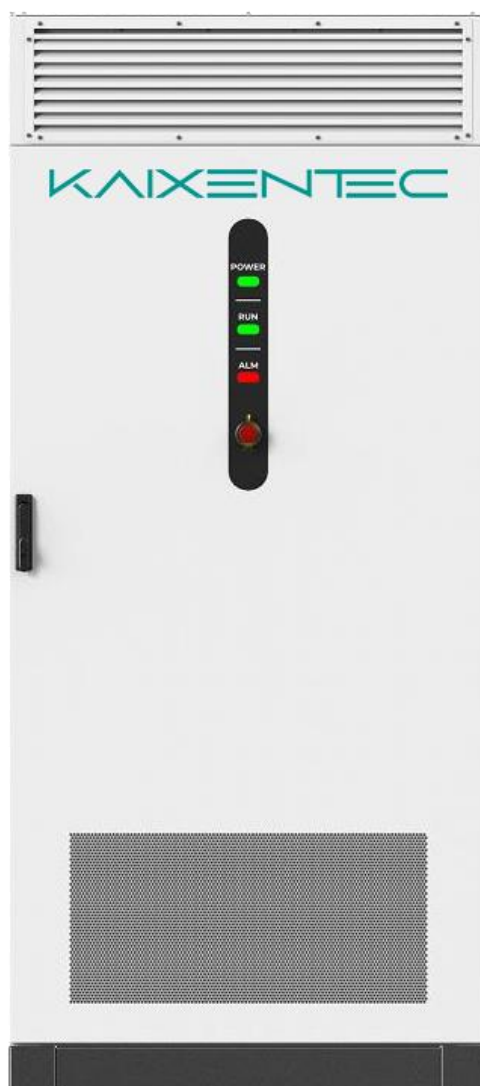




TECHNICAL SPECIFICATION

CITADEL 261KWh-125KW-L-PCS

Liquid Cooled Integrated Cabinet Energy Storage System

Version 1.0

1. TABLE OF CONTENTS

1.	Table of Contents.....	1
2.	Product Overview.....	2
3.	Product Features	3
4.	Product compliance standards	4
5.	System Introduction	5
6.	Product nameplate and packaging	21
7.	Accessories List	23
8.	Conditions of Use.....	23

2. PRODUCT OVERVIEW

The system is composed of five liquid-cooled battery modules rated at 166.4 V / 314 Ah, a high-voltage distribution box, a 125 kW PCS, an EMS controller, a liquid cooling unit, and an integrated fire protection system.

The system adopts an outdoor cabinet design with an IP55 protection rating, ensuring reliable operation in outdoor environments. It supports an energy storage configuration of 125 kW / 261 kWh and is suitable for operation in peak shaving and photovoltaic self-consumption modes.

This solution is designed for industrial and commercial energy storage applications, providing safe, stable, and efficient energy management.

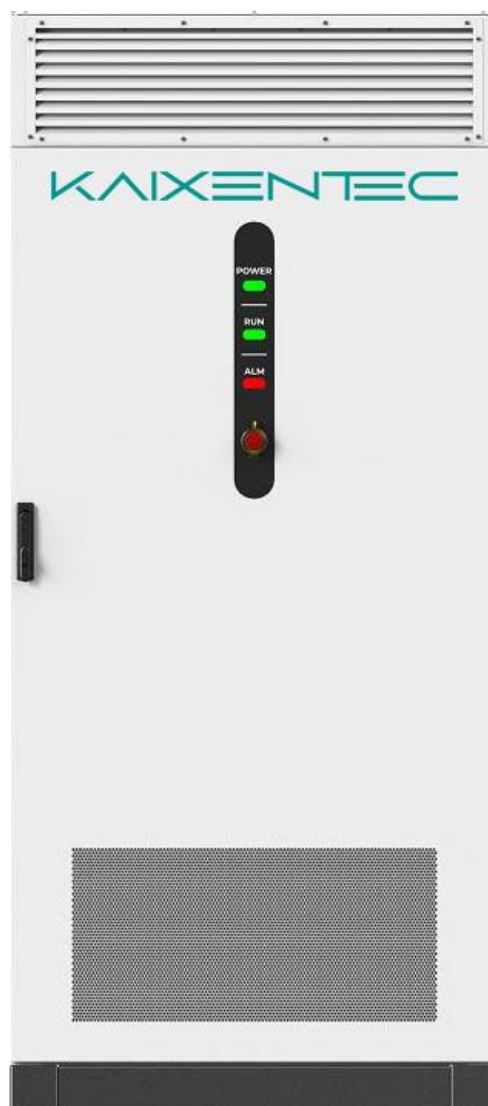


Figure 1-1 Product appearance

3. PRODUCT FEATURES

High Integration

- Highly integrated design combining the energy storage system, PCS, BMS, EMS, fire protection system, and thermal management system into a single unit.
- Compact footprint of only 1.35 m² with an overall height of 2.25 m, delivering industry-leading space efficiency.

Intelligent Liquid Cooling

- Equipped with a **5-kW liquid cooling unit**, providing effective thermal management in high-temperature operating environments.
- Intelligent temperature control strategy optimizes cooling performance while reducing auxiliary power consumption.
- Battery cell temperature difference is maintained at **≤3 °C**, extending system service life by **more than 20%** compared to traditional air-cooled solutions.

Safe and Reliable

- **Three-level protection architecture** enabling precise monitoring of short circuits, overcurrent, overvoltage, overtemperature, and other abnormal conditions.
- **Three-level fire protection system**, covering module level, cluster level, and water-based fire suppression.
- **Dual-level explosion-proof design** at both the module and cabinet levels, ensuring enhanced operational safety.

Smart Management

- Built-in **EMS**, integrated with the **Kaixentec cloud platform**, enabling remote monitoring, remote configuration, revenue calculation, firmware upgrades, data analysis, and cloud-based alarms.
- Mobile APP support simplifies on-site operation, maintenance, and system management.

