山东能源
SHANDONG ENERGY

FGI 新风光

Smart Energy Storage
IoT Connecting the Future

Energy Storage Product Manual

WINDSUN
New Era • New FGI

Save Energy Serve Society

Mission: Master core technologies and continuously promote the application of IoT for power electronic equipment across industries

Vision: Save energy, serve society, and build a century-old FGI

Core values: Integrity, Innovation, Cooperation, Endeavor

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Participated in three "863" programs

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19 performance and reliability laboratories

29
Developed 29 national / industry standards

50+
Over 50 years of experience in power electronics R&D and manufacturing

500+
Over 500 national patents

1 3
1 Station / 1 Lab / 1 Base / 10 Centers

30000+
Over 30,000+ sets of high-voltage cascade products commissioned on-site

About Us

Following China's 30-year history of energy conservation development
7 mergers and reorganizations, 4 factory relocations, over 600 product awards
Customer recognition stems from FGI's pursuit of manufacturing excellence

From 1970 to the present, half a century has passed.
In 1970, the state-owned Wenshang Radio Factory was established.
From 1990 to 1992, under the leadership of Li Ruilai (former factory director and chief engineer), the first generation of SCR (Silicon Controlled Rectifier) thyristor low-voltage frequency converters was developed, pioneering early research into low-voltage converters in China. In 1992, the first low-voltage frequency converter passed the appraisal by the Shandong Provincial Electronic Product Supervision and Inspection Institute. Through the team's relentless efforts, the products gradually became serialized, contributing to the national energy conservation cause and industry development. Since then, frequency converters as the main products have been continuously developed and produced.

Seeking development, the company underwent multiple reforms and reorganizations. In April 2002, Shandong Fengguang Electronics Co., Ltd. was established. In August 2004, the company was restructured and reorganized into Shandong WindSun Electronic Technology Development Co., Ltd. In 2008, venture capital was introduced, and a new factory area in Wenshang Economic Development Zone was completed, followed by the overall relocation. In 2011, strategic investment from Shandong Energy Group was introduced, forming the current mixed-ownership enterprise structure with Shandong Energy Group as the controlling shareholder and multiple equity components. In 2015, shareholding system reform was carried out, establishing WindSun Electronic Technology Co., Ltd. (FGI) A sound modern corporate governance structure was formed, including the Party Committee, General Meeting of Shareholders, Board of Directors, Board of Supervisors, Senior Management, and Labor Union.
On April 13, 2021, FGI was successfully listed on the STAR Market (Sci-Tech Innovation Board), becoming the 7th "New Energy Industry", 2nd "Smart Grid Industry", and 1st "Shandong Provincial State-Owned Enterprise" listed company on the board, achieving a new development milestone for the traditional enterprise.
Power electronics technology is profoundly changing the global energy system and gradually reaching every corner of the world! We consistently focus on power electronics technology, tirelessly exploring and providing customers in the power, industrial, and infrastructure sectors with solutions and services covering the entire value chain and life cycle. We are always committed to building new power systems, accelerating energy transition with digitalization, helping achieve carbon neutrality, and jointly creating a better future for humanity.

Milestones

1970
Gathering talent for "Four Orientations"
State-owned Wenshang Radio Factory established

2004
Revitalized through property rights reform
Restructured to set up Shandong WindSun Science & Technology Co., Ltd. (FGI)

2011
Mixed-ownership reform boosts momentum
Introduced Yankuang investment, vigorous development

2019
Build a talent hub
Established Jinan Branch and R&D Center

2021
Company listing marks a new chapter
Went public on the Science and Technology Innovation Board, with stock code: 688663

2022
Focusing on global development
Established Suzhou FGI and Overseas Business Department

2023
Positioning for new industrial heights
WindSun (Qingdao) Co., Ltd. (FGI) established

.....
FGI New Journey New Development

Accumulating in the energy storage track

2004

January: The "Magnetic Bearing Control System" developed by FGI was successfully applied in the key high-tech research project 863 Program's 4th generation nuclear reactor - the 10 MW High-Temperature Gas-Cooled Reactor Ammonia Direct Turbine Cycle Power Generation System.

2006

April: The "Plasma Vertical Displacement Fast Control Power Supply" developed by FGI was successfully applied in the "Major Scientific Research Project, EAST Tokamak Experimental Device" undertaken by the Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP).

November: The "500 kW Superconducting Magnetic Energy Storage Inverter and its Grid Switching System" developed by FGI was successfully applied in the IEEAS "SMES System" project and completed operational tests at the State Grid Beijing Mentougou Switching Station.

2007

May: Then State Councilor Chen Zhili highly praised the magnetic bearing control system developed by FGI Electronics at the National "10th Five-Year Plan" Major Scientific and Technological Achievements Exhibition.

2011

April: The world's first superconducting substation, developed with participation from FGI and led by IEEAS, was officially put into grid operation in Baiyin City, Gansu Province. The substation's 1 MJ/0.5 MVA high-temperature superconducting magnetic energy storage system can significantly improve power grid reliability and safety, enhance power quality, effectively reduce system losses, and decrease footprint.

2013

December: FGI's project "Key Technologies and Applications for High-Efficiency Operation and Control of Motor Systems under Complex Working Conditions" won the Second Prize of the National Technological Invention Award.

2016

October: The "Superconducting Magnetic Energy Storage - Fault Current Limiting Power Conditioning System" (SMES-FCL), co-developed by FGI, successfully passed the on-site technical acceptance organized by the expert group of the National 863 Program assigned to the Institute of Electrical Engineering, Chinese Academy of Sciences (IEEAS). Since 11:49 AM on Jan 6, 2017, it has been operating grid-connected in the 10 kV system of the Yumen Diwopu Wind Farm.

2021

November: FGI's project "Key Control Technologies and Applications for Power Quality Improvement in High-Proportion Renewable Energy Power Systems" won the Second Prize of the National Science and Technology Progress Award.

2022

April: China's first 6 kV mine-use high-voltage direct-connected energy storage emergency power supply system was successfully commissioned at Shandong Energy Group's Xinglongzhuang Coal Mine.

2024

FGI launched a new generation C&I energy storage system, incorporating the "All-in-One" design philosophy. It integrates long-life cells, Battery Management System (BMS), high-performance Power Conversion System (PCS), fire suppression system, and thermal management system into a single standardized cabinet, designed as an integrated energy storage system.

Honor & Qualification

EU CE Certification

Explosion-Proof Certificate

National Type Test Report

In 2023, successfully selected as a "National Demonstration Enterprise for Creating World-Class Specialized Leadership".

PCCC Certification

Invention Patents

National Standards

Software Copyright Certificates

Utility Model Patent Certificates

Design Patent Certificates

Quality Assurance

The company is certified under GB/T 19001, GB/T 24001, GB/T 45001, GB/T 29490, GB/T 50430-2017 and other management systems. It has been rated as a AAAA-level enterprise for good standardization practices, an advanced enterprise in Shandong Province for quality and management excellence, a qualified enterprise for metrological assurance, a quality benchmark enterprise in Shandong Province, and a winner of the Shandong Provincial Governor Quality Award. It is accredited by the China National Accreditation Service for Conformity Assessment (CNAS).
Production management follows a rigorous quality control plan, strictly adhering to GB/T 19001 standard requirements. Emphasis is placed on PDCA management in the production process, strict process control, production flow control, and implementation of full-process quality control. Combined with the application of the "6S" management tool on-site, the factory inspection pass rate for products is 100%.
The company's production and testing systems cover an area of 80,000 m2, featuring a highly automated and integrated product testing and centralized control center. It has imported automatic SMT machines, reflow ovens, and automatic spraying lines from Germany and South Korea, along with R&D test fixtures and environmental testing equipment. It operates 11 unit assembly lines and has an annual production capacity of 3,000-5,000 sets of high-voltage products.


