

# Klacci<sup>®</sup> Energy Storage System

life unlocked.





**klacci**<sup>®</sup>  
life unlocked.

**Energy Storage System**

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# Introduction

## Creating a Reliable and Sustainable Energy Environment with Renewable Energy and Storage Systems

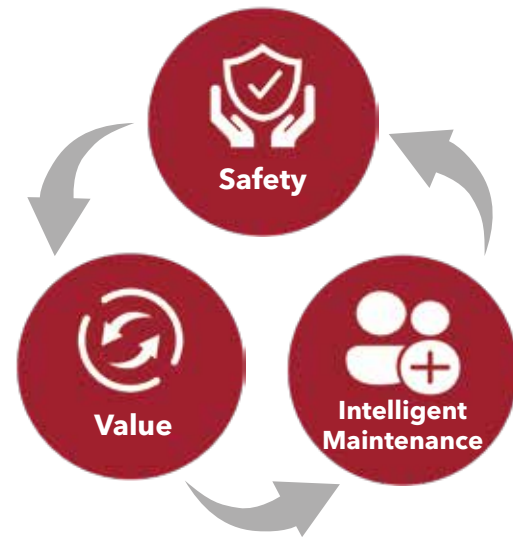
Since its establishment in 1965, Klacci Technology Co., Ltd.(a subsidiary of I-TEK Enterprise) has been known for supplying intelligent access control systems. Guided by the mission to "make everyone's life safer and their property more secure,"Klacci is committed to providing innovative, secure, and convenient solutions.Beyond its expertise in intelligent access control systems, Klacci integrates NFC, Bluetooth, and RFID technologies to create efficient mobile access and biometric solutions tailored for high-end residential and commercial office needs. Its smart building solutions combine automated door controls with contactless technology, offering a healthy and convenient lifestyle in the post-pandemic era.

Klacci embeds environmental sustainability into its core values. Through advanced energy-saving technologies, the company introduces secure energy storage systems to meet high-energy demands. These systems provide multiple benefits, including peak shaving, backup power supply, and carbon emission reduction. They enable customers to flexibly manage electricity usage, precisely control energy costs, optimize energy efficiency, and reduce environmental impact.

With stringent quality management and over 100 patents, Klacci's products have earned ANSI and UL certifications and are marketed globally, deployed across diverse sectors such as government institutions, schools, and hospitals. Driven by continuous technological innovation, Klacci integrates safety and energy-saving features into smart buildings, creating a safer and more sustainable living environment, delivering profound value to customers and society.

**We prioritize an environmentally friendly, stable, and easily maintainable safe usage environment, protecting the planet while providing reliable and efficient energy support.**

# System Advantages



## Safety

- **Electric Shock Protection**

The battery adopts a safe voltage level (51.2V SELV), completely eliminating the risk of electric shock to personnel.

- **Fire Safety Reliability**

- » Low Ohm Thermal Risk

"Large-section pure copper busbar and optimized connection design ensure ultra-low contact resistance and excellent heat dissipation, suppressing hotspot formation.

- » Controllable DC Side Risk

The high-voltage side after boosting adopts a low-current design, with positive and negative poles physically isolated in wiring, enhancing insulation protection.

- » Thermal Runaway Isolation

Module-level independent rapid shutdown mechanism, precisely isolating faulty units, effectively curbing thermal spread, and ensuring overall system safety.

## Value

- **Ultra High System Availability**

In a parallel architecture, when one or multiple battery modules fail or undergo maintenance, the system continues to supply power, maximizing uptime.

- **Longer Battery Life**

A parallel configuration distributes current and voltage stress, eliminating the transient high current and voltage surges experienced by the end modules in a series system.

Optimized management based on electrochemical characteristics slows down battery aging rate and reduces capacity degradation.

- **Intelligent control system**

Each 51.2V module employs independent precise voltage regulation, completely eliminating the need for complex passive or active battery balancing circuits and algorithms required in traditional series systems.

- **Simpler Grid Integration**

The modules are boosted by the controller and connected in parallel to the PCS DC bus, eliminating the strict phase and frequency synchronization requirements needed for AC paralleling on the PCS output side, thereby simplifying system integration and expansion.

## Intelligent Maintenance

- **High-Reliability Network**

Achieve real-time collection of massive module-level data

- **Cloud Big Data Platform**

Conduct in-depth analysis to accurately assess battery State of Health (SOH) and predict lifespan.

- **Preventive Maintenance**

Maximize system service life and reduce long-term operational costs.