4. PRODUCT COMPLIANCE STANDARDS

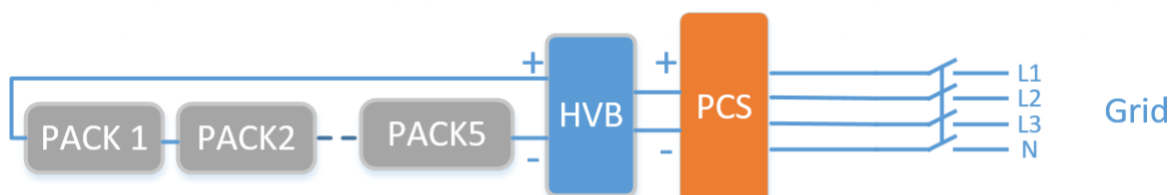
GB/T 36558-2018	General Technical Conditions for Electrochemical Energy Storage Systems in Power Systems
GB/T 36276-2018	Lithium-ion Batteries for Electric Energy Storage
NB/T 42091-2016	Technical specification for lithium-ion batteries for electrochemical Energy storage Power Stations
GB/T 34131-2017	Technical specification for Lithium-ion Battery Management System for electrochemical Energy storage Power Stations
GB/T 16935.1-2023	Insulation for equipment in low-voltage systems - Part 1: Principles, requirements and tests
GB7251	Low-voltage Switchgear and Control equipment
GB13539	Low-voltage Fuses
GB1208	Current Transformer
DL/T478	General Technical Specification for Relay Protection and Safety Automatics
GB4208	Enclosure Protection Grade (IP Code)
ISO12944	Paint and varnished Steel Structure anticorrosive coating Protection System
GB 11021	Evaluation and classification of Heat resistance of Electrical insulation
GB/T 19666	General Rules for Flame-retardant and Fire-resistant Wire and Cable
GB/T12666	Single wire and Cable burning test Method
GB/T 6995	Wire and Cable Identification Marking Method
GB/T17650	Test method for gases emitted by combustion of materials derived from cables or optical cables
GB/T17651	Determination of smoke density of burning cables or optical cables under Specified Conditions
GA 306	Flame-retardant and Fire-Resistant Cables
EN 50549-1	With the requirements of distribution network in parallel connection of power plants, part 1: with low voltage distribution network connection - B and the following power plants
EN 50549-10	Requirements for parallel connection of power plants and distribution networks - Part 10: Conformity assessment tests for generator sets
IEC 62477-1	Safety requirements for power electronic conversion systems and equipment - Part 1 General Provisions
EN 61000-6-1	Electromagnetic Compatibility (EMC) - Part 6-1: Common standards - Immunity for residential, commercial and light industrial environments
EN 61000-6-2	Electromagnetic Compatibility (EMC) - Part 6-2: General standards - Immunity in industrial environments

EN 61000-6-3	Electromagnetic Compatibility (EMC) - Part 6-3: General standards - Radiation standards for residential, commercial and light industrial environments
EN 61000-6-4	Electromagnetic Compatibility (EMC)- Part 6-4: General standards - Radiation standards for industrial environments
IEC62619	Batteries and batteries containing alkaline or other non-acidic electrolytes - Safety requirements for lithium batteries and batteries for industrial use
UN38.3	United Nations Recommendations on the Transport of Dangerous Goods: Manual of Tests and Standards, Part 3, section 38.3

5. SYSTEM INTRODUCTION

5.1 System topology diagram

Figure 3-1 System topology



No.	Item	Specification
System Parameters		
1	Rated capacity	261kWh
2	Rated output power	125 kW
3	Maximum charge and discharge current	172A
4	Design life	15 years
5	Protection level	IP55
6	Corrosion resistance	C3
7	Dimensions (W * H * D)	1000 * 2250 * 1350mm
8	weight	2500kg
9	Fire Fighting	Aerosol
10	Design Standards	IEC 62619/IEC62477-1
12	Maximum altitude	3000m [>2 000m derating]
13	Communication	RS485 /Ethernet/ CAN
14	Operating temperature	-20 °C ~ 55 °C
DC side parameters		

15	Rated DC power	125kW
16	DC voltage range	728V ~ 949V
AC side parameters (grid-connected)		
20	Rated voltage	400V
21	Rated output current	180A
22	Communication access method	Three-phase four-wire
23	Rated grid voltage	400V
24	Allowable grid voltage range	-15% ~ +15%
25	Grid frequency range	50Hz/60Hz
26	Current total harmonic distortion	≤3% [full load]
27	Power Factor	-1 ~ +1
28	DC component of current	≤0.5%
29	Charge and discharge conversion time	< 100ms

5.2 Components Introduction

Figure 3-2 Components Introduction (Closed)

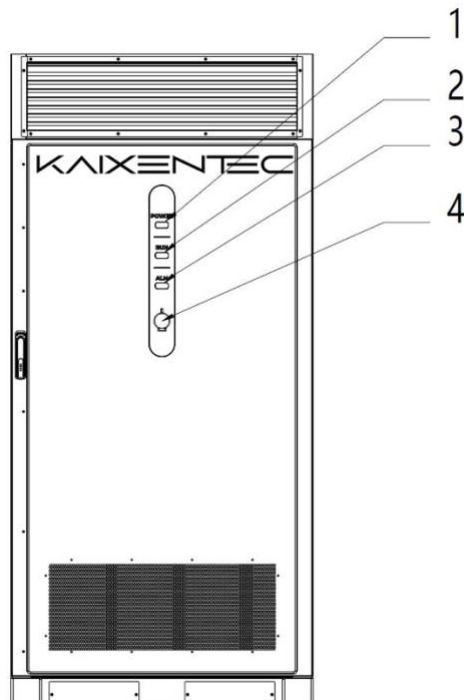


Table 3-2 External Configuration

No.	Item	Description
1	Power indicator	Indicates mains power status. The indicator is ON when mains power is available and OFF when mains power is not present.
2	Running indicator light	Indicates system operating status. The indicator flashes every 0.5 seconds when the system is charging and remains ON when the system is discharging or in standby mode.
3	Warning indicator	Indicates system fault or alarm status.
4	Emergency stop switch	Used for emergency shutdown of the system.

