where DC Transformer is installed change and there is a need to reverse a power flow, a method is developed to achieve that, by measuring relevant electrical quantities, deciding by means of state machine, stopping the DC Transformer operation and restarting the operation, while enabling power flow in needed direction. Such a maneuver requires no external set-points and greatly simplifies the operational principles.

Advantages

Direct Current Transformers represent a family of DC-DC converter that can achieve performances and behave similarly to that of an equivalent transformer in AC systems. Namely, power flow in the DC systems is naturally established, from sources to loads, without need to actively send the set points. Such properties may greatly benefit to various DC power distribution networks and systems, improving their operational performances and simplifying the overall system design. Method requires minimum number of external signals, and they are mostly available for protection reasons and has low computational effort.

Applications

- Power electronics
- Power systems
- DC grids
- Data centers