- **Reliable & Cost-Effective**

Strictly adhering to the IEC 61508 functional safety standard principles, the design meets data center availability requirements with a Tier IV - Fault Tolerant architecture. The system ensures high reliability and overall cost-effectiveness through the architectural design itself, featuring parallel redundancy and simplified control.



**The system has been certified and a patent application has been filed**

- **UL 9540A** Energy storage system thermal runaway propagation assessment test
- **UL 1973** Standard for Batteries
- **IEC 62619** Safety testing for industrial applications of secondary lithium-ion battery packs
- **CE-EMC** Electromagnetic compatibility testing
- **UN 38.3** Testing the safety of lithium batteries in air transport



# System Application

## Renewable Energy Integration for Improved Energy Efficiency

Energy storage improves efficiency by storing surplus energy for later use, reducing waste, cutting costs, and lowering reliance on traditional energy sources.

## Uninterruptible Power Supply (UPS)

Designed according to Tier IV data center specifications, it provides real-time backup power and voltage stability through battery storage and fast-switching mechanisms, ensuring critical loads operate normally during power anomalies. The energy storage system stores energy in normal mode and rapidly discharges during power outages, protecting equipment from the impact of power interruptions.

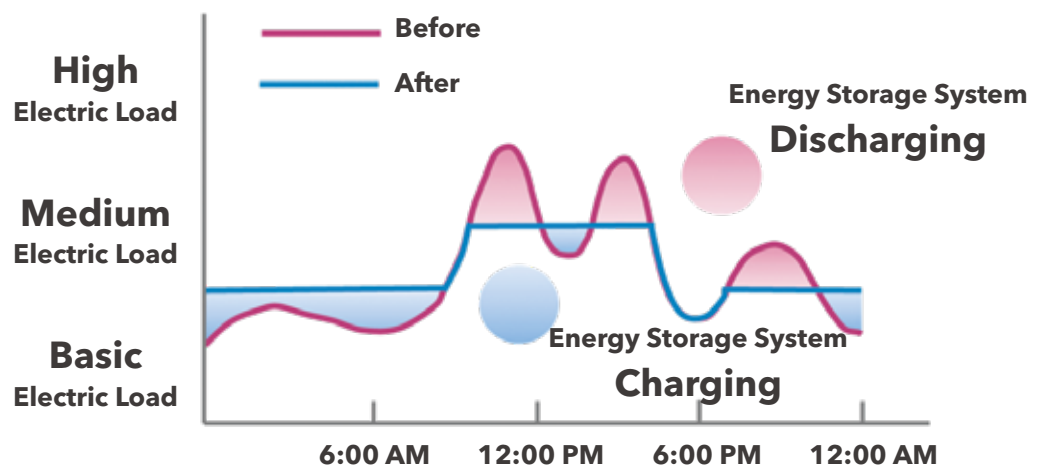
## Peak Shaving, Frequency Regulation

Supports power peak shaving (reducing peak loads) and frequency regulation services (stabilizing grid frequency), lowering electricity costs while enhancing grid stability.



## Peak Shaving and Valley Filling

Energy demand fluctuates throughout the day, with peaks during the day and valleys at night. Energy storage technology can store excess energy during low-demand periods to meet high-demand periods, thereby stabilizing energy supply and avoiding energy waste or shortages caused by supply-demand imbalances.