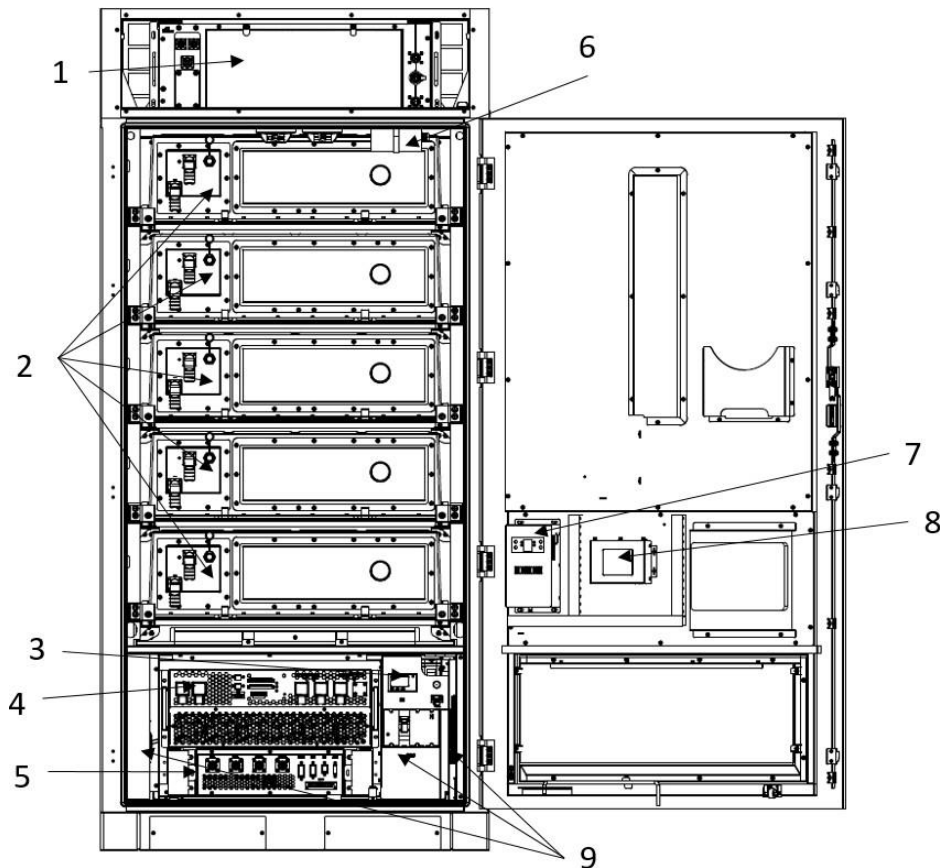


Figure 3 - 3 Components introduction (front)

Table 3 - 3 Internal Configuration

No.	Item	Description
1	Liquid cooling unit	For cooling and heating
2	Battery module	5 liquid cooling modules
3	PM	Electricity Meter
4	PCS	Bidirectional conversion between DC and AC
5	High-voltage box	Control the power on and off of the battery module and detect the information of each module
6	Fire Fighting Equipment	For fire prevention and control
7	Dehumidifier	Reduce humidity on the battery side
8	EMS	Energy Control
9	Switches	For user operation

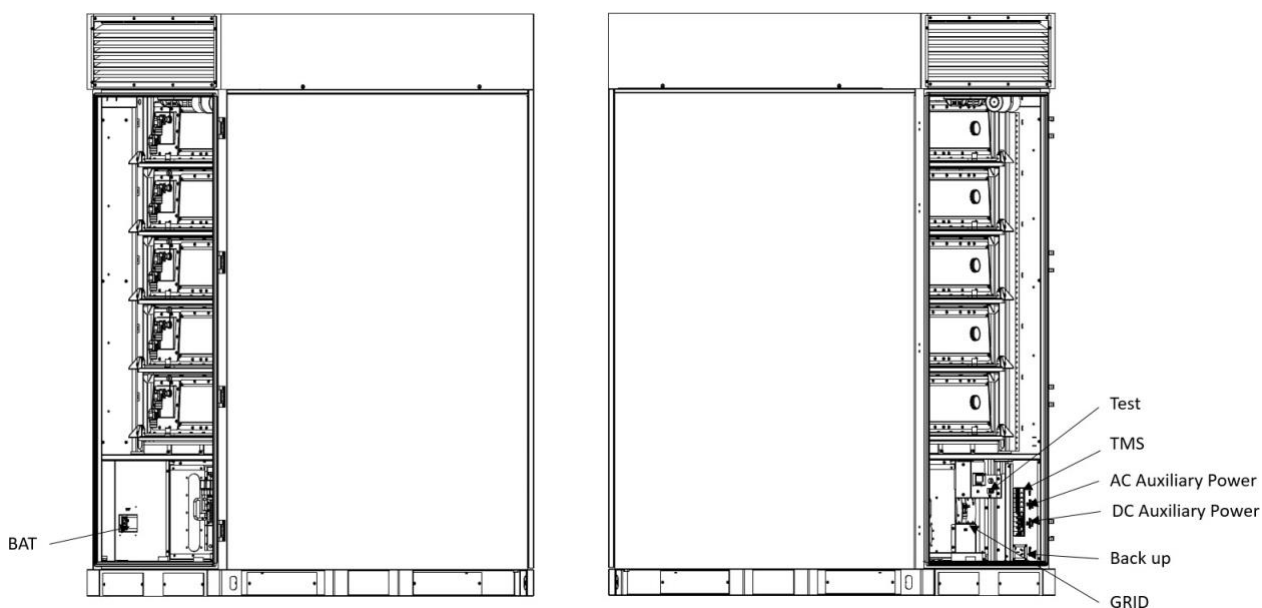
**Figure 3-4 Distribution compartment switch**

Table 3-4 Introduction to switches in distribution compartment

No.	Module Description	Function Description
1	Test	BMS debugging and commissioning interface
2	TMS	Power switch for the liquid cooling unit
3	AC Auxiliary Power	AC auxiliary power supply switch
4	DC Auxiliary Power	DC auxiliary power supply switch
5	Back up	Spare auxiliary power outlet
6	GRID	Grid-side power switch
7	BAT	Battery cluster DC disconnect switch

