Bi-directional Dc-Dc Converter

Overview

The LDB series bidirectional DC-DC converter is a programmable IGBT-based switching power supply equipment used in new energy, flow battery charging and discharging testing (supporting 0V pre-charging), DC uninterruptible power supply systems, power electronics testing, hybrid vehicles, and other fields.

The bidirectional DC-DC converter adopts the classic BUCK/BOOST step-up/step-down chopper circuit topology, possessing both step-up and step-down bidirectional conversion functions and bidirectional energy flow. It utilizes advanced interleaved control technology, resulting in low ripple current and high output power quality. For DC voltages ≤ 1200V, a two-level circuit topology is used; for DC voltages > 1200V and ≤ 1500V, a three-level circuit topology is used.

The bidirectional DC-DC converter features multiple operating modes, including constant voltage, constant current, and constant power, and supports parallel operation of multiple units. A touchscreen serves as the human-machine interface, integrating display and control. Operating data, status information, and fault information are displayed in real time, and a historical fault information query function is available (capable of storing 200,000 entries). An optional DC energy meter provides accurate DC energy statistics (0.2 accuracy class).

The bidirectional DC-DC converter can accommodate various energy storage forms, including lead-acid batteries, lithium batteries, flow batteries (supporting 0V pre-charging), hydrogen fuel cells, and supercapacitors. Multiple communication interfaces are available, including RS485, TCP/IP, and CAN, using the standard Modbus communication protocol for remote monitoring. Optional WIFI and GPRS communication modules allow users to download a smart terminal APP on their mobile phones or computers to monitor equipment operating data and alarm information 24/7 without leaving their location.

Typical applications include: energy storage conversion systems, photovoltaic energy storage and direct current flexible power systems (common DC bus), and battery level conversion.

Technical Features

1. Bidirectional buck-boost conversion, allowing for bidirectional energy flow.

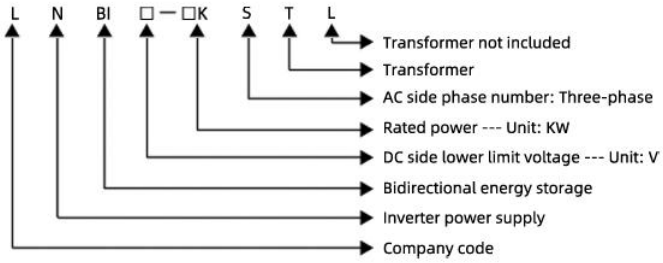
2. Supports constant current, constant power, and constant voltage parallel operation, as well as constant voltage droop control algorithm.

3. Advanced interleaved control technology for low output ripple current.

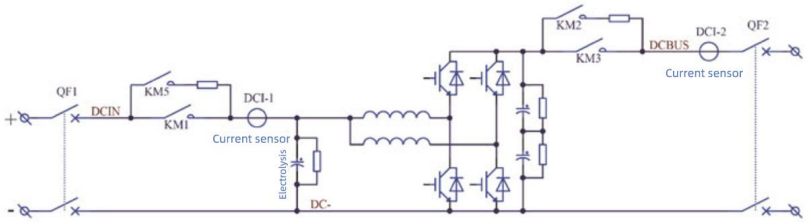
4. Features protection against reverse connection, over/under voltage, overcurrent, and overheating.

5. Color touch screen with Chinese and English language switching, integrated display and control, providing clear and concise operating data.