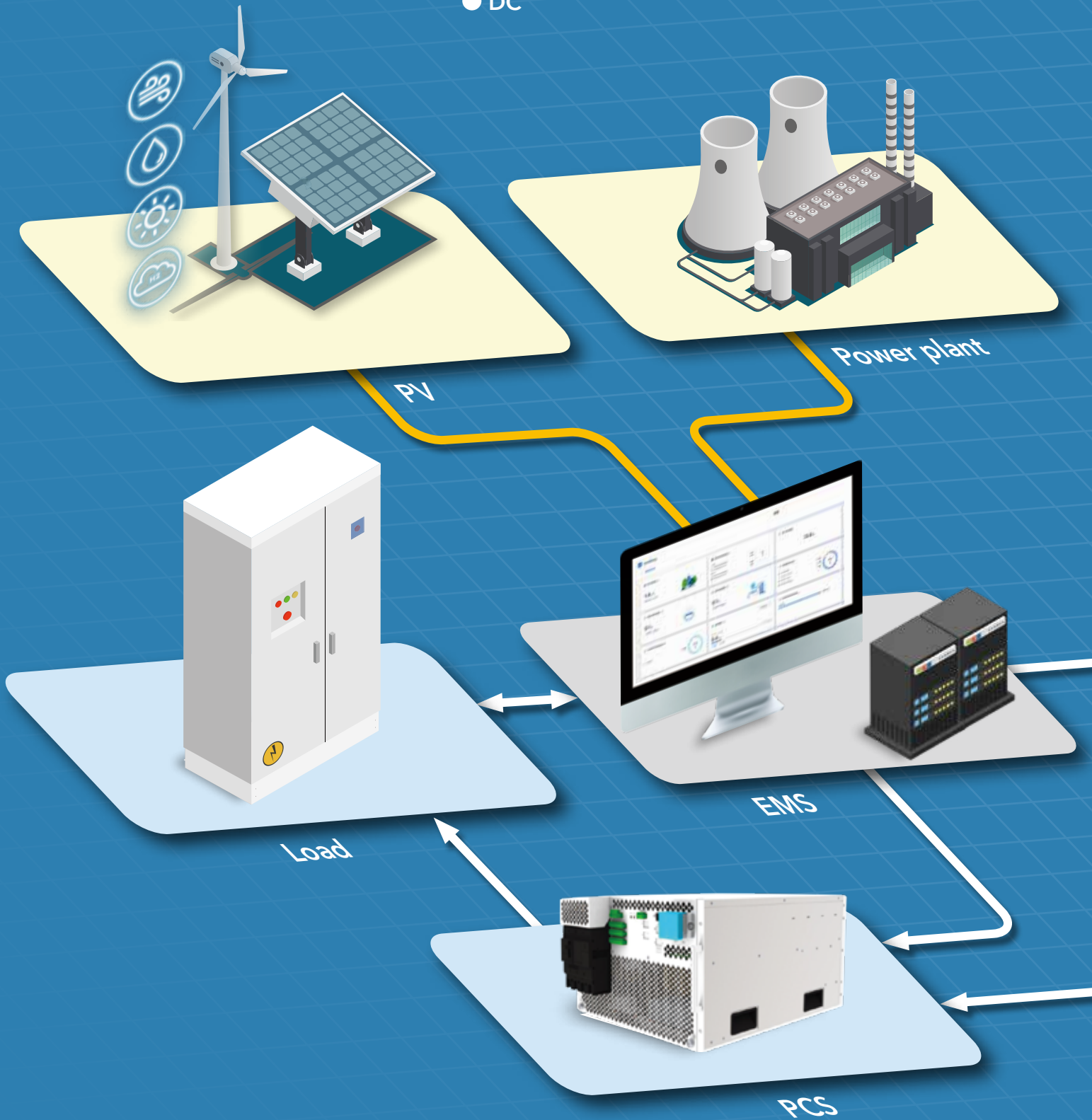
## Power Trading Participation and Grid Stability Enhancement

Energy storage enhances grid stability by quickly adjusting to demand fluctuations, ensuring reliable operation and reducing power interruptions.