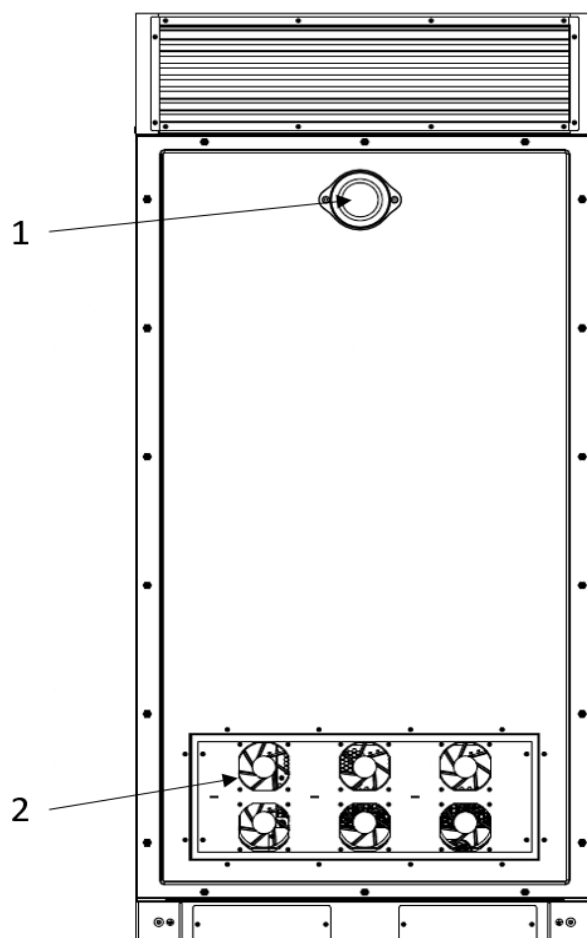


Figure 3 - 5 Components introduction (back)

Table 3 - 5 Component Configuration

No.	Component	Description
1	Pressure relief valve	Provides emergency pressure relief to prevent excessive internal pressure within the cabinet.
2	Fan	Used for heat dissipation within the power distribution compartment.

5.2.1 Battery module

The battery module contains 52 cells, which is the power source of the entire system.

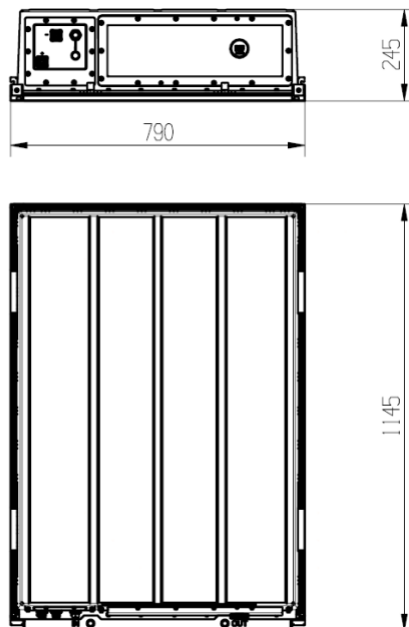


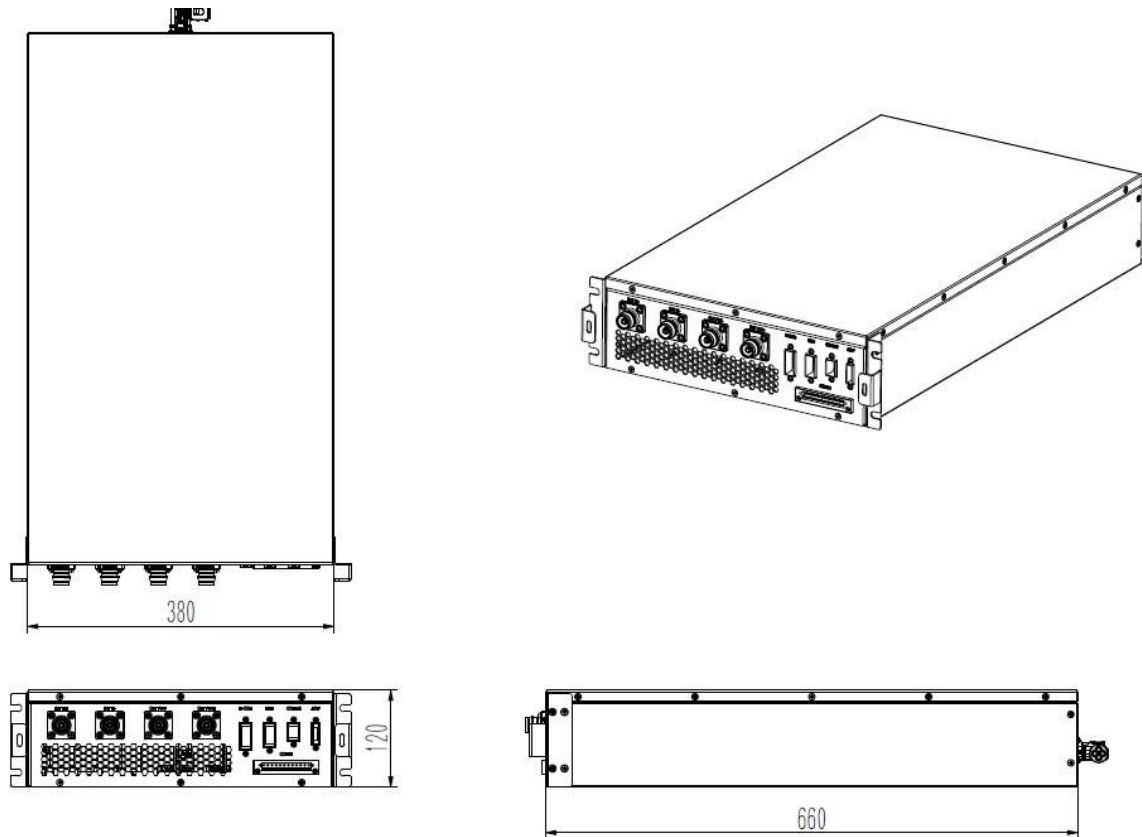
Figure 3-6 Battery module dimensions (unit: mm)

Table 3-6 Battery module parameters

No.	Parameter	Specification
1	Series / Parallel Configuration	52S1P
2	Rated Voltage	166.4 V
3	Rated Capacity	314 Ah
4	Rated Energy	52.25 kWh
5	Internal Resistance	$\leq 20 \text{ m}\Omega$ @ 1 kHz AC, 30% SOC
6	Rated Charging Voltage	166.4 V
7	Maximum Charge / Discharge Current	157 A @ $25 \pm 5^\circ\text{C}$
8	Recommended Charging Current	$\leq 157 \text{ A}$
9	Size	W : $790 \pm 2 \text{ mm}$
		D : $1145 \pm 2 \text{ mm}$
		H: $245 \pm 2 \text{ mm}$
10	Weight	$\approx 330 \text{ kg}$