100,000-level purification parts manufacturing center


PCB conformal coating line


PCB board debugging - FCT and ICT function test production line


SMT-AOI automatic placement - optical inspection line


AGV automated line


PCS intelligent assembly line


WMS automated warehouse system


Fully automated complete unit test system

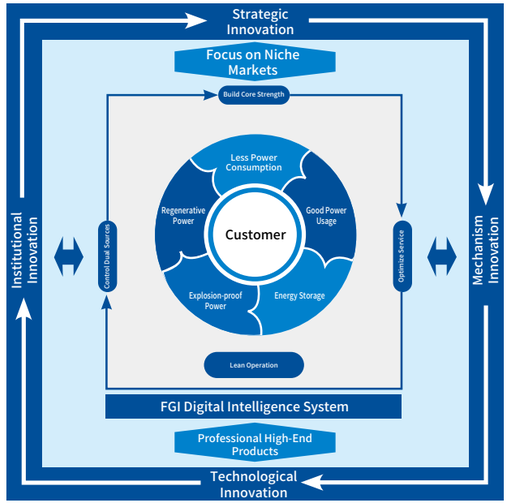
Test system central control room


10 MW-level high-power full-load test system

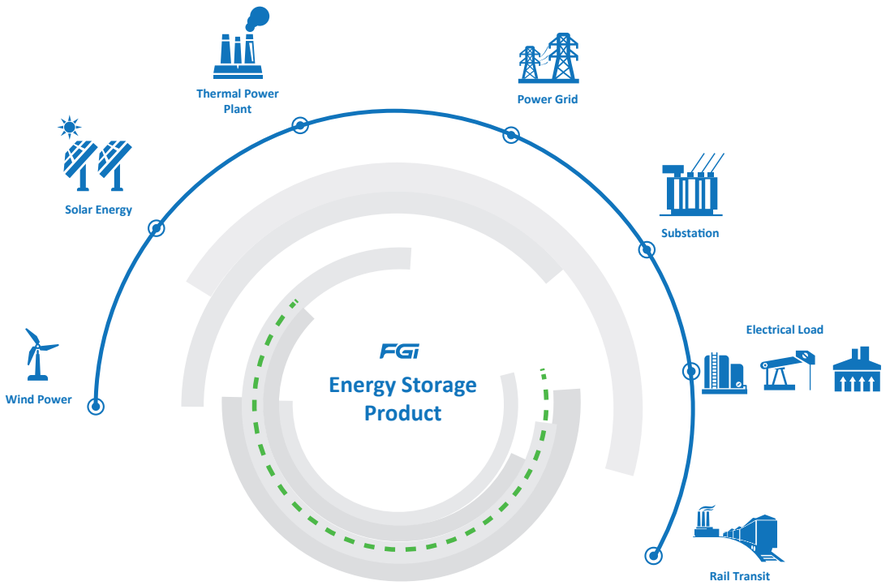

Low air pressure, high/low temperature environmental simulation chamber


Thermal shock environmental test chamber


Salt spray environmental test chamber



Energy Storage Applications



Application Scenarios

- Peak Shaving
- Backup Power Supply
- Peak/Frequency Regulation
- Reactive Power Support
- Black Start
- Output Smoothing
- Demand-side Response
- Microgrid/Islanding Applications
- Special Needs (Disaster sites, subway stations, airport terminals, military bases, etc.)
- Compensate for insufficient power supply, defer power infrastructure investment

Product Specification & Mode

FGPCS-□ □□/□-□ □□□□

- Other product identification information, combination of numbers and letters, the first digit must be a letter
- Inverter system output voltage: 0.4-0.4 kV and below; 6-6 kV; 10-10 kV; 35-35 kV; None - Without transformer
- PCS output voltage: 0.4-0.4 kV and below; 6-6 kV; 10-10 kV; 35-35 kV
- Power rating, e.g., 50 K-50 kW; 2 M-2 MW
- C-Cascade type; None - Non-cascade type
- FGI PCS

Note: FGPCS-1.725M/0.69: 690 V 1.725 MW PCS

FGPCS-3.45M/0.69-35: 3.45 MW integrated step-up unit, PCS output voltage 0.69 kV, system output voltage 35 kV

VFGPCS-C30M/35: 35 kV 30 MW direct-connected cascade PCS

FGPCS-C3M/6-10: 6 kV 3 MW 10 kV step-down PCS, system output voltage 10 kV

FGESS-□□□/□□-□□□□□

- Other product identification information, combination of numbers and letters, the first digit must be a letter
- System output voltage: 0.4-0.4 kV and below; 6-6 kV; 10-10 kV; 35-35 kV
- System energy rating: e.g., 50 K-50 kWh; 2 M-2 MWh
- System output power: e.g., 500 K-500 kW; 2 M-2 MW
- PCS Type: e.g., C-Cascade type; None - Non-cascade;
- FGI Energy Storage System

Note: FGESS-125K/261K-0.4OW, 125 kW/261 kWh energy storage system, 400 V grid-connected outdoor liquid-cooling type

FGESS-C2M/4M-35, cascade type 2 MW/4 MWh energy storage system, 35 kV grid-connected

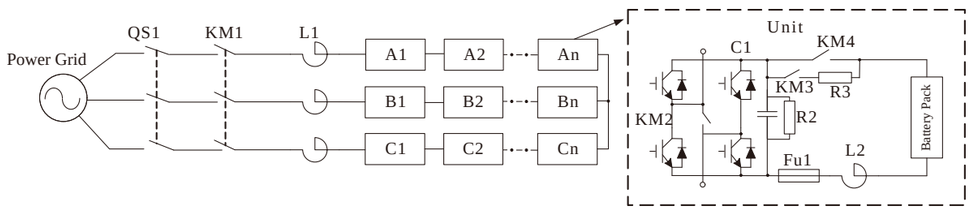
High-Voltage Cascade Energy Storage Grid-Connected Products

◎ High-Voltage Cascade Energy Storage Grid-Connected Product FGPCS-C□□□M/□□-O

Product Features

- High IP54 rating, strong adaptability
- Integrated design, convenient installation and maintenance
- Direct-connected design, high overall efficiency
- Automatic redundancy design, high reliability
- Supports multi-unit parallel operation, scalable to hundreds of MW and above
- Carrier phase-shifting design, low harmonic distortion

◎ Circuit Diagram

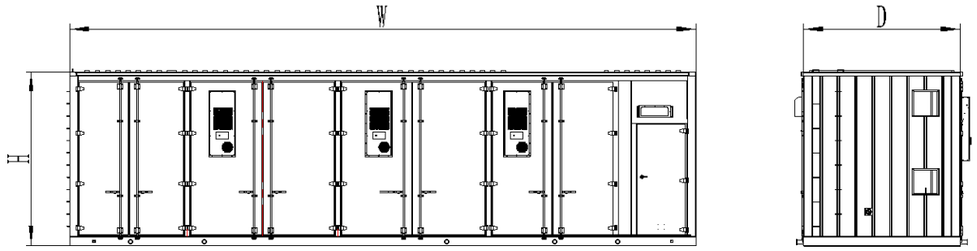


◎ Technical Specifications

General Parameters	
Rated voltage	6kV~35kV±10%
Operating frequency	50Hz（46.5~51.5Hz）
Rated power	2MW~100MW
Battery capacity	Based on actual configuration
Topology	Cascaded H-bridge
Current harmonics (THDi)	＜3%(≥25%P)
Response time / charge/discharge switching time	＜10ms
Overload capacity	1.1 x rated current for 10 min, 1.2 x rated current for 1 min
Communication interface and protocol	RS485, Ethernet; Modbus_rtu, Modbus_tcp, IEC 103/104, 61850
Operating mode	Active/reactive power independent control
Protection functions	Short-circuit, overcurrent, anti-islanding, communication, AC-side undervoltage/ overvoltage, DC-side overvoltage/undervoltage, cooling system fault protection, etc.
Multi-unit parallel operation	Supported
Redundancy function	Supported
Cooling mode	Air conditioning / liquid cooling
Installation method	Indoor / outdoor container
Operating temperature	-25~45°C
IP rating	Indoor IP20, outdoor IP54
Altitude	⩽2000m
Dimensions (W×D×H)	Refer to subsequent specification table
Grid-Forming Parameters	
Function	VSM characteristics; voltage, frequency, inertia support; time constant: 2s to 20s; droop: 0.5% to 5%
Short circuit ratio (SCR) adaptability range	1.1~20
Overload capacity	1.1 x rated continuous, 1.5 x rated for 1 min, 3 x rated for 10s
Phase angle abrupt change	±50° phase jump tolerance (no trip)
Transition capability	Supports on-grid/off-grid transition, supports grid-following/grid-forming transition

