SOFAR

USER MANUAL

PowerMagic – C&I ESS



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3 About the product

3.1 Overview

The PowerMagic Commercial and Industrial Battery Energy Storage System (BESS) is designed for applications such as stand-alone energy storage, PV and BESS integration scenarios, BESS charging stations, and microgrid scenarios.

Its primary functions include reducing electricity costs for enterprises by utilising peak-valley electricity price differences and serving as a reliable backup power supply.

A typical application diagram of the PowerMagic C&I BESS is shown below:

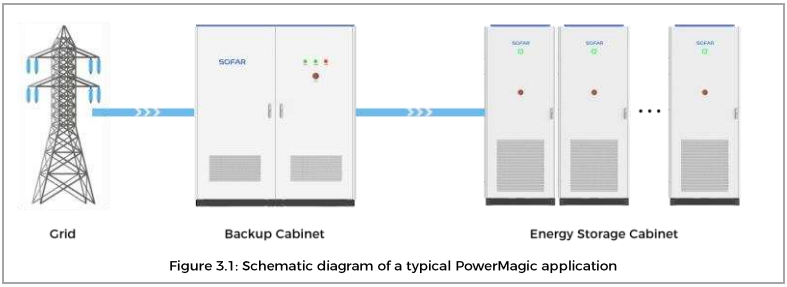


Figure 3.1: Schematic diagram of a typical PowerMagic application

3.2 Functions and features

- **Solution**

The C&I ESS includes the energy storage cabinet (with PCS and liquid cooling unit), junction cabinet, and backup cabinet, providing a one-stop, full-scenario solution for customers.

- **Flexible capacity design**

The system supports flexible parallel connection and capacity expansion.

- **Cabinet parallel design**

To reduce the installation footprint, energy storage cabinets (with integrated PCS and liquid cooling units) in a C&I ESS can be connected in parallel configuration. This approach increases system energy density while reducing overall system costs.

- **Upper-lower compartment design**

The commercial and industrial energy storage cabinet adopts an upper-lower compartment design. The battery PACKs are concentrated in the upper battery compartment, while the liquid cooling unit, PCS, auxiliary power modules, and other electrical components are integrated into the lower electrical compartment. Dedicated safety protection measures are designed separately for the battery compartment and the electrical compartment, enabling compartmental isolation and reducing coupling effects.

Compared with a left-right compartment layout, the upper-lower compartment design requires a smaller footprint and enables higher power and energy density.

- **3 + 2 Safety system**

Designed for ultimate safety:

3 Levels of Fire Protection

- Level 1: Pack-level perfluorohexanone gas fire suppression (optional).
- Level 2: Compartment-level perfluorohexane gas fire suppression (or aerosol).
- Level 3: Water-based fire suppression.

2 Additional Safety Measures

- Explosion venting design.
- Directional combustible gas exhaust system.

Note: The system with a standard compartment-level aerosol fire suppression solution, with the option to select Pack-level or compartment-level perfluorohexane gas fire suppression.

- **Intelligent liquid cooling system**

The liquid cooling system ensures temperature uniformity, longer lifespan, and higher efficiency of battery modules. Using a local intelligent controller, the liquid cooling system can automatically adjust heating, cooling, and self-circulation modes in real time, ensuring stable operation of the energy storage system under various harsh conditions.

- **On/off-grid switching**

By incorporating a backup cabinet, the commercial and industrial energy storage system can meet the requirements of both grid-connected and off-grid applications, as well as the need for quick switching between the two modes.

- **Local EMS functions**

The local controller inside the energy storage cabinet integrates a basic Energy Management System (EMS) for grid-connected applications. The key functionalities include:

1. Anti-backflow protection
2. Peak shaving
3. Self-consumption optimization
4. Overload protection
5. Flexible charging and discharging strategies for different time periods

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- **Remote & Local monitoring & O&M**

The system supports on-site monitoring, upgrades, and installation configuration via a local web interface. It also enables remote access through a web platform or mobile app, allowing real-time monitoring of system operating status.

- **High efficiency & Reliability**

Easy to install and operate, the system features high conversion efficiency, comprehensive protection functions, long service life, and compliance with grid interconnection requirements in China, Europe, and other regions.

3.3 Model description

The main product models involved in this article are follows:

Table 3.1 Product model

System configuration	Energy storage cabinet
5 Pack, 261 kWh	ESS-261KLC-SA1

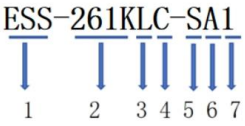


Figure 3.2: Model identification

Table 3.2 Description of energy storage cabinet/battery cabinet model

No.	Name	Meaning	Take value description
1	ESS	Product series name	Energy storage system
2	261K	Energy grade	Rated energy is 261kWh
3	L	Liquid cooling	Thermal management mode
4	C	Battery cell capacity	Example: A-280Ah, C-314Ah
5	S/B	With the PCS/battery	Whether the PCS module is included
6	A/D	AC/DC	Voltage type
7	1	Product version	The first generation of products