5.2.2 High-voltage box

The high-voltage box is used to collect information such as voltage, current, temperature, etc., and cooperate with the BMS to execute system operation strategies and protection functions. It contains the protection components of the entire system, such as relays, circuit breakers, fuses, etc. The interface definition is as follows. The high-voltage module size and interface definition are as follows:



follows:

Figure 3-7 High voltage box specifications (unit: mm)

Table 2-7 High-voltage box parameters

No.	Parameter	Specification
1	Maximum Operating Voltage	1000 V
2	Maximum Operating Current	200 A
3	EMS Communication Interface	RS485
4	Communication with PCS	CAN
5	Communication with Battery Modules	CAN
6	Panel Interfaces	BAT IN+ / BAT IN-: DC input interface
		OUT PUT+ / OUT PUT-: DC output interface
		M-COM: Indicator light control interface
		BMU: Battery module communication interface
		COMM2: EMS 24 V interface
		AC-P: AC/DC 24 V auxiliary power interface
		COMM1: External BMS communication interface
7	Operating temperature	-20~55°C
8	Protection level	IP20
9	Size	W:380±2mm
		D:660±2mm
		H: 120±2mm
10	Weight	≈ 30kg

5.2.3 Battery Cluster

The entire battery cluster consists of 5 * 166.4V 314Ah battery modules, and the battery cluster is 261.248kWh.

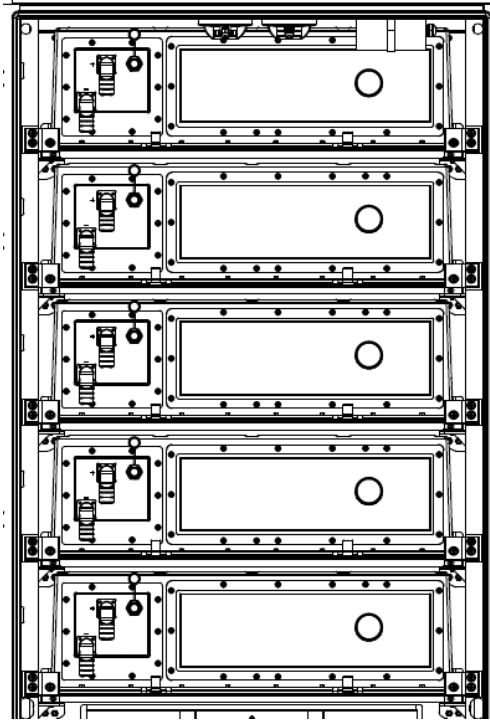


Figure 3-8 Schematic diagram of battery cluster

Table 3-7 Battery cluster parameters

No.	Parameter	Specification
1	Series / Parallel Configuration	260S1P
2	Rated Voltage	832 V
3	Rated Capacity	314 Ah
4	Rated Energy	261.248 kWh
5	Operating voltage range	728V ~ 949V
6	Internal Resistance	$\leq 100 \text{ m}\Omega$ @ 1 kHz AC
7	Maximum Charge / Discharge Current	157 A @ $25 \pm 5 \text{ }^{\circ}\text{C}$
8	Recommended Charging Current	$\leq 157 \text{ A}$

5.2.4 Energy storage converter

This product is equipped with a modular inverter with a rated power of 125kW, supports bidirectional energy flow and a wide range of battery voltages, meets the needs of different application scenarios, and is flexible to install and use.

The handle is only used for pushing and pulling, and is not load-bearing

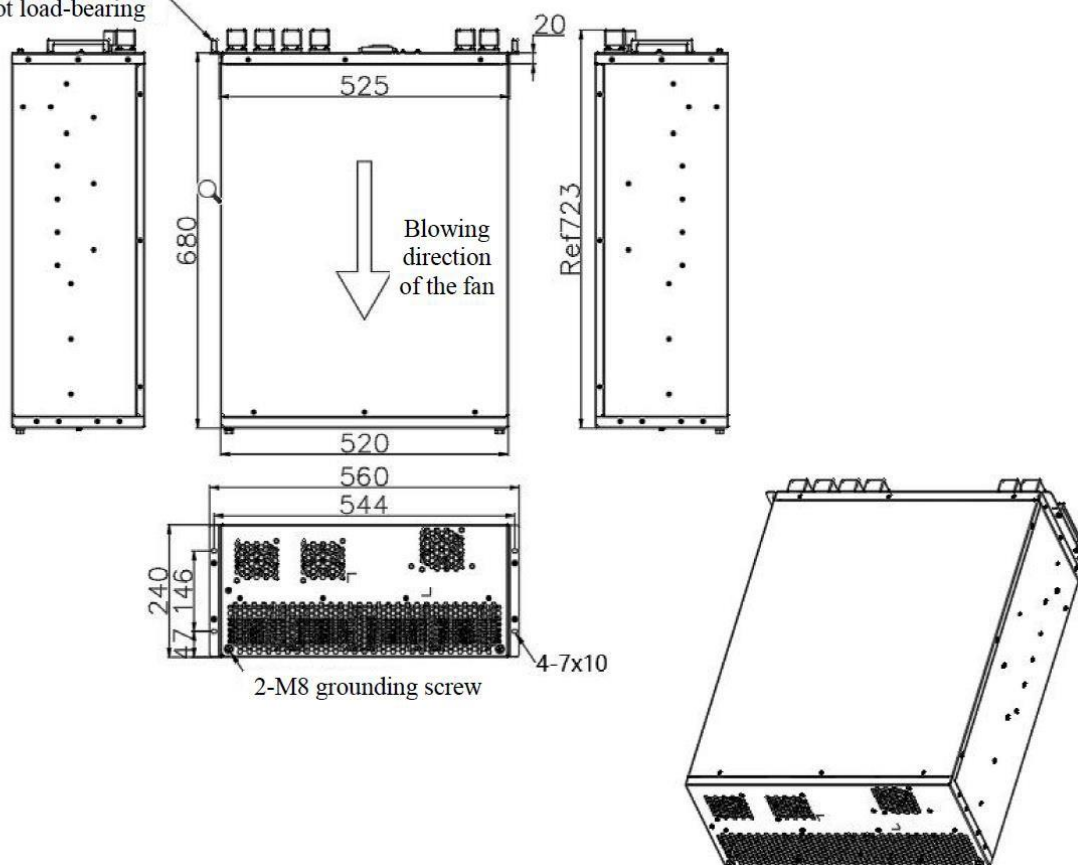


Figure 3-9 Energy storage converter dimensions (unit: mm)