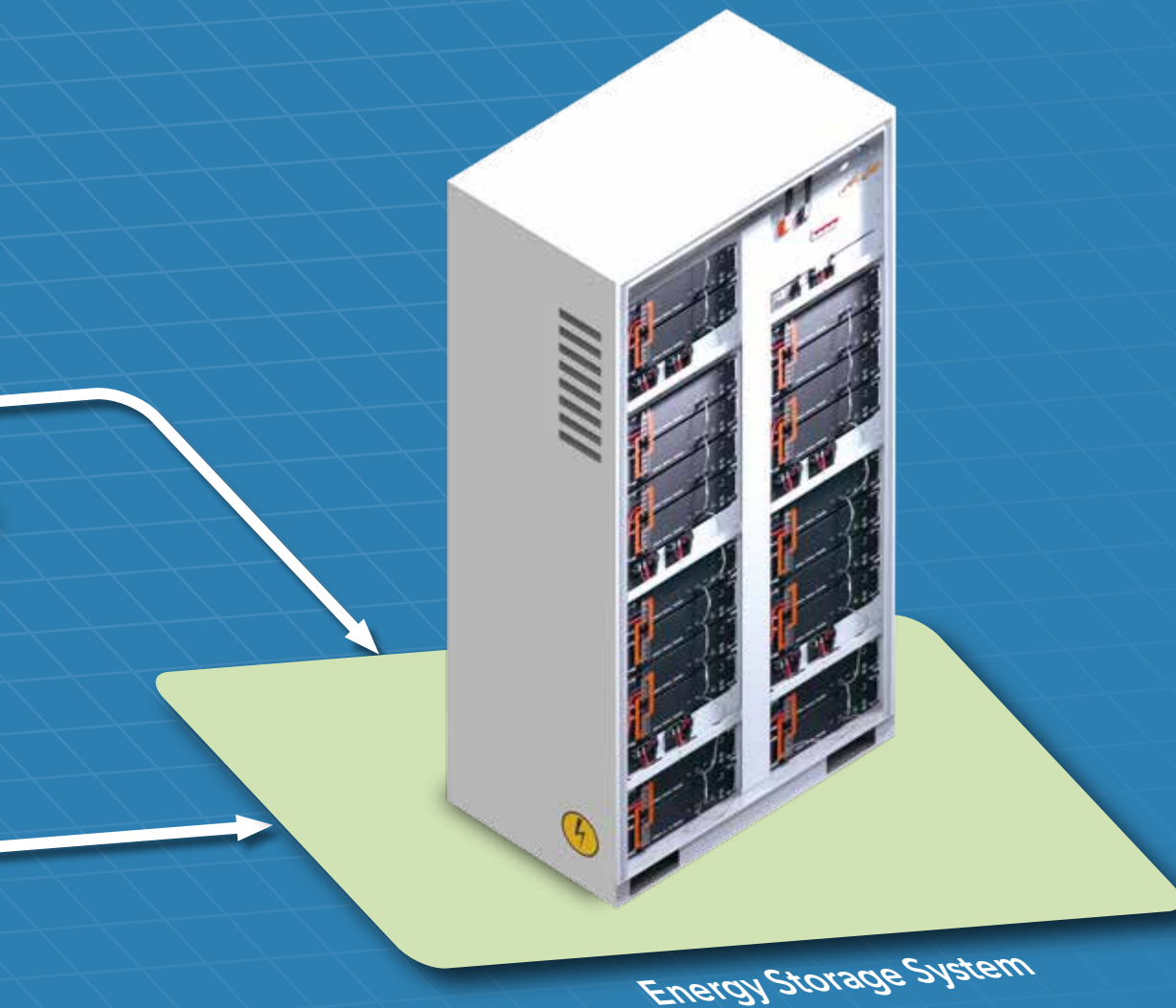


# System Configuration

● AC  
● DC



The system architecture converts electricity generated from solar energy through a Power Conditioning System (PCS), enabling storage in battery modules or direct supply to loads. The Energy Management System (EMS) oversees real-time monitoring, data analysis, and equipment scheduling. Through automated management, it effectively enhances the utilization rate of renewable energy, while reducing energy consumption and mitigating the issue of high power generation costs.



# System Feature Evaluation

|                                     | Klacci                                                                                             | Other manufacturers                                                                                                                                  |
|-------------------------------------|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Feature Comparison                  | Low-Voltage Battery Parallel Connection System                                                     | High-Voltage Battery Series Connection System                                                                                                        |
| Operating temperature               | Low                                                                                                | High (Endpoint)                                                                                                                                      |
| BMS Battery Module                  | Low (On / Off)Automatic Balancing                                                                  | High (Overcharge Monitoring/ Overdischarge)                                                                                                          |
| Control System                      |                                                                                                    |                                                                                                                                                      |
| Cooling System                      | Working Temperature: 40 ± 5°C<br>(Natural Cooling with Exhaust Fan)                                | High Temperature Above 80°C<br>(Needs forced air / liquid / immersion cooling)                                                                       |
| Charging and Discharging (SOC)      | 90%                                                                                                | 80%                                                                                                                                                  |
| Battery Remaining                   | >90%                                                                                               | <80%                                                                                                                                                 |
| Capacity after 5 Years              |                                                                                                    |                                                                                                                                                      |
| Auxiliary System Energy             | Low                                                                                                | High                                                                                                                                                 |
| Consumption                         |                                                                                                    |                                                                                                                                                      |
| Safety                              | Ensures safety for both personnel and products                                                     | Risks include high-temperature and high-voltage runaway, as well as electric shock hazards to personnel                                              |
| Risk of Electric Shock to Personnel | No Risk of Electric Shock (Low Voltage)<br>Arc voltage below 60V<br>Gasification occurs below 900V | High risk of electric shock (Requires high-voltage insulation)<br>Arc voltage above 900V<br>Vaporization above 1100V                                 |
| Fire Risk Safety                    | Extremely Safe                                                                                     | Danger                                                                                                                                               |
| Initial Setup Cost                  | High                                                                                               | Low                                                                                                                                                  |
| Operation and Maintenance Cost      | Low (Easy to replace)<br>Can be handled anytime by a general electrician                           | High (Difficult to replace)<br>Needs upkeep from skilled electrical technicians                                                                      |
| Reliability Rate                    | 99.99% availability with no downtime<br>Supports hot-swappable maintenance<br>Longer battery life  | Cabinet shutdown with 3 charge-discharge cycles<br>Requires at least 2 days for battery equalization<br>Requires at least 15 days of annual downtime |
| Placement / Installation area       | Indoor/outdoor use allowed                                                                         | Limited to outdoor, enclosed spaces                                                                                                                  |
| Required Space (Area Efficiency)    | 20' container (1.1M)                                                                               | 20' container (2.4M)                                                                                                                                 |