Model and meaning

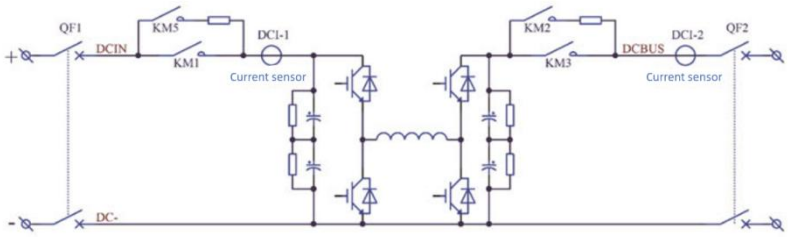


Electrical schematic diagram



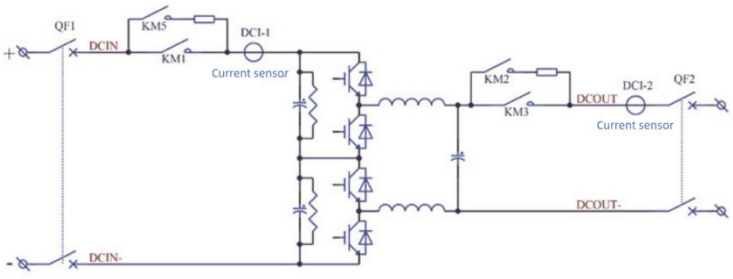
▲ Two-level boost or buck converter topology

Note: This topology requires a voltage difference of at least 30V between the two sides, i.e., U_high_voltage_side - U_low_voltage_side > 30V.



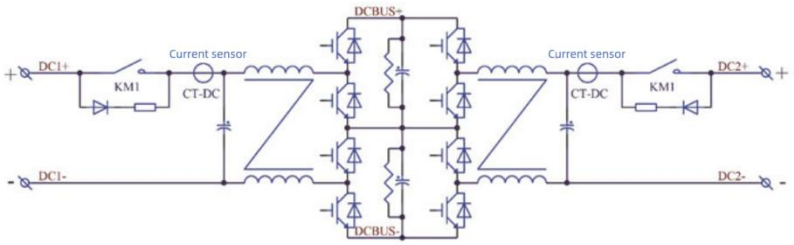
▲ Two-level buck-boost topology

Note: In this topology, the high and low voltage sides can overlap, but the control is relatively complex, and the hardware and software costs are higher.



▲ Three-level boost or buck topology

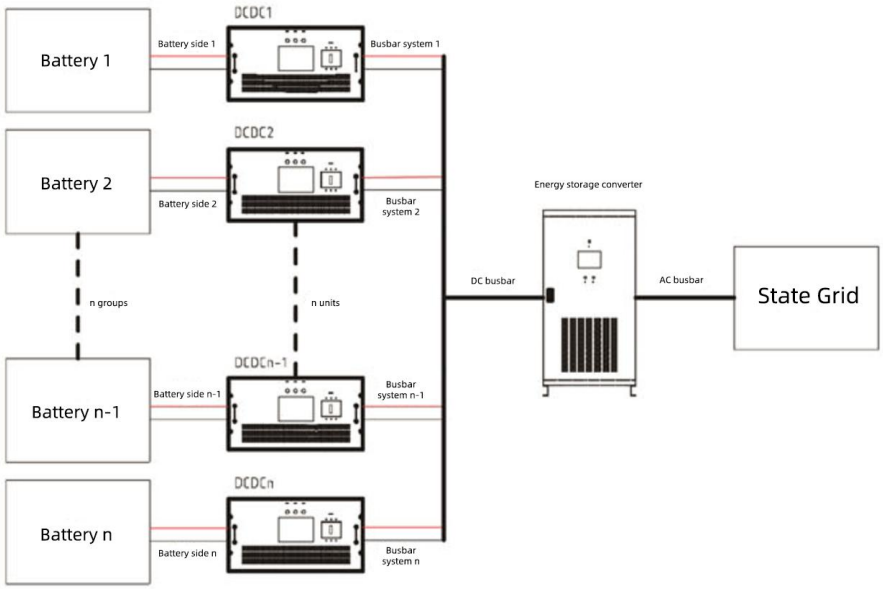
Note: This topology requires a voltage difference of at least 50V between the two sides, i.e., U_high voltage side - U_low voltage side > 50V.



▲ Three-level buck-boost topology

Note: In this topology, the high and low voltage sides can overlap, but the control is relatively complex, and the hardware and software costs are higher.