Note:
1. The above dimensions are for reference only, please refer to the actual product.
2. Due to product upgrades, the contents of this manual will be updated periodically. If you need to purchase our products, please refer to the latest product manual;
3. For more specifications and capacities, please contact sales personnel.

◎ Outline Diagram



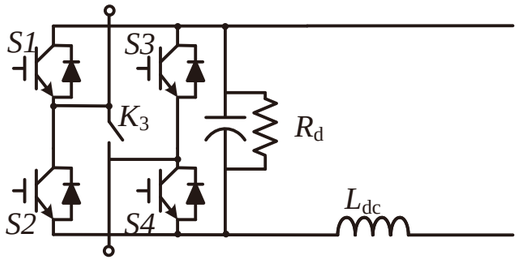
◎ Specification Table

Voltage Level (kV)	Rated Power (MW)	Rated Capacity (MWh)	Weight (t)	Quantity	Dimensions (m)		
					Width (W)	Depth (D)	Height (H)
6	2	4	35	2	9	2.6	2.896
6	3	6	50/35	2	13+9	2.6	2.896
6	5	10	50	3	13	2.6	2.896
6	4	4	35	2	9	2.6	2.896
6	6	6	50/35	2	13+9	2.6	2.896
6	10	10	50	3	13	2.6	2.896
10	5	10	50	3	13	2.6	2.896
10	10	10	50	3	13	2.6	2.896
10	10	20	50	6	13	2.6	2.896
10	20	20	50	6	13	2.6	2.896
35	25	50	55	9	11.8	3.2	3.5
35	25	55	60	9	12.8	3.2	3.5
35	25	100	55	18	11.8	3.2	3.5
35	25	110	60	18	12.8	3.2	3.5

Note:
The above dimensions are for reference only. The company reserves the right to upgrade and improve products. Product dimensions are subject to change without prior notice.

◎ High-Voltage Cascade Energy Storage PCS Power Unit

The cascade PCS power unit is the main part for system energy conversion. It consists of 2 pairs of IGBTs forming an H-bridge structure, enabling bidirectional AC/DC energy conversion, and uses liquid cooling. The single-phase bypass contactor K3 is normally open. When a power unit fails, closing K3 bypasses the unit, achieving unit redundancy. The DC side is connected to the battery pack unit via an LC filter to reduce battery ripple current and protect the battery.



Power unit

S/N	Project Name	Parameter Value	Remarks
1	AC current range	0~450A	Continuous operation
2	Power range	0~260kW	
3	Max. AC current	540A	＞1min
4	DC voltage range	450V~1150VDC	
5	Switching frequency	500Hz~1000Hz	
6	Topology	H-bridge	
7	Overload capacity	⩾1.1 x rated for 10 min, ⩾1.2 x rated for 1 min	
8	Max. PCS conversion efficiency	⩾99%	
9	Communication protocol	RS485 interface, Modbus protocol	With high-voltage box
10	Control protocol	Custom parallel optical fiber communication	
11	Cooling mode	Liquid-cooling	
12	Altitude	⩽2000m	
13	IGBT junction voltage protection	Yes	
14	DC overvoltage protection	Yes	
15	DC undervoltage protection	Yes	
16	Overtemperature protection	Yes	
17	Bypass protection	Yes	
18	Optical fiber communication error protection	Yes	
19	Dimensions (excluding reactor)	430*715*265 (W*D*H)	Dimensions vary by project, refer to the actual project.
20	IP rating	IP20	Excluding reactor

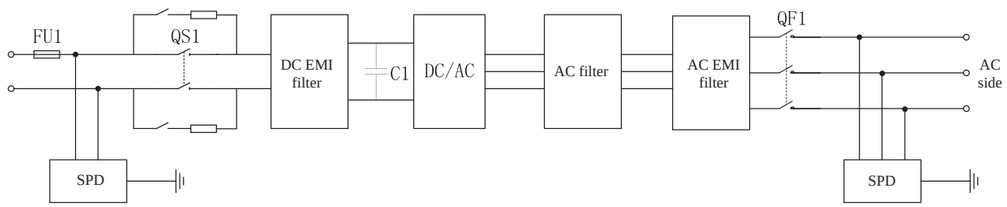
Low-Voltage Energy Storage Grid-Connected Products

◎1000 V Three-Phase Power Conversion System FGPCS-□□□K/0.4

Product Features

- Fast anti-islanding detection technology
- High/low voltage ride-through (HVRT/LVRT) function
- Standalone peak shaving function
- Reactive power and harmonic compensation function
- Constant power, constant current charge/discharge function
- Supports multi-unit parallel operation, scalable to MW level

◎ Circuit Diagram



◎ Technical Specifications

Product Model	FGPCS-630k/0.4	FGPCS-500k/0.4	FGPCS-250k/0.4	FGPCS-500k/0.315	FGPCS-250k/0.315
DC-side parameters					
Max. DC voltage	900V				
DC voltage range	600~900V			480~900V	
Max. DC current	1179	935A	468A	1169	585A
Number of DC inputs	1				
AC side parameters (grid-connected)					
Rated power	630kW	500kW	250kW	500kW	250kW
Rated current	910A	722A	360A	916A	458A
Rated voltage	400V			315V	
AC voltage range	400Vac(-20%～+15%)			315Vac(-20%～+15%)	
Rated grid frequency	50Hz/60Hz±2.5Hz				
Total harmonic distortion (THDi)	⩽3% (at rated power)				
Power factor	-0.99～+0.99				
Adjustable reactive power range	-1~+1				
AC-side parameters (off-grid)					
Rated AC voltage	400Vac			315Vac	
AC voltage harmonics	⩽3% (linear load)				
Rated output frequency	50Hz/60Hz				
System parameters					
Isolation type	Transformerless isolation				
Max. efficiency	98%				
IP rating	IP20				
Operating temperature range	-35°C to +60°C (derating above 45°C)				
Allowable humidity range	⩽95%, non-condensing				
Altitude	⩽4000 m (derating required above 2000m)				
Cooling mode	Intelligent air cooling				
Communication interface	RS485, CAN, Ethernet				
Dimensions	W1100mm*D850mm*H2000mm				
Weight	1000kg		800kg	1000kg	800kg

Note:
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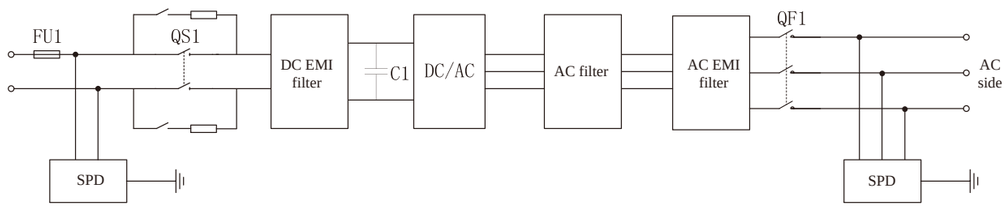
◎1500 V Three-Phase Power Conversion System FGPCS-□□□M/□□

