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Abbreviations

BMU	Battery Management Unit
BMS	Battery Management System
PCS	Power Conversion System
EMU	Energy Management Unit
CAN	Controller Area Network
CSC	Cell Supervision Circuit
CSU	Current Sampling Unit
DCAN	CAN for Cell Calibration
ETH	Ethernet Module
MSD	Manual Service Disconnect
SBMU	Slave Battery Management Unit
SCAN	CAN between BMU and CSU
SOC	State of Charge
SOE	State of Energy
SOH	State of Health
SOP	State of Power

1 System Overview

1.1 Product Description

The product includes battery packs, a control box (with integrated secondary BMS and EMU), the liquid cooling system, a bidirectional energy storage converter and fire suppression system. It adopts modular design, suitable for various industrial and commercial scenarios. Functions including time of use, off-peak power consumption, automatic backup, as well as reduce pressure of electrical grid.

1.2 Product Functions

1) System with lithium-iron phosphate cell chemistry, has two-stage battery management system (BMS) with liquid crystal display (LCD) screen
2) Adopts 125kW power conversion system (PCS), allows wide range of voltage input, supports grid voltage regulation, three-phase imbalance problem control, as well as power harmonics management
3) Suitable for various outdoor application scenarios, with cabinet protection degree of IP55 and heat resistance design
4) Equipped with local energy management system (EMS) and cloud platform, realizing data acquisition of PCS and system

1.3 Product Features

1) Extreme safe
   - Liquid cooled pack, cell special designed for battery storage
   - High protection degree with IP67 pack and IP55 system
   - Equipped with fire suppression system
   - Multi-level electrical safety
2) Flexible configuration
   - Various application scenarios
   - Transportation with forklift or crane
   - Self-developed EMU, supports customization
3) Highly integrated
   - Space saving all-in-one design
   - Modular design, easy maintenance
   - Supports capacity expansion via parallel connection

4) Smart maintenance

- System running state monitoring in real time, ensure system safety
- Intelligent management of charging and discharging, save the costs

1.4 Product Structure

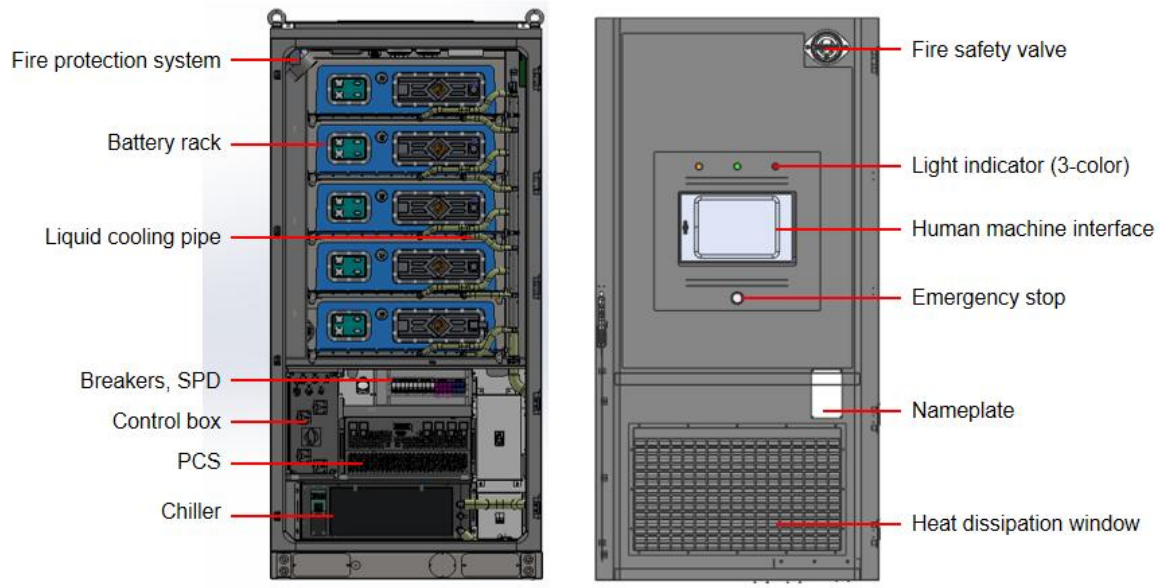

Figure 1-1: Product structure

2 Product Specification

Table 2-1: Product specification

Product specification	ESC-R125-261-CE
System parameter	
DC voltage range	728-936 Vdc
Output rated voltage	400V@AC (-15% ~ +15%)
System configuration	1P260S
Rated power	125 kW
System nominal energy	261 kWh
Dimensions (L*W*H)	1120*1350*2420mm(Including the height of the vent plate)
Weight	2600 kg
Protection degree	IP55
Operating temperature range	-30 °C – 50 °C (>45 °C derating)
Humidity	≤95% (no condensation)
Altitude	≤3000 m (>2000 m derating)
Cooling method	PCS air cooling + battery liquid cooling
Fire suppression system	aerosol
Communication interface	RS485 / Ethernet (reserved)
Communication protocol	Modbus / MQTT (supports protocol customization)
Cell parameter	
Rated capacity	314 Ah
Rated energy	1004.8 Wh
Dimension	71.95*174.8*207.1 mm
Pack parameters	
Configuration	1P52S
Nominal voltage	166.4 Vdc
Nominal energy	52.2 kWh
Dimension	800*1152*237 mm
Weight	Approx. 340 kg
System components	

Pack	5 sets
Battery management system	1 set
Fire suppression system	1 set
Chiller	1 set, 5 kW
Cabinet	1 set
PCS	1 set, 125 kW
Battery control box	1 set
EMU	1 set

3 Technical Specification of Control Box

The control box is responsible for power supply to BMS, fire suppression system, display screen, indicator lights, etc. Components of which including isolated DC/DC power supply, AC/DC power supply unit, DC/UPS power supply, EMU, etc. Functions including fault alerts and protection, safety protection, emergency stop, ensure system safety also during maintenance.