Typical application topology: DC/DC*n + PCS*1



When the energy storage converter needs to interface with N battery packs, and the charging and discharging of each battery pack needs to be independently controllable, a topology using n DCDC converters sharing a common DC bus can be selected to interface with the energy storage converter.

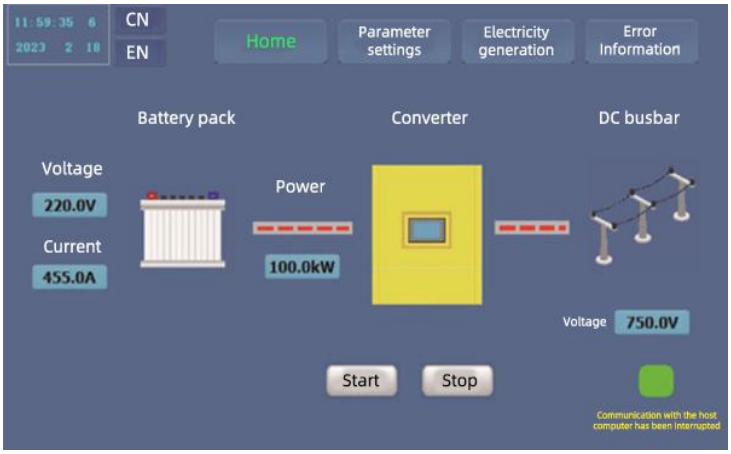
• In grid-connected mode, the energy storage converter establishes the DC bus, and each battery pack can independently adjust its charging or discharging mode according to its own status (charging and discharging can occur simultaneously).

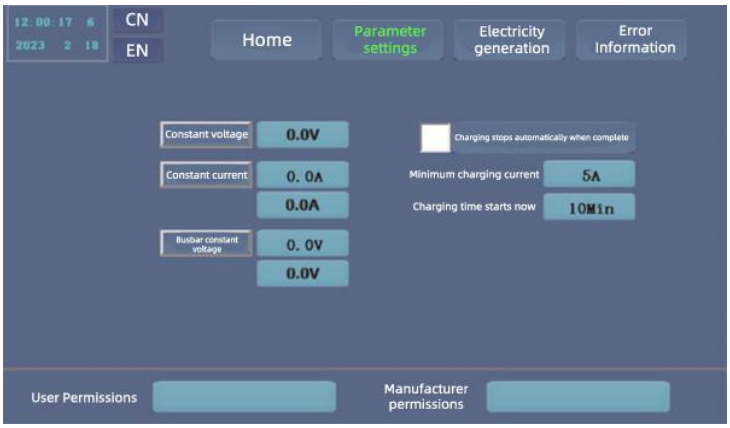
• In off-grid mode, the DCDC converters establish the bus through droop control, and the energy storage converter operates in island mode with constant AC voltage output.

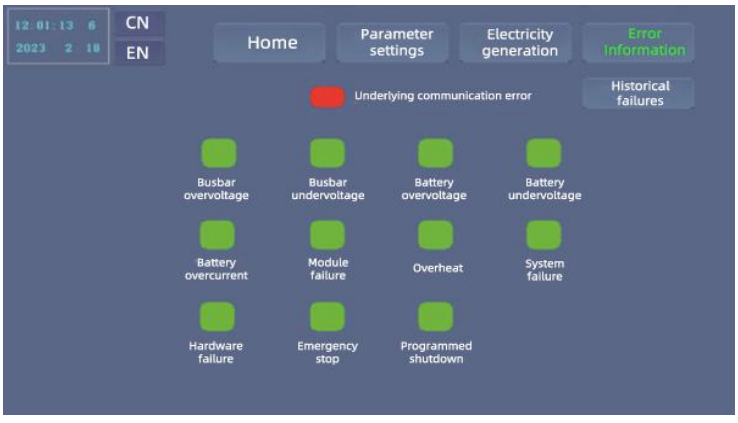
Application example: DCDC (7 units of 10kW each) + PCS (1 unit of 70kW)

Operating Interface

Color touch screen, integrated display and control, supports Chinese and English language switching.