Product Features

- Three-level ANPC topology, max efficiency 99%
- Intelligent air cooling, no derating at 45°C ambient temperature
- Wide operating voltage range, no derating at 1500 V
- Adjustable power factor range -1 to +1
- Features islanding operation, primary frequency regulation, VSG, black start, automatic on-grid/off-grid switching, inertia response, grid-forming functions
- Supports high/low voltage ride-through (HVRT/LVRT)
- High IP rating (IP65)
- Supports multi-unit parallel operation for easy expansion

◎ Circuit Diagram



◎ Technical Specifications

Product Model	FGPCS-1.25M/0.5	FGPCS-1.375M/0.55	FGPCS-1.575M/0.63	FGPCS-1.725M/0.69	FGPCS-1.250M/0.69	FGPCS-0.625M/0.69
DC-side parameters						
Max. DC voltage	1500V					
DC voltage range	730V~1500V	800V~1500V	915V~1500V	1000~1500V		
Max. DC current	1936				1403	701
Number of DC inputs	1					
AC side parameters (grid-connected)						
AC output power	1250kVA@45°C/ 1375kVA@30°C	1375kVA@45°C/ 1512kVA@30°C	1575kVA@45°C/ 1732kVA@30°C	1725kVA@45°C/ 1897kVA@30°C	1250kVA@45°C/ 1375kVA@30°C	625kVA@45°C/ 1875kVA@30°C
Max. AC current	1443A@45°C/ 1587A@30°C				1046A@45°C/ 1151A@30°C	523A@45°C/ 1569A@30°C (3 times for 10s)
Rated AC voltage	500V	550V	630V	690V		
AC voltage range	425~550V	467.5~605V	535.5~693V	586.5~759V		
Rated grid frequency	50Hz/60Hz					
AC current harmonics	<1.5% (at rated power)					
Power factor	>0.99 (>20% load)					
Adjustable power factor range	-1~+1					
AC-side parameters (off-grid)						
Rated AC voltage	500V	550V	630V	690V		
AC voltage range	425~550V	467.5~605V	535.5~693V	586.5~759V		
AC voltage harmonics	<3% (linear load)					
Rated output frequency	50Hz/60Hz					
System parameters						
Isolation type	Transformerless isolation					
Max. efficiency	99%					
IP rating	IP65					
Operating temperature range	-35°C to +60°C (>45°C derating required)					
Allowable humidity range	0 to 100% (non-condensing)					
Altitude	5000 m (>2000m derating required)					
Cooling mode	Intelligent air cooling					
Communication interface	RS485、CAN、Ethernet					
Communication protocol	Modbus RTU/TCP , IEC104 , IEC61850					
Dimensions (W×H×D)	1000*2400*1500mm					
Weight	1500kg					
Grid-forming function	/	/	/	/	/	Compliant

Note:
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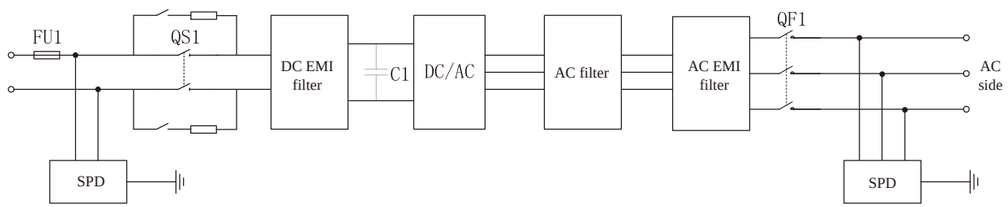
◎1500 V Three-Phase Power Conversion System FGPCS-□□□M/□□

Product Features

- Three-level ANPC topology, optimal efficiency
- Liquid-cooling, no derating at 50°C ambient temperature
- Standard intelligent fuse protection for DC side
- Features constant voltage, constant current, constant power control modes
- Supports high/low voltage ride-through, features grid-forming function
- Features islanding operation, primary frequency regulation, VSG, black start, automatic on-grid/off-grid switching functions
- High IP rating (IP65)
- Supports multi-unit parallel operation

◎ Circuit Diagram



◎ Technical Specifications

Product Model	FGPCS-1.8M/0.5-OW	FGPCS-2M/0.55-OW	FGPCS-2.3M/0.63-OW	FGPCS-2.5M/0.69-OW	FGPCS-1M/0.69-OW-G
DC-side parameters					
Max. DC voltage	1500V				
DC voltage range	730V~1500V	800V~1500V	915V~1500V	1000~1500V	
Max. DC current	2551				1122
Number of DC inputs	1				
AC side parameters (grid-connected)					
AC output power	1800kVA@50°C / 1980kVA@30°C	2000kVA@50°C / 2200kVA@30°C	2300kVA@50°C / 2530kVA@30°C	2500kVA@50°C / 2750kVA@30°C	1000kVA@50°C / 3000kVA@30°C
Max. AC current	2092A@50°C / 2301A@30°C				837A@50°C / 2511A@30°C (3 times for 10s)
Rated AC voltage	500V	550V	630V	690V	690V
AC voltage range	425~550V	467.5~605V	535.5~693V	586.5~759V	
Rated grid frequency	50Hz/60Hz				
AC current harmonics	<1.5% (at rated power)				
Power factor	>0.99 (>20% load)				
Adjustable power factor range	-1~+1				
AC-side parameters (off-grid)					
Rated AC voltage	500V	550V	630V	690V	
AC voltage range	425~550V	467.5~605V	535.5~693V	586.5~759V	
AC voltage harmonics	<3% (linear load)				
Rated output frequency	50Hz/60Hz				
System parameters					
Isolation type	Transformerless isolation				
Max. efficiency	99%				
IP rating	IP65				
Operating temperature range	-35°C to +60°C (>50°C derating required)				
Allowable humidity range	0 to 100% (non-condensing)				
Altitude	5000 m (>3000m derating required)				
Cooling mode	Intelligent air cooling				
Communication interface	RS485、CAN、Ethernet				
Communication protocol	Modbus RTU/TCP , IEC104 , IEC61850				
Dimensions (W×H×D)	1000*2550*1400mm				
Weight	1700kg				
Grid-forming function	/	/	/	/	Compliant

Note:
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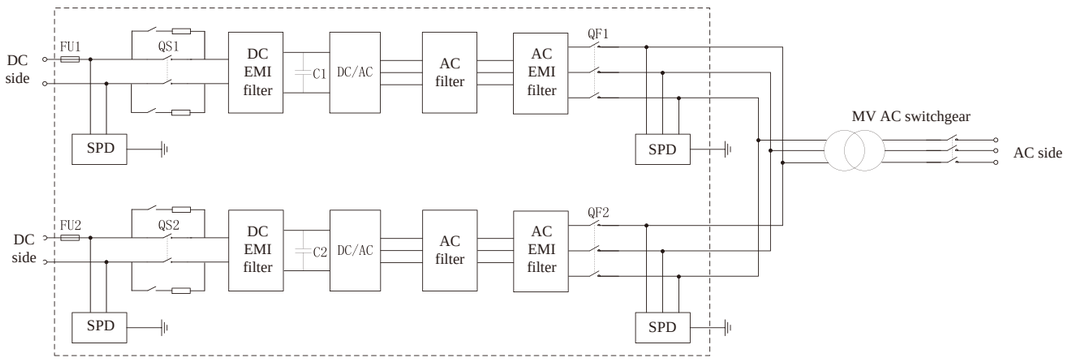
◎1500 V Integrated Energy Storage Inverter and Step-up Unit FGPCS-□□□M/□□-□□O