Appearance of control box is illustrated in the following picture, dimension of which is 440*750*200mm.

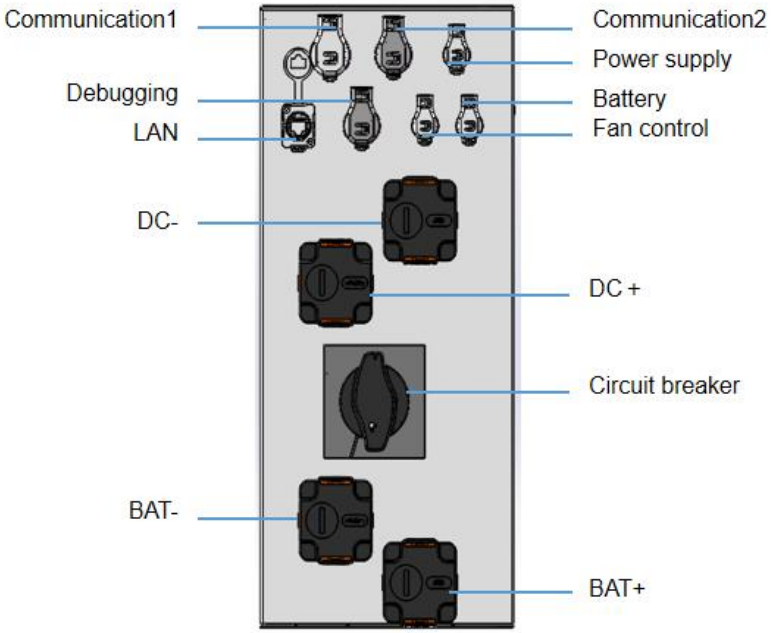

Figure 3- 1: Control box interface

4 Technical Specification of PCS

Power conversion system (PCS) consists of DC/AC bidirectional power converter and control units, responsible for power conversion between AC and DC side. The PCS converts electrical power from direct current of battery side to alternating current on grid side, and vice versa.

Table 4-1: PCS technical specifications

DC Side	
Operating voltage range	600 – 1000 V
Full load voltage range	630~950V
Rated direct current	198A
AC Side (on-grid)	
Nominal output power	125 kW
Nominal current	180 A
Nominal grid voltage	400 V (three phase four wire)
Grid voltage range	340-460V
Grid frequency	50 / 60 Hz
Power factor	-0.99 – +0.99
Total harmonic distortion	≤3% @rated power
AC Side (off-grid)	
Nominal output power	125 kW
Nominal voltage	400 V
Frequency	50 / 60 Hz
Basic Parameter	
Maximum efficiency	99%
Operating temperature range	-30 °C – 50 °C (>45 °C derating)
Humidity	0-95%, non-condensing
Altitude	≤3000 m (>2000 m derating)
Noise	≤75 dB
Structural Parameter	
Dimension (W*H*D)	540*240*680 mm

Cooling method	Forced air cooling
Housing material	Metal
Mounting	Rack mounting / plug-in
Ingress protection	IP20
Interface	
Communication interface	RS485, RJ45, CAN
Communication protocol	Modbus TCP, Modbus RTU, CAN

5 Technical Specification of Chiller

Chiller controls temperature of battery storage system. The control of cell temperature is realized by chiller and cooling plate inside the battery packs. It uses liquid as heat exchange medium to ensure the batteries always operate within the allowable temperature range, ensures cell cycle life.

The coolant flows out of chiller through pipe, then into the battery pack cooling plate. Coolant after thermal exchange is collected, and flows back to chiller.

Table 5-1: Chiller technical specifications

Nominal voltage	220 Vac
Nominal frequency	50 Hz
Cooling capacity	5 kW @45°C ambient temperature, 18°C coolant output
Heating capacity	2 kW
Working temperature	-30 °C – 55 °C
Working humidity	5-95%
Storage temperature	-40 °C – 70 °C
Storage humidity	5-95%
Flow rate	46.5 L/min@60 kPa
Transport performance	can adapt to land transport, air transport and sea transport
Dimension (W*D*H)	700*900*245 mm
Liquid coolant	50% Glycol aqueous solution
Ingress protection	IPX5

6 Technical Specification of EMU

6.1 Overview

EMU is a system which integrates hardware and software, used for various energy storage systems. It enables energy storage system running state at real time, achieving system efficient utilization and running strategy optimization.

System components including touch screen and motherboard, and shown in the following picture.



Figure 6-1: Topology and touch screes

6.2 Technical Parameters

Table 6-1: EMU technical parameters

Size motherboard (L*W*H)	196*150*30 mm
Display screen size	10.1 inch
Display resolution	1024*600
Screen	Capacitive touchscreen
Power supply	5 W, 6-33 V
Maximum power	10 W
Operating temperature	-40 °C – 85 °C
Installation	Flush-mounted with M3 screws
Communication protocol	MQTT / Modbus
Interface type	3*RS485; 3*RS232; 1*10/100M Ethernet; 6*DI and DO

6.3 Product Features

1) Data transmission to cloud via 2G/4G/LAN
2) Remote monitoring and control
3) Edge computing
4) Alerts via message
5) Communication protocol conversion
6) Data recording and exportation
7) Alerts information exportation
8) Supports peak shaving, emergency back-up, battery protection, system protection
9) Supports strategy customization (micro grid, charging/discharging strategy, etc.)