Technical parameters and selection criteria

Bidirectional DC-DC converter parameters					
Rated equipment power	30KW	100KW	250KW	500KW	1000KW
Maximum equipment power	33KW	110KW	275KW	550KW	1100KW
Low-voltage DC side parameters					
DC voltage range	130-400VDC	240-400VDC	450-650VDC	450-650VDC	450-650VDC
Maximum DC current	230.8A	769.3A	1041.7A	1111.2A	2222 3A
Voltage/current regulation accuracy	±1%FS				
DC voltage ripple	< 3%lmms				
High-voltage DC side parameters					
DC voltage range	450-550VDC	450-550VDC	650-750VDC	750-850VDC	750-850VDC
Maximum DC current	66.7A	222 3A	384.7A	666.7A	1333.4A
Voltage/current regulation accuracy	±1%FS				
DC voltage ripple	< 3%lmms				
System Parameters					
Operating modes	Constant voltage, constant current, constant power				
Charging and discharging modes	Constant current - constant voltage, constant power - constant voltage, OV pre-charging (only supported in constant current mode)				
Pre-charging mode	Reverse polarity, short circuit, overheating, over/under voltage, overcurrent, etc.				
Maximum conversion efficiency	99%				
Noise	＜65dB				
Protection level	IP20 (customizable to IP54)				
Permissible ambient temperature	-15℃ to 50℃ (Other temperatures can be customized)				
Permissible relative temperature	0-95% (no condensation)				
Permitted altitude	≤6000m; for altitudes exceeding 2000 meters, derating is required (1% derating for every 100 meters increase in altitude).				
Cooling method	Intelligent air cooling				
Emergency shutdown	There is an emergency stop button.				
Display	Touchscreen				
Insulation monitoring	Insulation tester				
Temperature monitoring	Temperature monitoring instrument				
Communication interface	RS48 , Ethemet , WIFI , GPRS , CAN				
Communication protocol	Modbus RTU/ Modbus TCP				

This indicates optional features. The above technical parameters are standard parameters and are for reference only; they can be customized according to the user's actual needs.

Optional features

Input Dry Contacts: Start/Stop dry contact, BMS fault dry contact, Charge/Discharge direction dry contact, Reset control dry contact, etc.

Output Dry Contacts: Running status dry contact, Fault status dry contact, Power-on status dry contact, Charging status dry contact, Discharging status dry contact, etc.

Dry Contact Definitions:

a) Start/Stop Dry Contact: Input type, dry contact closed, equipment runs; dry contact open, equipment stops.

b) BMS Fault Dry Contact: Input type, dry contact closed, equipment is allowed to run; dry contact open, equipment stops and alarms.

c) Charge/Discharge Direction Dry Contact: Input type, dry contact closed, equipment operates in charging mode; dry contact open, equipment operates in discharging mode.

d) Reset Control Dry Contact: Input type, dry contact changes from open to closed (rising edge signal), equipment performs fault reset, dry contact remains closed for at least 1 second.

e) Running Status Dry Contact: Output type, dry contact activates when the equipment is running or stopped, 1NO+1NC

f) Fault Status Dry Contact: Output type, dry contact activates when the equipment malfunctions, 1NO+1NC

g) Power-on Status Dry Contact: Output type, dry contact activates when the equipment is powered on and the screen is lit, 1NO+1NC

h) Charging Status Dry Contact: Output type, dry contact activates when the equipment is charging the battery from the power grid, 1NO+1NC

i) Discharging Status Dry Contact: Output type, dry contact activates when the equipment is discharging from the battery to the power grid, 1NO+1NC

Note: For the selection of the number of dry contacts and definitions of other functional dry contacts, please consult our company's technical department.

Standard dimensions and net weight

● W --- Width, L --- Depth, H --- Height

Due to continuous equipment upgrades and adjustments, the dimensions and weight are for reference only; the actual product shall prevail.

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