Product Features

- Strong grid adaptability, meets voltage levels of 35kV and below
- Three-level ANPC topology, high efficiency
- Intelligent air cooling, no derating at 45°C ambient temperature
- Wide operating voltage range, no derating at 1500 V
- Adjustable power factor range -1 to +1
- Features islanding operation, primary frequency regulation, VSG, black start, automatic on-grid/off-grid switching, inertia response, grid-forming functions
- Supports high/low voltage ride-through (HVRT/LVRT)
- High IP rating (IP65 inverter / IP54 others)
- Supports 1.1x overload for 10 min, 1.2x overload for 1 min

◎ Circuit Diagram



◎ Technical Specifications

Product Model	FGPCS-2.5MW/0.69-35O	FGPCS-3.45MW/0.69-35O	FGPCS-5MW/0.69-35O	FGPCS-5MW/0.69-35O
DC-side parameters				
Max. DC current	1500V			
DC voltage range	1000~1500V			
Max. DC current	1403*2	1936*2	1403*4	2551*2
Number of DC inputs	2		4	2
AC side parameters (grid-connected)				
AC output power	2500kVA@45°C /2750kVA@30°C	3450kVA@45°C /3795kVA@30°C	5000kVA@45°C/5500kVA@30°C	
Max. AC current	2092A@45°C /2302A@30°C	2886A@45°C /3175A@30°C	4184A@45°C/4602A@30°C	
Rated AC voltage	690V			
AC voltage range	586.5~759V			
Rated grid frequency	50Hz/60Hz			
AC current harmonics	<1.5% (at rated power)			
Power factor	>0.99 (>20% load)			
Adjustable power factor range	-1~+1			
AC-side parameters (off-grid)				
Rated AC voltage	690V			
AC voltage range	586.5~759V			
AC voltage harmonics	<3% (linear load)			
Rated output frequency	50Hz/60Hz			
Transformer parameters				
Isolation type	Dry-type transformer			
Transformer rated power	2500kVA	3450kVA	5000kVA	5000kVA
LV/MV voltage	0.69kV/35kV			
System parameters				
Max. inverter efficiency	99%			
IP rating	IP65 (inverter) / IP54 (others)			
Operating temperature range	-35°C to +60°C (>45°C derating required)			-35~+60°C (>50°C derating required)
Allowable humidity range	0 to 100% (non-condensing)			
Altitude	5000 m (>2000m derating required)			
Dimensions	6650×3000×2800	6600×3000×2900	9800*3200*3000	7200*3200*3000
Weight	13400kg	13400kg	25000kg	24000kg

Note:
1.The above dimensions are for reference only, please refer to the actual product.
2.Due to product upgrades, the contents of this manual will be updated periodically. If you need to purchase our products, please refer to the latest product manual;

◎Commercial and Industrial Energy Storage System FGESS-100K/215K-0.4OW

Product Overview

Adopting the "All-in-One" design philosophy, integrating battery PACK, Battery Management System (BMS), Energy Management System (EMS), Power Conversion System (PCS), thermal management system, and fire suppression system into a single cabinet, forming a standardized, plug-and-play modular energy storage system.

Product Features

- **High Safety**

Single cluster design, no parallel capacity loss, reducing thermal runaway risk; Immersion-type active fire suppression, intelligent safety warnings

- **High Performance**

Supports multi-unit parallel operation, demand control, anti-reverse flow, load tracking

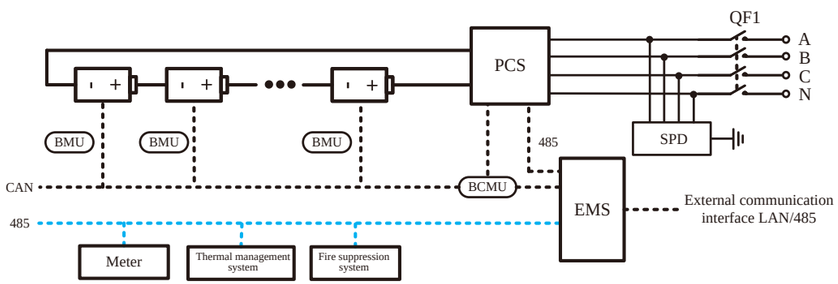
- **High Density**

Integrated design, small footprint, simple construction, flexible expansion

- **High Intelligence**

Distributed database, health management and proactive O&M, cloud-edge coordinated energy scheduling

◎ Circuit Topology Diagram



◎ Technical Specifications

Product Model	FGESS-100K/215K-0.4OW		
DC-side parameters			
Cell type	LFP 3.2V/280Ah	Battery voltage range	672~864V
Battery pack configuration	43kWh/1P48S	DC protection	Circuit breaker + Fuse
Battery pack configuration	215kWh/1P240S	Battery PACK IP rating	IP67
AC-side parameters			
AC rated power	100kW	Rated grid voltage	400V
Max. AC power	120kW	Rated grid frequency	50Hz
THID	⩽3% (full load)	Adjustable power factor range	-1~+1
DC component	⩽0.5%Ipn	Charge/discharge switching time	<100ms
System parameters			
Max. system efficiency	⩾87%&0.5P	Cooling mode	Liquid-cooling
Charge C-rate	⩽0.5P	Operating temperature	-20°C~+50°C (>45°C derating required)
Depth of discharge (DoD)	5~95%DOD	Relative humidity	0 to 95% RH, non-condensing
Noise	⩽75dB	Altitude	⩽2000m
Cooling capacity	3.0kW	Cooling input power	1.4kW
Times of cycle	6000 times	Fire suppression system	Aerosol
Communication interface	LAN/485	IP rating	IP54
System dimensions (W×D×H)	1300*1300*2200mm	Weight	2700kg

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◎Commercial and Industrial Energy Storage System FGESS-125K/261K-0.4OW

Product Overview

Adopting the "All-in-One" design philosophy, integrating battery PACK, Battery Management System (BMS), Energy Management System (EMS), Power Conversion System (PCS), thermal management system, and fire suppression system into a single cabinet, forming a standardized, plug-and-play modular energy storage system.

Product Features

- **High Safety**

Single cluster design, no parallel capacity loss, reducing thermal runaway risk; Immersion-type active fire suppression, intelligent safety warnings

- **High Performance**

Supports multi-unit parallel operation, demand control, anti-reverse flow, load tracking

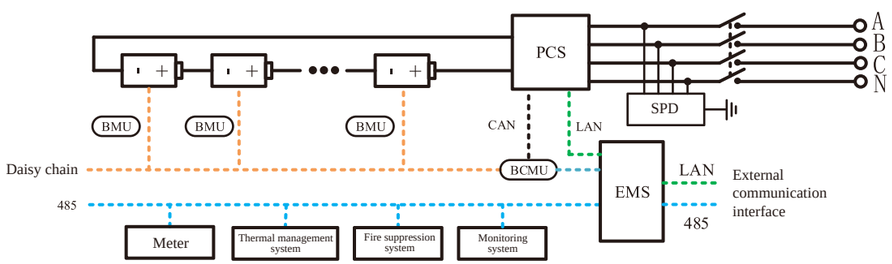
- **High Density**

Integrated design, small footprint, simple construction, flexible expansion

- **High Intelligence**

Distributed database, health management and proactive O&M, cloud-edge coordinated energy scheduling