3.4 System description

- **Single-unit grid-connected scenario:** Single energy storage cabinet

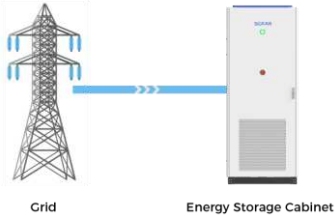


Figure 3.3: Single cabinet scenario

3.5 Dimension

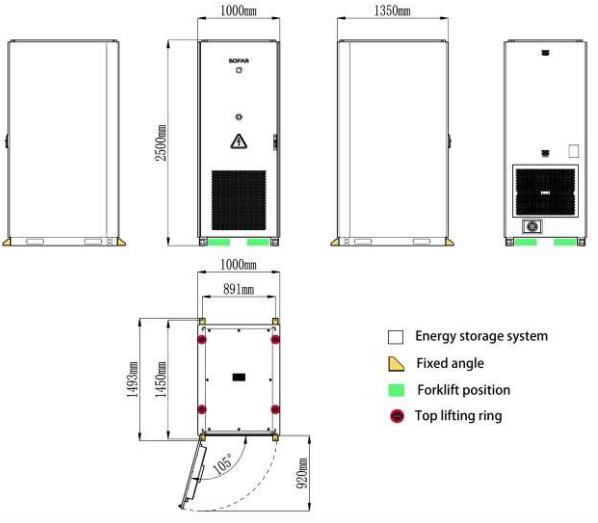


Figure 3.7: Dimensions of energy storage cabinet and maximum door opening size

3.6 Component introduction

Table 3.3 Introduction of energy storage cabinet components

NO.	Name	Qty.	Description
A	Cabinet	1	
B	Temperature/smoke/ combined detectors	1	
C	Aerosol	1	
D	Logo indicator	1	
E	Emergency stop button	1	
F	PACK	5	
G	Liquid Cooling piping	1	

5.2.2 Requirements for installation space

In order to ensure that the air inlet can be better air intake and maintenance, it is recommended to reserve enough space around the cabinet installation position. A minimum clearance of 600 mm is recommended on all sides, and a fire emergency access passage of not less than 1000 mm shall be provided. The minimum space requirement is shown in the figure below:

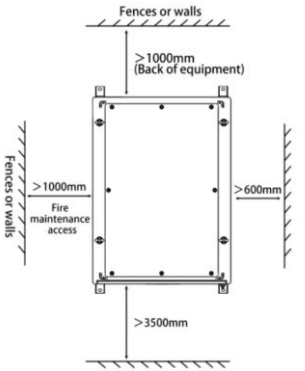


Figure 5.1: Single-unit energy storage system installation

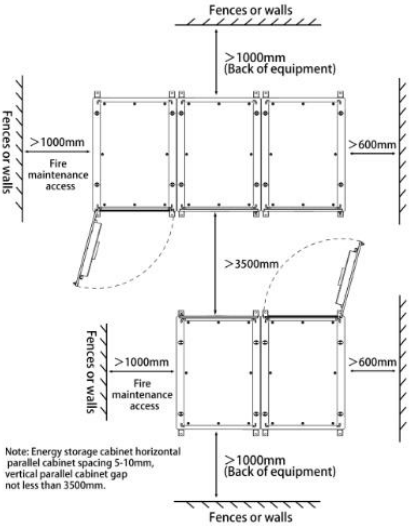


Figure 5.2: Parallel cabinet installation (face-to-face)

6.2.2 Prepare Cables

Table 6.1 Recommended Cable Specifications

Name	Type	Scope of cross-sectional area selection	Terminal	Remarks
AC input power cable	5 core (A, B, C, N, PE) outdoor copper core wire or choose armored cable	95mm²*4 + 50 mm²*1	OT / DT terminal: A/B/C/N: M12 PE: M8	Energy storage cabinet AC input three-phase power cable
Parallel cabinet signal cable	2 Core shielding cable	(0.5~1mm²) *2	Tubular terminal, 8 mm	Connecting energy storage cabinets in parallel (for PWM communication and parallel synchronization I/O signals)
RS485 communication cable	2 Core shielding line	(0.5~1mm²) *2	Tubular terminal, 8 mm	For communication between the energy storage cabinet, external PCC, and PV meter
CSU communication network cable	CAT 5E Outdoor shielded network cable, with an internal resistance of 1.5 Ω / 10m	—	Shield of the RJ 45 crystal head	Local management or EMS communication
DRM signal cable	CAT 5E Outdoor shielded network cable, with an internal resistance of 1.5 Ω / 10m	—	Shield of the RJ 45 crystal head	PCS DRM signal
I/O dry contact signal cable	2 Core cable	(0.5~1mm²) *2	Tubular terminal, 8 mm	External fault output signals from the energy storage cabinet, external fault input signals to the energy storage cabinet, PCS NS protection signals, etc.
Protective Grounding (PE) Cable	Single-core outdoor copper core wire or grounding flat steel	Copper core wire: (25mm²~50mm²) or ground flat steel: (section (40mm * 4mm)	M10 OT / DT terminal	The specific size of the grounding wire / flat steel is subject to the design of the design institute