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From Power Consumer to Power Producer: Applications of the BIC-5K Bidirectional Power Supply

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In recent years, with the rapid growth of renewable energy and its increasing share in grid integration, power systems have gradually evolved from traditional centralized, large-scale generation to distributed architectures spread across various locations. However, renewable energy sources are inherently intermittent, increasing the demand for flexible dispatching and grid stability.

To enhance grid stability and enable a more flexible power infrastructure, bidirectional power supplies have evolved from simple power conversion devices into the core of energy asset management. They are key technologies for enabling Vehicle-to-Grid (V2G), microgrids, and residential energy storage grid integration (see Figure 1). As the logic of energy usage is being redefined, bidirectional power supplies are no longer optional—they are essential tools for transforming electricity from a “consumable” into an “asset.”

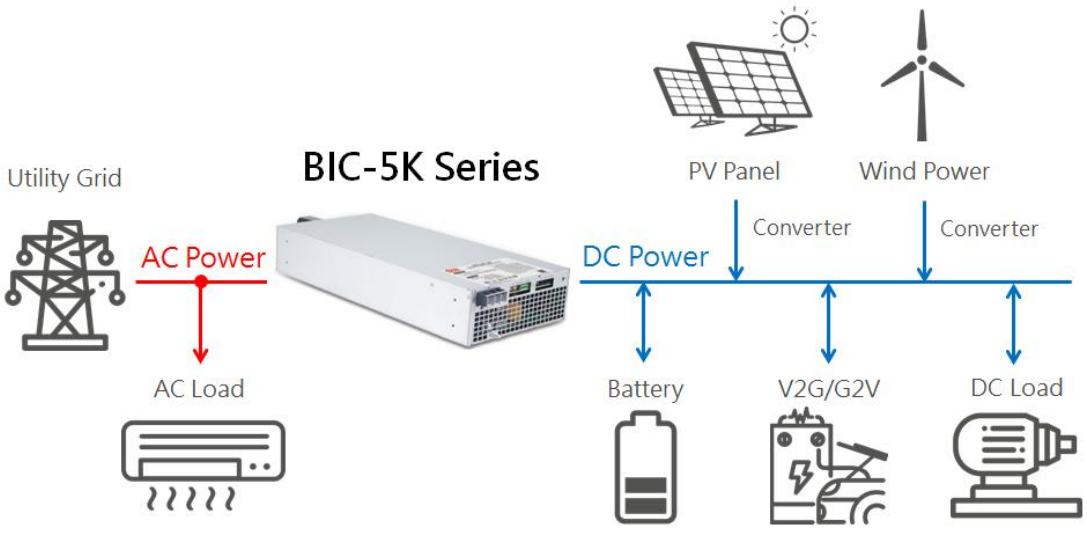

Figure 1. Applications of Bidirectional Power Supplies

MEAN WELL's latest BIC-5K bidirectional power supply complies with the international grid-connection standard **IEC 50549-1** and provides the critical performance required for grid stabilization:

- Ultra-Fast Switching: AC/DC switching time under 1 millisecond, ensuring flexible grid dispatch.
- High Efficiency: Bidirectional conversion efficiency up to 93.5%.
- High-Voltage Support: New 380V model supporting DC 290–430V high-voltage battery applications.
- Flexible Expansion: Supports parallel operation up to 30kW.
- Smart Communication: Built-in CAN Bus / Modbus for seamless integration with EMS (Energy Management Systems).
- Enhanced Safety: Anti-islanding protection to ensure the safety of grid maintenance personnel.

The BIC-5K integrates AC-DC power supply and DC-AC inversion into a single unit, fully meeting the requirements of the above applications. To better align its rich functionality with different use scenarios, the BIC-5K offers three operating modes: **BIC Bidirectional Mode, Grid-Tied Mode, and Charging Mode**.

● BIC Bidirectional Mode

In this mode, the BIC-5K operates as a standalone high-power bidirectional power supply. It automatically detects voltage conditions to switch current direction, and can also switch via external signals or CAN Bus / Modbus communication.

It supports up to six units in parallel for expansion up to 30kW in an AC/DC conversion system. Available models include 24V, 48V, 96V, and 380V, covering both low- and high-voltage battery applications.

Suitable Applications:

- **Manufacturing:** Battery formation and grading, DC motor energy recovery, etc.

- **Green Energy Applications:** Lithium battery discharge and recycling, residential solar systems, home energy storage systems, etc.

Grid-Tied Mode

In this mode, compliant with IEC 50549-1, the BIC-5K functions not just as a bidirectional power supply but as part of a Distributed Energy Resource (DER) system.

For example, in factories or microgrids with high solar penetration, midday voltage levels may rise excessively, triggering overvoltage protection in equipment. The BIC-5K can regulate voltage through active/reactive power control (Volt-Var Control), maintaining grid voltage within normal limits.

In the event of transient voltage dips or surges caused by lightning or other disturbances, the BIC-5K features High Voltage Ride-Through (HVRT) and Low Voltage Ride-Through (LVRT) capabilities. It remains connected during short disturbances, waiting for grid recovery instead of disconnecting.

Through fully digital CAN Bus / Modbus communication, the BIC-5K reports real-time grid status to the EMS system—critical for the stability and dispatch response of Virtual Power Plants (VPP).

Charging Mode

The BIC-5K's charging mode is more than just a high-power standalone charger. Charging parameters—including 2-stage or 3-stage charging profiles—can be configured via communication. It can also be combined with Grid-Tied Mode. When both modes operate simultaneously, the BIC-5K continuously monitors battery voltage while connected to the grid. If the battery voltage drops to a critical threshold, it automatically exits grid-tied operation and switches to charging mode. Once fully charged, it automatically returns to grid-tied mode to feed power back to the grid.

This powerful combination eliminates the need for an additional charger in energy storage systems, replacing the traditional "inverter + charger" configuration. The result is significantly reduced system size and complexity. The BIC-5K serves as the final safeguard against battery over-discharge.

The BIC-5K is a highly versatile bidirectional power supply.
For more detailed operational information, please refer to the BIC-5K user manual on the MEAN WELL official website.

For related product and application requirements, please contact MEAN WELL distributors or MEAN WELL application engineers.
Also, do not forget to stay tuned for online products and solutions courses on MEAN WELL virtual EXPO.