Table 3-8 Energy storage inverter technical parameters

No.	Parameter	Specification
DC side parameters		
1	DC Voltage Range	600–1000 V DC
2	Rated DC Current	198 A
3	Rated DC Power	125 kW
AC grid-connected parameters		
4	Rated AC power	125 kW
5	Overload Capability	1.1 × rated power (continuous), 1.2 × rated power (1 min)
6	Rated AC Voltage	400 V
7	Rated AC Current	180 A
8	Grid Connection Method	Three-phase, four-wire
9	Grid Voltage Range	400 V (–15% to +15%)
10	Grid Frequency Range	50 Hz / 60 Hz ± 2.5 Hz
11	Total Harmonic Distortion (THD)	≤ 3% (full load)
12	Power Factor	–1 to +1
13	DC Current Component	≤ 0.5%
14	Charge / Discharge Switching Time	< 100 ms
Other Parameters		
15	Maximum Conversion Efficiency	≥ 99%
16	Allowable Ambient Temperature	–30 °C to +60 °C (power derating above 50 °C)
17	Allowable Relative Humidity	≤ 95% (non-condensing)
18	Noise Level	≤ 75 dB
19	Protection Rating	IP20
20	Installation Altitude	> 2000 m, derating required
21	Dimensions (W × H × D)	520 × 200 × 680 mm
22	Weight	60 kg
23	Cooling Method	Forced air cooling
24	BMS Communication Interface	CAN or RS485
25	EMS Communication Interface	Ethernet or RS485

5.2.5 Energy Storage Controller

The local EMS all-in-one unit is a dedicated control device designed for energy storage applications. It supports simultaneous connection to multiple subsystems, including BMS, PCS, power meters, liquid cooling systems, fire protection systems, and temperature and humidity sensors. Integrated with AI-based algorithms, the local EMS performs intelligent strategy management and control at the edge level, enabling real-time decision-making and optimized system operation. It also conducts statistical analysis and processing of operational data to enhance system performance and reliability.

In addition, the local EMS supports connectivity with a **cloud-based EMS platform**, allowing required operational data to be reported to the cloud system while receiving centralised strategies and control commands issued by the platform.

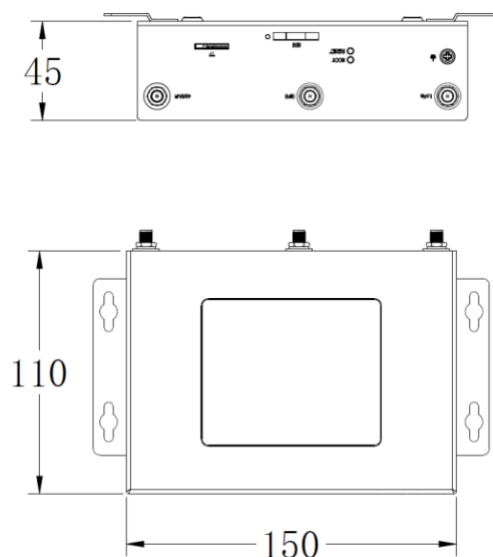


Figure 3-10 Controller dimensions (unit: mm)

Table 3-9 Technical parameters

Category	Items	Specification
System	CPU	NXP i.MX6ULL, ARM Cortex-A7, 792 MHz
	Operating Frequency	800 MHz
	Memory	512 MB
	Storage	8 GB eMMC
	Operating System	RT-Linux 4.1
Interface Type	Ethernet	2 × 10/100 Mbps Ethernet ports
	RS485	4 channels, including status indicator; 1.5 kV isolation protection; ESD Level 4
	RS485 / RS232	4 channels (one channel multiplexed with RS232); 1.5 kV isolation protection; ESD Level 4
	DI	2-channel dry contact input with isolation protection

	DO	2-channel relay output; contact rating: 5 A @ 250 VAC, 5 A @ 30 VDC
	CAN Bus	1 channel; 1.5 kV isolation protection; ESD Level 4
	4G	
Hardware Parameters	Operating Voltage	Main power input: DC 12 V; supports a wide input range, DC 9–36 V; reverse polarity and overcurrent protection
	TF Card	1 × TF card slot
	Watchdog	Hardware watchdog
	Reset Button	Used for system reset
	BOOT Button	Used in combination with the reset button for firmware upgrade
	Power-Off Protection	When external power is disconnected, the supercapacitor continues supplying power for approximately 30 seconds
	Installation Method	DIN rail mounting or wall mounting
	Dimensions (W × H × D)	150 × 110 × 45 mm
Software Parameters	RS485	Provides RS485 test examples; supports Modbus RTU protocol
	Network Protocols	TCP/IP, UDP, DHCP, TFTP, FTP, SSH, HTTP, iptables, MQTT, SQLite
	Ethernet	10/100 Mbps adaptive Ethernet; supports static and dynamic IP address allocation ; supports MAC address configuration
	4G Network	Supports 4G network access for China Mobile, China Unicom, and China Telecom
	RTC	Supports NTP automatic time synchronization and power-off clock retention
Work Environment	Operating Temperature	–30 °C to +70 °C
	Storage Temperature	–40 °C to +85 °C
	Operating Humidity	5%–95% RH (non-condensing)
	Storage Humidity	5%–95% RH (non-condensing)
Protection Level	EMC / ESD / Surge	EMC Level 3

5.2.6 Liquid cooling unit

The liquid cooling unit injects a specified volume of coolant into the internal water tank, where it is cooled by the integrated refrigeration system. The internal circulation pump then delivers the low-temperature chilled water to the components requiring cooling.

As the chilled water circulates through the equipment, it absorbs heat generated during operation. The warmed coolant subsequently returns to the internal water tank, where it is cooled again, forming a closed-loop liquid cooling cycle that ensures stable and efficient thermal management.