◎ Circuit Topology Diagram



◎ Technical Specifications

Product Model	FGESS-116K/233K-0.4OW		FGESS-125K/261K-0.4OW	
DC-side parameters				
Cell type	LFP 3.2V/280Ah	LFP 3.2V/314Ah	Battery voltage range	728~936V
Battery pack configuration	46.6kWh/1P52S	52.2kWh/1P52S	DC protection	Circuit breaker + Fuse
Battery pack configuration	233kWh/1P260S	261kWh/1P260S	Battery PACK IP rating	IP67
AC-side parameters				
AC rated power	116kW	125kW	Rated grid voltage	400V
Max. AC power	127.6kW	137.5kW	Rated grid frequency	50Hz
THID	⩽3% (full load)		Adjustable power factor range	-1~+1
DC component	⩽0.5%Ipn		Charge/discharge switching time	<100ms
System parameters				
Max. system efficiency	⩾88%&0.5P		Cooling mode	Liquid-cooling
Charge C-rate	⩽0.5P		Operating temperature	-20℃~+50℃ (>45℃ derating required)
Depth of discharge (DoD)	95%DOD		Relative humidity	0 to 95% RH, non-condensing
Noise	⩽70dB		Altitude	⩽2000m
Cooling capacity	5.0kW		Cooling input power	2.5kW
Times of cycle	6000 times		Fire suppression system	Perfluorohexanone
Communication interface	LAN/485		IP rating	IP55
System dimensions (W×D×H)	1000*1300*2400mm		Weight	2800kg

Note:
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◎100 kW Bidirectional DC-DC Converter FGDCDC-100K-0.4

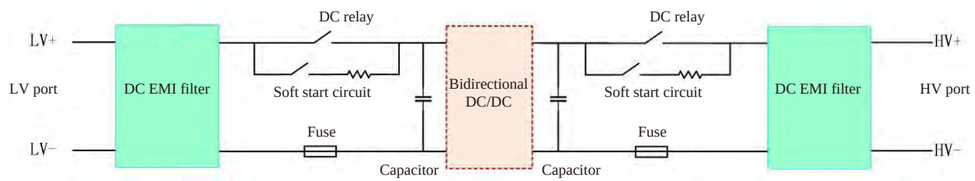
Product Overview

The bidirectional DC-DC converter (DCDC) is the core power conversion unit in the energy storage system. FGDCDC-100K/0.4 is specifically designed for flow battery energy storage scenarios, featuring excellent performance and flexible application methods. This device supports flow battery charging starting from 0V, adopts a modular design for flexible power expansion, meeting the needs of different scale energy storage systems.
FGDCDC-100K/0.4 utilizes an advanced 6-phase interleaved parallel topology combined with Silicon Carbide (SiC) power devices, significantly enhancing system efficiency and performance. Its maximum efficiency reaches 99.5%. While reducing energy losses, it further optimizes power density, making the device smaller, lighter, and easier to install and maintain.

Product Features

- Wide voltage range, supports 0V charging function
- Utilizes silicon carbide power devices, efficiency up to 99.5%
- Modular design for convenient power expansion
- Features constant voltage, constant current, constant power control modes

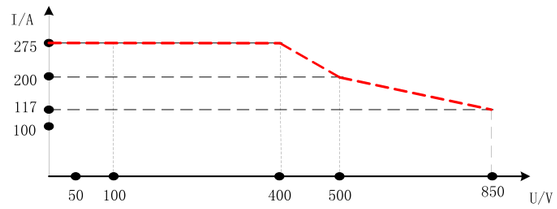
◎ Circuit Topology Diagram



◎ Technical Specifications

	Product Model	FGDCDC-100K/0.4
Electrical Parameters	Low voltage side voltage/V	0 V-850 V (current range 0A--±275A)
	High voltage side voltage/V	50 V-900 V (rated voltage 700V, rated current 143A) note 1
	Rated power/kW	100
	Overload capacity	110% of rated current for long duration
	Low voltage rated current/A	200 (max@275A)
	High voltage rated current/A	143
	Voltage control accuracy	1%
	Current control accuracy	1%
	Max. efficiency	99.5%
	Current ripple RMS	⩽2%
	MPPT function	Available
Other Parameters	Dimensions/mm (W×D×H)	560*570*185mm
	Weight/kg	< 50
	Communication interface	3 channels of RS485 communication, 2 channels of CAN communication, 1 channel of Ethernet interface
	Input/output interface	4 channels of input, 4 channels of output
	IP rating	IP20
	Structural wiring	Front entry, front exit

Note 1: Clarified application range: Low voltage side 0V to 850 V (current range 0 A to ±275 A), high voltage side 50 V to 900 V (rated voltage 700 V, rated current 143 A);
Requirement: Low voltage side voltage cannot exceed high voltage side voltage, and the voltage difference between the two must be at least 50 V; low voltage side power curve is shown below:



100 kW bidirectional DC-DC converter low voltage side power curve

◎BMS System Level 1 BMU FGBMS-BMU-xxSxxT-xxxx

Product Features

- Cell voltage acquisition function, full-range sampling error < 1‰;
- Cell temperature acquisition function, achieving full coverage of cell temperature monitoring;
- Supports active and passive cell balancing management methods;
- Pack fan control, real-time control of PACK internal temperature based on cell temperature and difference, ensuring cells operate within a reasonable temperature range, effectively extending cell life;
- AFE sleep control, supports AFE sleep control during long periods of cell inactivity, reducing excessive energy consumption by AFE, preventing cell over-discharge;
- Supports Bootloader upgrade and automatic CAN ID encoding.

◎ Technical Specifications

Item	Description	Technical Parameters
Power supply	Input voltage and power consumption	Input voltage range: 6 V to 32 V (with reverse polarity protection); Power Consumption: <0.5 W
Operating environment	Operating temperature	-20~65°C
	Storage temperature	-40~125°C
	Operating humidity	5~95%RH
	Atmospheric pressure	80~110kPa
	Altitude	0~2000m
Cell voltage acquisition	Supports 10 to 104 channels of cell voltage acquisition	Acquisition range: 0 V to 5 V; resolution: 1 mV; acquisition accuracy: ⩽5 mV; Acquisition rate: 100ms
Cell temperature acquisition	Supports 10 to 104 channels of cell temperature acquisition	Acquisition range: -40°C to +125°C; acquisition resolution: 0.1°C; Acquisition accuracy: ⩽1°C at -20°C to +65°C; ⩽2°C at -40°C to +125°C; acquisition rate: ⩽1s
Cell balancing	Supports 10 to 104 channels of cell passive balancing	Balancing resistor: 30 Ω; balancing current: 100 mA; balancing temperature rise: ⩽45°C
Address assignment	Assigns CAN addresses to slave controllers	Receives commands from master or slave modules to sequentially assign addresses to slave modules
Passive output	Supports 1 channel of passive DO output	Control current: ⩽2 A; control voltage: ⩽30 Vdc
CAN communication	Non-isolated CAN, communicates with master controller	Communication rate: 250 Kbps/500 Kbps
Fault diagnosis	AFE sampling self-check	Supports AFE chip fault self-check, sampling line disconnection detection, etc.