## Klacci's energy storage is not just a backup, but an active defense and value enhancement, the system features

- High Safety: No fire, no explosion, no overheating
- Intelligent Adjustment: Store electricity at low prices, discharge at high prices
- Structural Stability: Reduces battery temperature and remains reliable under long-term loads
- Highly durable: Long lifespan and low maintenance
- Easy to operate: No dedicated personnel required; easy to manage

### Klacci Low-voltage Parallel

No air conditioning required - natural heat dissipation design saves energy. Ideal for applications with high safety requirements.



No air conditioning, fan cooling



### Other manufacturers High-voltage Connection

Additional cooling, such as air conditioning or liquid cooling, is needed to ensure system stability.

Liquid Cooling System



Outdoor energy storage cabinet cooling system with air conditioning

# Specifications

## Power Plant / Industrial Type

### PCS

125kW



#### Specifications

##### Battery Cabinet Performance Parameters

|                                   |                |
|-----------------------------------|----------------|
| Number of Routes                  | 1              |
| DC Voltage Range                  | 600 - 1000Vdc  |
| Maximum DC Current                | 198A           |
| Rated DC Power                    | 125kW          |
| Stabilizing Accuracy              | $\leq \pm 2\%$ |
| Stabilization Accuracy            | $\leq \pm 5\%$ |
| Pressure Limiting Characteristics | Eligible       |
| Current Limiting Characteristics  | Eligible       |

##### AC Output (Grid)

|                                  |                           |
|----------------------------------|---------------------------|
| Rated Output Power               | 125kW                     |
| Overload Capacity                | 1.1x Long Term            |
| Rated Voltage                    | AC400V                    |
| Rated Output Current             | 180A                      |
| AC Access Method                 | Three-Phase Four-Wire     |
| Isolation                        | Non-Isolated              |
| Grid Voltage Range               | 400V (-15% - +15%)        |
| Grid Frequency Range             | 50Hz / 60Hz $\pm 2.5$ Hz  |
| Total Harmonic Distortion Rate   | $\leq 3\%$ (Fully Loaded) |
| Power Factor                     | 0.99 / -1 - 1             |
| Current DC Component             | $\leq 0.5\%$              |
| Charge/Discharge Conversion Time | <100ms                    |
| Size (W×H×D)                     | 800 × 1800 × 800mm        |

##### AC Output (Load)

|                                            |                          |
|--------------------------------------------|--------------------------|
| AC Off-Grid Voltage                        | 400Vac                   |
| AC Voltage Range                           | 400Vac $\pm 3\%$         |
| AC Off-Grid Frequency                      | 50Hz / 60Hz              |
| Offline Output THDU                        | $\leq 3\%$ (Linear load) |
| Unbalanced Load Capability                 | 1                        |
| Offline Multi-Computer Parallel Connection | Nonsupport               |
| DC Side Parallel Connection                | Nonsupport               |

##### General Specifications

|                               |                                                   |
|-------------------------------|---------------------------------------------------|
| Dimensions (W×H×D)            | 520 × 240 × 680mm                                 |
| Weight                        | 70 kg                                             |
| Cooling Method                | Compulsory Air-Cooled                             |
| Maximum Working Altitude      | 3000m                                             |
| Operating Temperature Range   | -20°C - 60°C                                      |
| Allowable Relative Humidity   | $\leq 95\%$                                       |
| Protocol                      | BMS-CAN   EMS -Network<br>Port / RS485            |
| Maximum Conversion Efficiency | $\geq 99\%$                                       |
| Newsletter                    | $\leq 75$ dB                                      |
| Multi-Module Networking       | DC Side Separate - AC Side<br>Parallel Connection |
| Waterproof Rating             | IP21 Indoor Container                             |