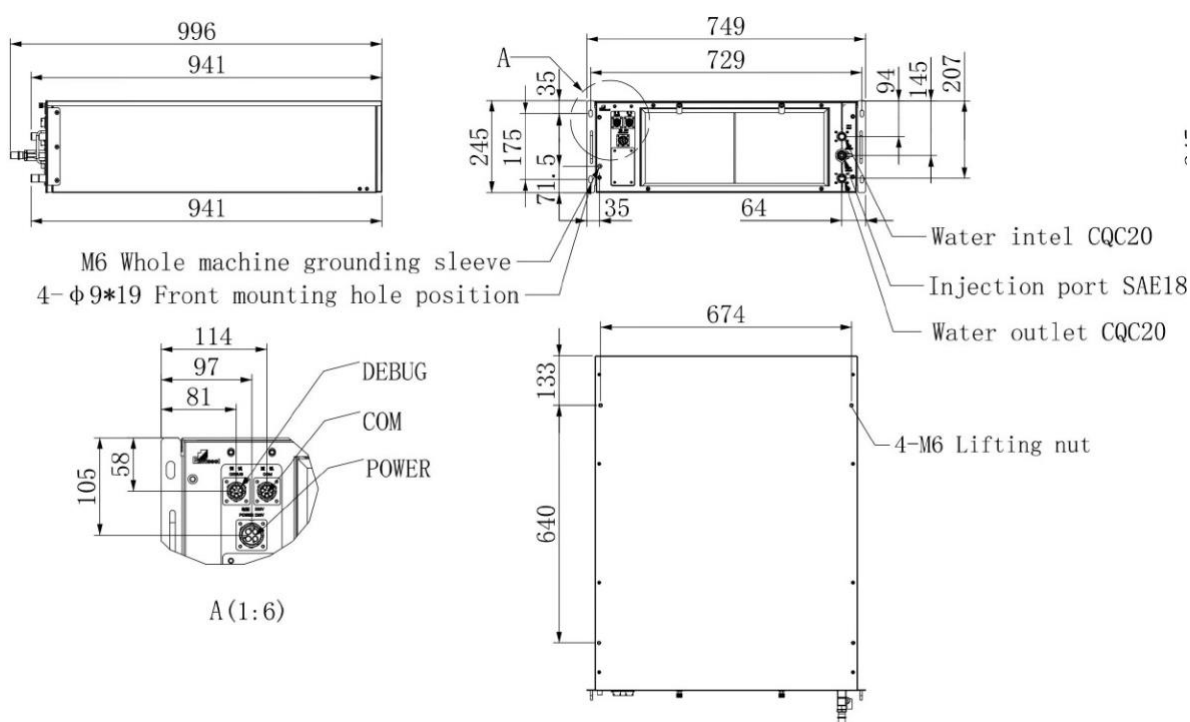


Figure 3-11 Appearance of chiller

Table 3-10 Main parameters of chiller

No.	Parameter	Specification
Size, Quality & Installation		
1	Overall dimensions (width * depth * height)	700 * 900 * 245mm
2	Mass (excluding refrigerant)	75kg
3	Installation	Drawer type
4	Application Environment	Outdoor
Environmental Protection & Performance		

5	Operating Temperature Range	-30 °C ~ +55 °C
6	Storage Temperature Range	-40 °C ~ +70 °C
7	Operating Altitude	0-4000 m (power derating of 3% for every additional 1000 m above 1000 m)
8	Noise Level (@L45/W18)	75 dB(A)
9	Protection Rating	IPX5, suitable for outdoor IP55 operating environments
10	Refrigerant	R134a
11	Coolant	50% ethylene glycol aqueous solution
12	RoHS Compliance	Yes
Cooling / Heating Capacity		
13	Cooling Capacity	5.0 kW
14	Heating Capacity	2.0 kW
15	Outlet Water Temperature	18 °C
Circulating Water Flow		
16	Rated Circulating Water Flow	46.5 L/min @ 60 kPa
17	Cooling Input Power (@L35/W18)	2.50 kW
18	Heating Input Power (@Tu = 10 °C)	2.35 kW
19	Self-Circulation Mode Power (single pump operation)	0.25 kW
20	Maximum Power Consumption	3.60 kW
Power Supply		
21	Rated Operating Voltage	220-240 V AC, 50/60 Hz
22	Supported Voltage Range	220 V ±15%, 50/60 Hz ±3 Hz
23	Maximum Operating Current	19.2 A

5.3 Product composition

Table 3-11 Main component configuration list

No.	Component	Specification	Unit	Quantity	Remark
1	Battery Module	166.4 V / 314 Ah	Tower	5	
2	High-Voltage Box	/	Set	1	
3	Battery Cluster	832 V / 314 Ah	Set	1	Single cluster with 261 kWh capacity
4	Energy Storage Converter (PCS)	125 kW	Tower	1	125 kW three-phase, three-wire PCS
5	Liquid Cooling Unit	5 kW	Tower	1	
6	EMS Controller	/	Tower	1	
7	Outdoor Cabinet	/	Tower	1	
8	Fire Protection System	/	set	1	PACK-level and cluster-level fire protection
9	Accessories	/	set	1	

6. PRODUCT NAMEPLATE AND PACKAGING

The equipment can be identified by the nameplate, which provides key information including the equipment model, main technical specifications, and date of manufacture.