◎BMS System Level 2 BCMU FGBMS-BCMU-xxxx

Product Features

- Supports real-time current sampling using shunt or Hall effect current sensors
- Features high-voltage sampling function
- Features insulation sampling function
- Features high-voltage power-up/down management, supports relay status detection and diagnosis
- Features battery state data processing, real-time processing of BMU cell voltage, temperature, etc., collected via CAN bus
- Features four-level fault diagnosis protection strategy, supports fault threshold and hysteresis calibration
- Features SOC\SOH\SOP\SOE estimation, cell balancing management
- Features cell thermal management, controls system active heating and cooling based on system temperature, effectively extending cell life
- Supports system expansion, including multiple active/passive node input/output interfaces
- Features CAN communication, Ethernet communication, RS485 communication functions
- Features Bootloader upgrade function
- Features data storage function, supports local data storage on power loss

◎ Technical Specifications

Item	Description	Technical Parameters
Power supply	Input voltage and power consumption	Input voltage: 16 V to 32 V (with reverse polarity protection); power consumption: <3 W (DO no load)
Output power supply	Hall sensor power supply	Voltage range: 12 V to 18V; output power: 3 W
	BMU module power supply	Voltage range: 16 V to 32V; output power: 8 W
Operating environment	Operating temperature, humidity, altitude	-20~+65°C、5~95%RH 、0~2000m
Voltage acquisition	Supports 2 channels of voltage acquisition	Acquisition range: 0 V to 1500 V; resolution: 0.1 V; Acquisition accuracy: ⩽±0.5% F.S; acquisition rate ⩽100ms
Current acquisition	Supports shunt and Hall sensor acquisition	Acquisition range: ±500 A; Acquisition Resolution: 0.1 A; Acquisition accuracy: ⩽±0.2% F.S; acquisition rate: 50ms
Temperature acquisition	Supports 3 channels of temperature acquisition	Acquisition range: -40°C to +125°C; acquisition accuracy: -20°C to +65°C, accuracy ⩽±1°C, other intervals within acquisition range, accuracy ⩽±2°C; Acquisition Rate ⩽1s
Insulation detection	Detects insulation resistance value between positive/negative terminals and chassis	Acquisition range: 0 MΩ to 10 MΩ, acquisition accuracy: ⩾500 V, Accuracy ⩽±10% F.S
Digital input (DI)	Supports 8×DIs, 3×high-active inputs, 3×low-active inputs, 2×digital state detections	High level range: 16 V to 32 V, low level range: <0.7 V
Digital output (DO)	Supports 8×DOs, 3×high-active outputs, 3×low-active outputs, 2×dry contact outputs	High-active output: single channel max current 3 A, 3 channels max total current 4 A; Low-active output: single channel max current 2.5 A; Dry contact output: 24 Vdc/2 A
CAN communication	Supports 1 channel of non-isolated CAN communication, 1 channel of isolated CAN communication	Communication rate: 250 kb/s; isolation voltage: 3000 Vdc (isolated CAN)
RS485 communication	Supports 1 channel of isolated RS485 communication	Communication rate: 9600 bps; isolation voltage: 3000 Vdc
LAN	Supports multi-BCMU "hand-in-hand" networking	Communication rate: 10/100 Mb/s

◎BMS System Level 3 BAMU FGBMS-BAMU-xxxx

Product Features

- Features cell information aggregation, supports up to 40 clusters
- Supports display of battery information, system status information, alarm information, and action records
- Features numerical calculation, performance analysis, alarm processing, and data logging/storage
- Features backend communication, supports information query and backend control operations for BMS
- Features linkage control with EMS/PCS
- Features dry contact detection function
- Features CAN communication, Ethernet communication, RS485 communication functions
- Features stack SOC/SOH calculation function
- Supports calibration and download of battery information parameters
- Supports system expansion, including multiple active/passive node input/output interfaces
- Supports communication with air conditioning and fire suppression systems based on requirements

◎ Technical Specifications

Item	Function parameters
LCD screen	10.1" TFT true color LCD screen (16:9 ratio), resolution 1024×600
Touch specification	Over 1 million touches (stylus tip 0.8mm², key press force 250 g, key press speed 2 times/second)
Central processing unit	Cortex A8 embedded ARM low power CPU, main frequency 800 MHz
Memory RAM	512 M Bytes DDR3 SDRAM
SD card storage	Max support for expansion to 128G; (configurable based on demand)
Measured power consumption	6W
Communication interface	3 channels of isolated RS-485 interfaces; 2 channels of 10/100M network interfaces; 2 channels of isolated CAN bus interfaces;1 channel of RS-232; 2 channels of USB interfaces
DI/DO interface	4 channels of digital IO inputs / 4 channels of digital IO outputs
Power input	DC 12V\24V
Data logging interval	⩽60S
Event log	Over 5000 event records, including alarm records, occurrence time, charge/discharge start time, threshold modification records, etc.
Application environment	Operating temperature: -10°C to 60°C, storage temperature: -20°C to 70°C; Operating humidity: 20% RH to 95% RH, non-condensing
Other	Anti-surge, lightning protection, anti-reverse connection, overcurrent protection, wide voltage

◎High Voltage Box FGBMS-HVMU-HVMU-XX/XXX-xxxx

Product Features

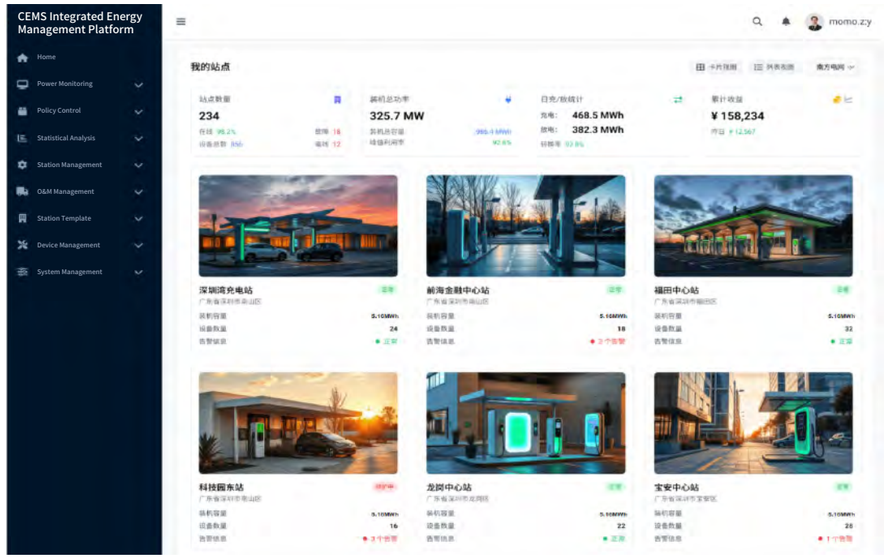
- Standard AC 220 V power supply, supports battery cluster terminal power supply, meets customized needs
- Real-time detection of battery cluster terminal current, supports shunt or Hall sensor sampling
- Supports insulation resistance monitoring, ensures operational safety
- Supports DC 24 V power supply for battery module fans, enables battery cluster thermal management
- Supports manual or electric closing control function for circuit breakers
- Supports communication with BMU, BAMU for data management and aggregation
- Real-time monitoring of internal environment and device temperature, ensures system operational safety
- Supports fault diagnosis function, implements local protection based on abnormal states like voltage, current, insulation, etc.
- Supports passive digital output
- High voltage box IP rating is IP65 high IP rating
- High voltage box equipped with onboard switch, supports serial communication, simplifies wiring path
- High voltage box supports high-voltage cascade energy storage applications, uses fiber optic communication to enhance communication insulation

◎Combiner Box FGBMS-PVMU-XX/XXX

Product Features

- Supports 220 Vac power input, supplies power to the internal UPS of the combiner box
- Supports power supply to high voltage box (if any), power supply voltage is 220 Vac, indirectly supplies power to the master control module
- Supports communication with PCS system, EMS system, air conditioning and fire suppression equipment, etc.
- Supports circuit breaker trip control and status monitoring, with status displayed by indicator lights, supports emergency stop control function
- Aggregates real-time data information of the entire system, supports battery stack status data processing, implements battery charge/discharge management and control after processing
- Features alarms and protection for battery (cell, module, cluster, stack) overvoltage, undervoltage, voltage difference, overcurrent, undercurrent, overtemperature, low temperature, temperature difference, short circuit, insulation, relay diagnosis, etc.