### Battery Cabinet

110kWh

208kWh



#### Specifications (110kWh)

##### Performance Parameters

|                              |                                            |
|------------------------------|--------------------------------------------|
| Voltage Output Range         | 500 - 850Vdc (Constant Voltage Adjustable) |
| Max. Discharge Power         | 100kW                                      |
| Max. Output Current          | 150A                                       |
| Max. Charging Power          | 100kW                                      |
| Total Energy                 | 220kWh                                     |
| Battery Module Specification | 51.2V 100Ah                                |
| Battery Module Number        | 22                                         |

##### General Specifications

|                       |                                                   |
|-----------------------|---------------------------------------------------|
| Dimensions (W×H×D)    | 800 × 1900 × 1200mm                               |
| Weight                | 1600 kg                                           |
| Cooling Method        | Natural Cooling<br>Charging: 0°C - 56°C           |
| Operating temperature | Discharging: -20°C - 56°C                         |
| Waterproof Rating     | IP21 Indoor Container /<br>IP65 Outdoor Container |
| Protocol              | CAN / RS485                                       |
| Cycle Life            | $\geq 6000$ times                                 |

#### Specifications (208kWh)

##### Performance Parameters

|                              |                                            |
|------------------------------|--------------------------------------------|
| Voltage Output Range         | 600 - 850Vdc (Constant Voltage Adjustable) |
| Max. Discharge Power         | 104kW                                      |
| Max. Output Current          | 140A                                       |
| Max. Charging Power          | 104kW                                      |
| Total Energy                 | 208kWh                                     |
| Battery Module Specification | 51.2V 100Ah                                |
| Battery Module Number        | 13                                         |

##### General Specifications

|                       |                                            |
|-----------------------|--------------------------------------------|
| Dimensions (W×H×D)    | 1000 × 1950 × 1250mm                       |
| Weight                | 1750 kg                                    |
| Cooling Method        | Forced Air Cooling<br>Charging: 0°C - 56°C |
| Operating temperature | Discharging: -20°C - 56°C                  |
| Waterproof Rating     | IP21 Indoor Container                      |
| Protocol              | CAN / RS485                                |
| Cycle Life            | $\geq 6000$ times                          |

# Light Duty / Commercial Type

## PCS

### 6.5kW Hybrid Inverter

- Supports Parallel Connection
- Can connect up to 6 units in parallel

(Exceeding the quantity may cause delays in RS485 communication function.)



**Model: ECO-HV-5548**

### Specifications

| Performance Parameters                         |                                          |
|------------------------------------------------|------------------------------------------|
| Phase                                          | Single-phase Input / Single-phase Output |
| Max. PV Input Power                            | 6500W                                    |
| Rated Output Power                             | 6000W                                    |
| Max. Charging Power                            | 6000W                                    |
| Parallel Capability                            | Able to Connect 6 Units in Parallel      |
| Photovoltaic Input (DC)                        |                                          |
| Rated DC Voltage / Maximum DC Voltage          | 360Vdc / 500Vdc                          |
| Starting Voltage / Initial Supply Voltage      | 60V / 90Vdc                              |
| Maximum Power Voltage Range                    | 60Vdc - 450Vdc                           |
| Maximum Input Current                          | 1/20A                                    |
| Maximum Conversion Efficiency (DC/AC)          | >99%                                     |
| Grid Input (AC)                                |                                          |
| Nominal Voltage (AC)                           | 220 / 230 / 240VAC                       |
| Output Voltage Range                           | 170 - 264 VAC / 90 - 264 VAC             |
| Rated Output Current                           | 24A                                      |
| Power Factor                                   | >0.99                                    |
| Total Harmonic Distortion (THD)                | <3%                                      |
| Conversion Efficiency                          |                                          |
| Maximum Conversion Efficiency (DC/AC)          | 93% (Battery DC/AC)                      |
|                                                | 97% (PV DC/AC)                           |
| Off-grid and Hybrid Operation                  |                                          |
| AC Startup Voltage / Automatic Restart Voltage | 170 / 180VAC                             |
| Frequency Range                                | 45 - 65Hz                                |
| Acceptable Input Voltage Range                 | 170 - 264 VAC / 90 - 264 VAC             |
| Maximum AC Input Current                       | 30A                                      |
| Battery Output                                 |                                          |
| Nominal Output Voltage                         | 220 / 230 / 240VAC                       |
| Rated Output Power                             | 5500W                                    |
| Pulse Power                                    | 8250W                                    |
| Switch Time                                    | <10ms                                    |
| Output Waveform                                | Pure sine wave                           |
| Total Harmonic Distortion (THD)                | <3%                                      |
| Efficiency (DC/AC)                             | 92%                                      |
| Batteries and Charging                         |                                          |
| Rated DC Voltage                               | 48Vdc                                    |
| Maximum Solar Charging Current                 | 100A                                     |
| Maximum AC Charging Current                    | 80A                                      |
| Max. Charging Current                          | 100A                                     |
| General Specifications                         |                                          |
| Dimensions (W×H×D)                             | 260 × 450 × 102mm                        |
| Weight                                         | 8.5 kg                                   |
| Protocol                                       | RS485 / Wi-Fi / GPRS / Lithium Battery   |
| Relative Humidity                              | 0 - 90%                                  |
| Operating temperature                          | -10°C - 50°C                             |