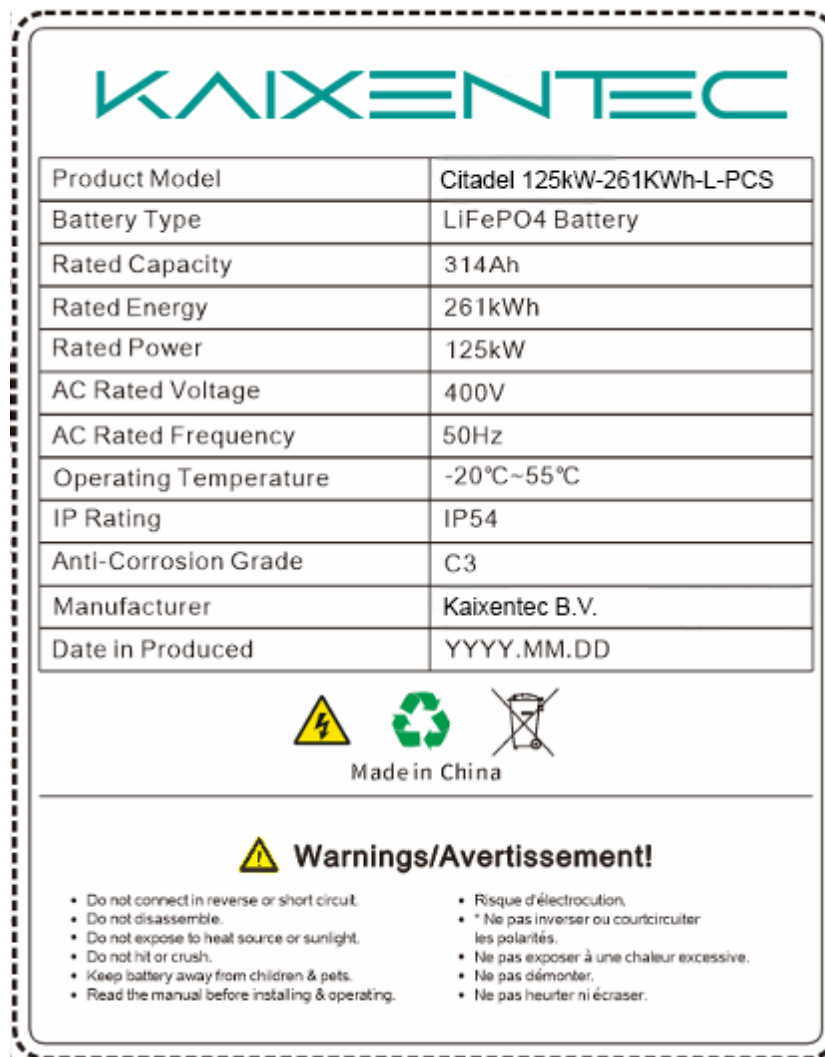


Figure 4-1 Citadel 125kW-261kWh-L-PCS nameplate

The product is shipped in a wooden crate, as illustrated in the figure below.

Type	Weight (kg)	Dimensions (mm)	Volume (m ³)
Energy storage cabinet	2600	1110x1460x2430	3.938

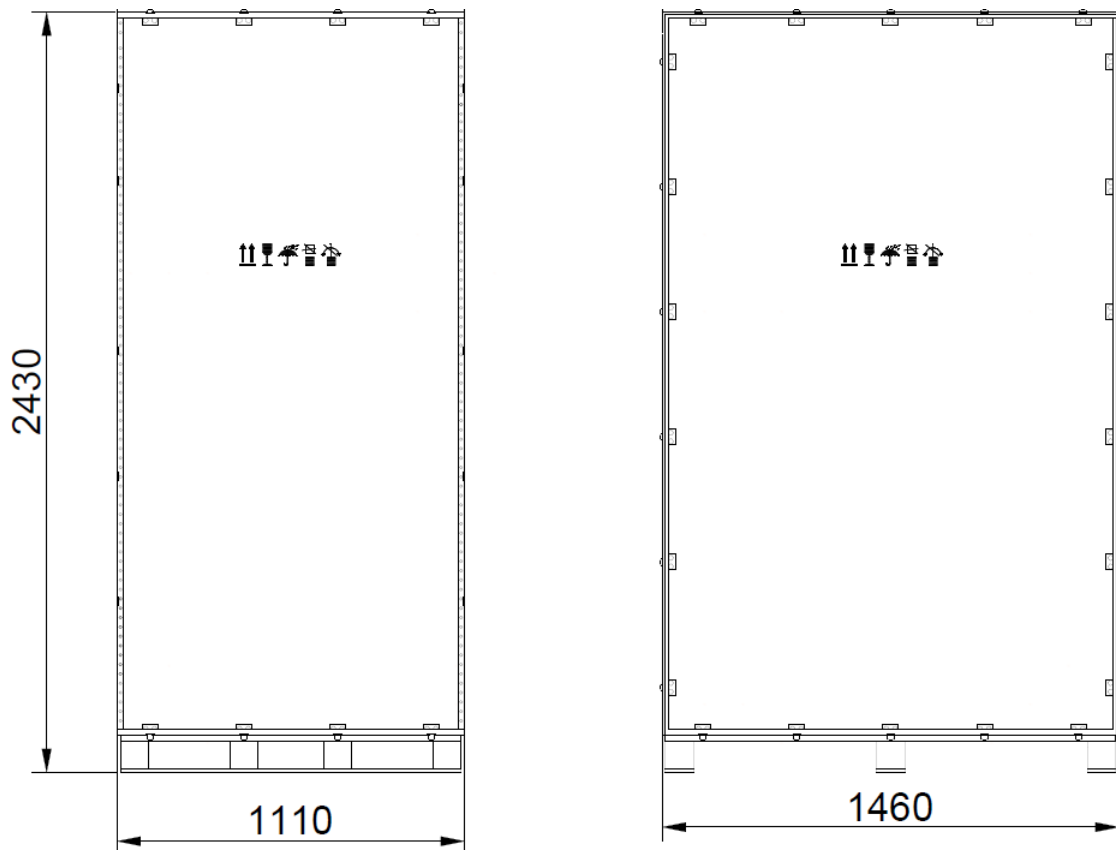


Figure 4-2 Product Packaging Diagram (unit: mm)

7. ACCESSORIES LIST

Each single battery system is supplied with the following accessories, which are packed in the accessories box.

Table 5-1 Accessories List

No.	Category	Specification	Quantity	Description
1	Fasteners	M12 × 80 expansion bolt with nut	4 pcs	Used to secure the cabinet to the ground
2	Fasteners	Countersunk screw, M4 × 10	8 pcs	Cabinet base cover fixing
3	Fasteners	Base cover	4 pcs	Cabinet base cover
4	Consumables	Fireproof sealing compound	6 kg	Fireproof sealing material
5	Documents	Certificate	1 pc	
6	Documents	Shipping inspection report	1 pc	

8. CONDITIONS OF USE

8.1 Normal Operating Environment Conditions

- **Ambient Temperature:**
Operating temperature range: −20 °C to +55 °C
Storage temperature range: −10 °C to +40 °C
- **Ambient Air Pressure:**
Operating atmospheric pressure: 79.5 kPa to 106 kPa
- **Altitude:**
Up to 2000 m without power derating.
Derated operation is required when the installation altitude exceeds 2000 m.
- **Relative Humidity:**
0% to 95% RH, non-condensing.
- **Installation Orientation:**
Vertical installation is required. The maximum allowable inclination shall not exceed 5°.
- **Installation Environment:**
The installation site shall be equipped with appropriate measures to protect against wind, sand, rain, and snow.
The environment shall be free from corrosive gases and explosive atmospheres.
- **Vibration:**
Strong vibration and mechanical shock are not permitted.
- **Note:**
Special applications or environmental conditions outside the above specifications may be supported upon customization.