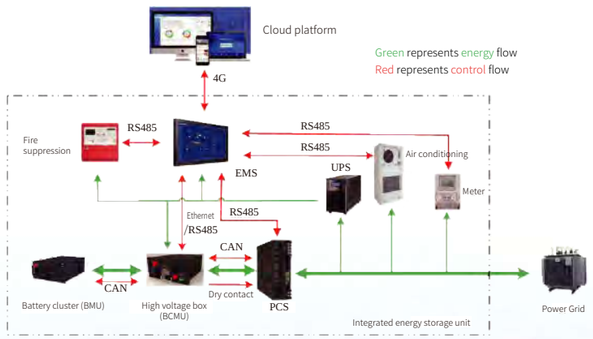
◎Commercial and Industrial EMS



Commercial and Industrial Energy Storage EMS Features

- Data Dashboard: Provides statistical data display functions such as customer overview, site overview, energy storage cabinet overview, including charge/discharge amount, revenue, etc. User roles are divided into administrator, agent, owner, etc. If the role is owner, customer overview information is not displayed.
- Device Monitoring: View various devices by equipment, including but not limited to PCS, BMS, air conditioning, meters, intelligent circuit breakers, fire suppression main units, various sensors, etc., real-time operating data, and supports device control.
- Supports configuration of peak-valley time-of-use periods throughout the year, electricity price configuration, seasonal configuration, power curve configuration, protection logic configuration, etc., richly and flexibly meeting business needs.
- Operating Revenue: Displays energy storage revenue and energy information, capable of performing revenue analysis and investment return analysis for daily, weekly, monthly, quarterly, annual, and arbitrary time periods.
- Fault Alarms: Aggregates fault alarms from various devices, queries by time, status, level, etc.
- Statistical Analysis: Queries historical operating data and related reports for devices, supports data export.
- Energy Management: Core function of EMS, configuring energy storage strategies, including manual and automatic modes, meeting needs for debugging, maintenance, daily operation, upkeep, etc.
- System Management: Includes power station basic information, device management, electricity price period management, operation logs, account management, language switching, etc.

Commercial and Industrial Energy Storage EMS Highlights



System Framework Diagram

• Revenue

Configure daily energy storage system operating power plan, multiple time periods and time zone configurations, better strategies, higher economic benefits

• Cost

Fast debugging, remote capability, reducing construction and O&M costs

• Safety

Ensure energy storage system safety, reliability, and economic operation through internal calculation logic

◎ Technical Specifications

Operating System	Windows	Windows7,Windows7-Embedded, Windows10 IoT
Power Supply	Input voltage	DC12V to 24 V ±10%, includes overcurrent, overvoltage, and reverse polarity protection
Environmental Parameters	Operating temperature	-20°C to 60°C (using SSD)
	Storage temperature	-40°C to 80°C (using SSD)
	EMC	5% to 95% (non-condensing)
	Relative humidity	CE/FCC Class A
	Vibration	Complies with IEC60068-2-64
	Shock	Complies with IEC60068-2-27
Hardware Configuration	CPU	⩾4 cores / 4 threads, 2.0GHz
	RAM	8GB
	Memory	256GB
	Storage	Supports SSD hard drive expansion
	Ethernet	2×Intel Gigabit Ethernet port
	RS485	8×RS485
	DI	8×DI NPN/PNP, isolation voltage 2500 Vrms
	DO	4×relay DO
	Reserved screen interface	DVI-D
	USB	1×USB3.0, 3×USB2.0
	SIM card slot	Supports operator 4G network
	Expansion	Full-size miniPCIe card slot
	Watchdog	Programmable settings

Note:
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2. Due to product upgrades, the contents of this manual will be updated periodically. If you need to purchase our products, please refer to the latest product manual.

Typical Cases

◎ Power Side

◎ Large PV Power Generation Project in Zhejiang

Grid-connected voltage: 35 kV
PCS voltage: 35 kV cascade direct-connected
Power/Energy: 28 MW/9.676 MWh
Location: Wenzhou City, Zhejiang Province
Features: Features primary frequency regulation and reactive power compensation functions, characterized by large system scale, fast response speed, precise energy control, strong bidirectional regulation capability, high operating efficiency, small footprint, etc.

◎ CNNC Agro-Photovoltaic Complementary PV Power Generation Demonstration Project in Shandong

Grid-connected voltage: 35 kV
PCS voltage: 400 V
Power/Energy: 6 MW/12 MWh
Location: Tengzhou City, Zaozhuang City, Shandong Province

◎ Wind Farm Energy Storage Project in Anhui

Grid-connected voltage: 35 kV
PCS voltage: 400 V
Power/Energy: 10 MW/10 MWh
Location: Huaiyuan County, Bengbu City, Anhui Province

◎ Desert Control Energy Storage Project in Gulang, Gansu

Grid-connected voltage: 35 kV
PCS voltage: 690 V
Power/Energy: 60 MW/120 MWh
Location: Gulang County, Gansu Province
Features: Integrates PV power generation, desert control, and ecological restoration

◎ PV Power Station Energy Storage Project in Lingtai, Gansu

Grid-connected voltage: 35 kV
PCS voltage: 10 kV Cascade
Power/Energy: 5 MW/10 MWh
Location: Lingtai County, Pingliang City, Gansu Province

◎ Emergency Power Supply

Grid-connected voltage: 6 kV
PCS voltage: 6 kV cascade direct-connected
Power/Energy: 4 MW/4 MWh
Location: Xinglongzhuang Coal Mine, Jining City, Shandong Province

◎ Independent Energy Storage Project in Shandong

Grid-connected voltage: 35 kV
PCS voltage: 35 kV cascade direct-connected
Station capacity: 100 MW/200 MWh
Location: Dongying, Shandong
Features: Single unit capacity 25 MW/50 MWh, large single unit capacity, fast response speed, good harmonic characteristics, etc.

◎ User Side

◎ Huadian—FGI "PV, Storage, Charging, Source" Multi-Energy Complementary Project

Project

- 200 kW distributed industrial rooftop power station;
- Distributed 30 kW carport PV power generation system;
- Multi-functional 300 kW new energy vehicle parking lot charging system;
- High-voltage cascade 4 MWh energy storage power station;
- Low-voltage 1.26 MWh cascaded battery energy storage power station.

Six Key Features of Projects

01 Innovative application of prefabricated multi-functional integrated energy storage cabin

02 Research and application of innovative thermal management system

03 Trigger-type integrated fire blanket isolation support

04 Multi-energy complementary integrated energy management system

05 High-voltage cascade PCS application

06 Cascaded battery utilization combined with PV and charging pile applications

◎ User Side Outdoor Energy Storage Project in Ningbo, Zhejiang

Power capacity: 900 kW/1935 kWh
Specification model: FGESS-100K/215K-0.4OW
Application mode: Peak-valley arbitrage, demand control, anti-reverse flow

◎ User Side Energy Storage Project in Wenzhou, Zhejiang

Power capacity: 250 kW/522 kWh
Specification model: FGESS-125K/261K-0.4OW
Application mode: Peak-valley arbitrage, demand control, anti-reverse flow

Full-life Cycle Service for Worry-free Use

Serve at anytime and anywhere Customer always comes first

Pre-sale, In-sale and After-sale Services

- Life cycle management mechanism
- Professional technicians diagnose electricity usage situations, making equipment selection more reasonable
- On-site installation, commissioning, training, Q&A

Remote Monitoring

- Equipped with a remote data monitoring center
- Real-time grasp of equipment operating status
- Timely reminders for inspection and maintenance
- Predict fault occurrences

Sunshine Service

- Regularly launch "Customer Care, Sunshine Service" activities, proactively visit user sites to provide one-stop free services.
- Users can visit the company for free tours and learning anytime; company headquarters organizes four training sessions annually (at the end of each quarter), inviting customers to the company for training.

Service Network

- 5 major service centers
- 21 offices
- 2-hour response, 24-hour on-site arrival
- Service radius less than 200 kilometers
- Experienced service team with excellent technical skills

Stock abbreviation: Xin Feng Guang (新风光)
Stock code: 688663

Official Website

WeChat Official Account

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