## Batteries

### 5kWh Battery Module (3U)



**Model: YNJB16S100ND-L**

### Specifications

| Battery Module Performance Parameters |                                                                                 |
|---------------------------------------|---------------------------------------------------------------------------------|
| Rated Voltage                         | 51.2Vdc                                                                         |
| Output Voltage Range                  | 44.8-57.6Vdc                                                                    |
| Nominal Capacity                      | 100Ah                                                                           |
| Rated Energy                          | 5.12kWh                                                                         |
| Rated Discharge Current               | 50A                                                                             |
| Max. Discharge Current                | 100A                                                                            |
| Rated Charge Current                  | 50A                                                                             |
| Max. Charging Current                 | 100A                                                                            |
| Max. Discharge Power                  | 5.12kW                                                                          |
| Max. Charging Power                   | 4kW                                                                             |
| Performance                           | ≥95% DOD                                                                        |
| Voltage Sampling Quantity             | 16S                                                                             |
| Battery Balancing                     | Active Balancing 3A                                                             |
| Dimensions (W×H×D)                    | 484 × 133 × 470mm                                                               |
| Weight                                | 40±1 kg                                                                         |
| Operating temperature                 | Charging: 0°C - 45°C<br>Discharging: -20°C - 55°C                               |
| Storage Temperature                   | 0 - 25°C / 12 months                                                            |
| Waterproof Rating                     | IP52                                                                            |
| Protocol                              | CAN / RS485                                                                     |
| Cycle Life                            | ≥6000 times                                                                     |
| Additional Features (optional)        |                                                                                 |
| Heating Function                      | Activates when charging temperature is below 0°C (Automatically managed by BMS) |
| Certification / Compliance            |                                                                                 |
| Certification / Compliance            | IEC62619 / CE / UN38.3                                                          |

# EMS System Management

## EMS Energy Management System



## Cloud System Architecture

The system offers two selectable power supply operation modes

- Energy Storage AI Automatic Regulation
- Hybrid Inverter Smart Control Mode



**NextDrive Cloud**  
(Supplier by )



**NextDrive**  
**Smart Energy Gateway**

### Measurement



Meter Table

### Energy Storage Management

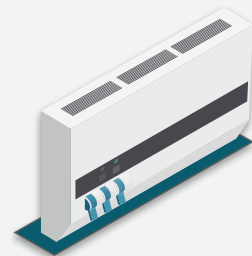


PV

Energy Storage  
System

Charger

### Monitoring



Key Equipment



This EMS (Energy Management System) is centered around the NextDrive Smart Energy Gateway, which connects all on-site electricity consumption, power generation, and energy storage equipment. Through the NextDrive Cloud platform, data is uploaded to the cloud for centralized management.

The web-based EMS interface allows administrators to monitor and manage energy systems in real time.

## Power usage

Users gain clear insight into their electricity usage, including consumption levels, billing estimates, and demand trends.

## Green Energy

Through the integration of solar and energy storage systems, users gain insights into carbon savings and energy efficiency outcomes.

## AI Intelligence

The system is equipped with AI-driven automatic regulation capabilities to optimize energy dispatching based on predictive analytics.

## Equipment Monitoring

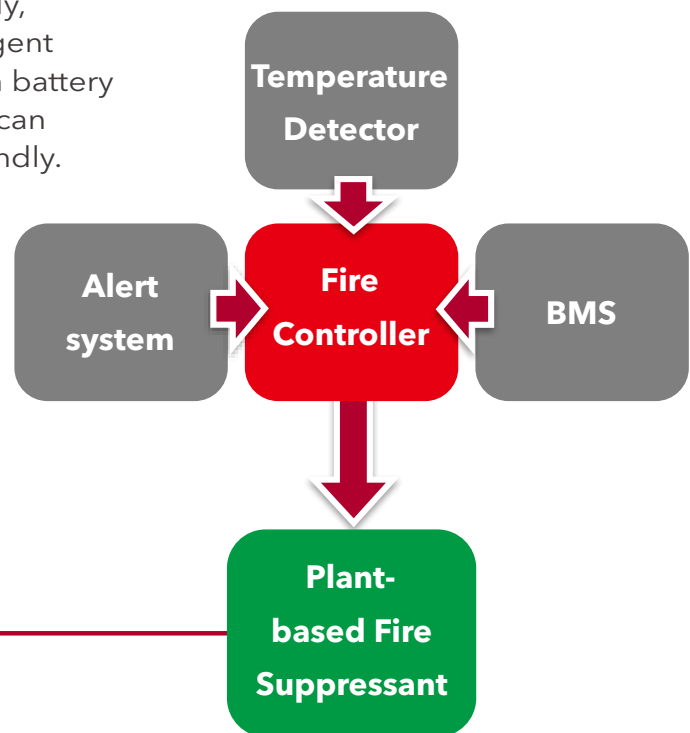
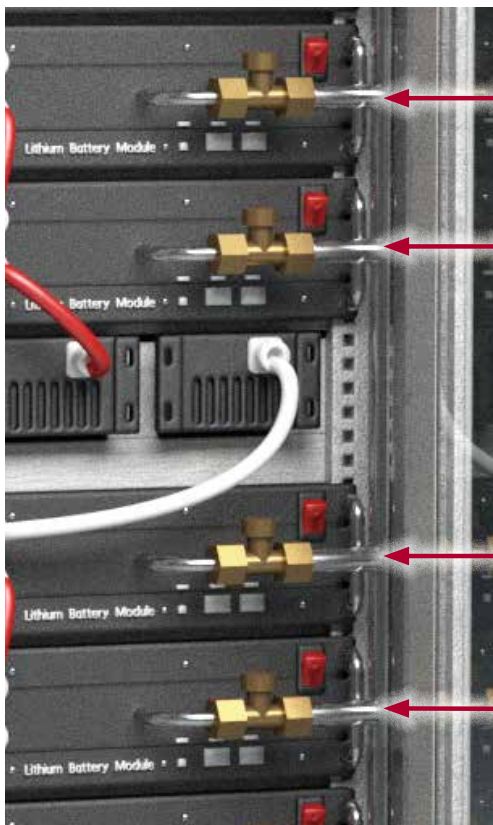
Instant notifications are sent to managers upon equipment faults to facilitate swift handling.

# Optional Fire Suppression System

This energy storage system combines the electrochemical characteristics of the battery with a self-developed intelligent power controller to effectively solve the voltage matching issue between low-voltage batteries and high-voltage PCS, while simplifying the control system and enhancing safety and performance. Utilizing EDC (Efficient Data Collection and Distributed Control System) technology, combined with thermocouple modules and DIDO control modules, the system can precisely monitor temperature variations within the energy storage cabinet batteries and detect anomalies in real time to ensure safety.

## EDC Automatic Fire Extinguishing Function

- The system can be optionally equipped with an automatic fire suppression system. When an abnormal condition is detected, it will automatically activate alarms, cut off power, or release extinguishing agents targeting the thermal runaway cells, extinguishing the fire immediately. This effectively prevents fire escalation and ensures safety.
- This system uses an environmentally friendly, plant-based, non-toxic fire extinguishing agent that can extinguish Class A fires and lithium battery fires. The agent is biodegradable in soil or can be recycled, making it environmentally friendly.



### Green, safe, and non-toxic agent

- The agent has passed toxicity tests.
- The agent decomposes in soil.
- Assist in fire escape and survival.
- The agent is recyclable and environmentally friendly.
- Fire Department Certified Agent

# Thermal Runaway Cause Analysis of Competing Systems

**The Other Manufacturers' Systems waterproof design limited the fire suppressant to the outer casing, failing to extinguish burning lithium cells inside. Gas agents cannot put out Class A fires, leading to uncontrolled fire spread.**

## Thermal Runaway Risk

If lithium batteries fail to detect and control temperature in time, thermal runaway can occur, rapidly generating high temperatures and flammable gases, which may lead to battery module fires or even explosions.



## Installation Defects

Improper wiring, damaged protective layers, or lack of fire and waterproof planning during installation can lead to short circuits, leakage, and increased fire and equipment damage risks.



## BMS Failure Risks

The BMS monitors battery voltage, temperature, and status in real time. Failure can cause overcharge and thermal runaway risks.



## Safety Mechanism Deficiency

Relying solely on the BMS for safety protection means that if the BMS fails, the entire system lacks a final line of defense.





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Subject to change without notice. 202512(A60a1BH-05-00-04)