

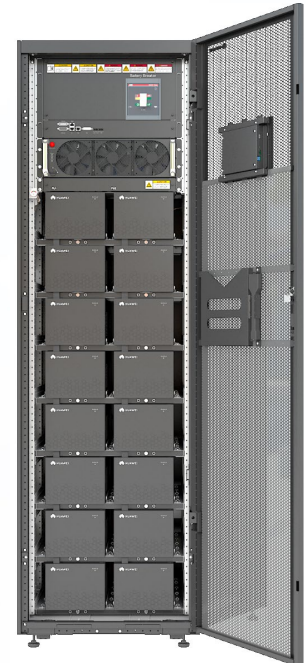
# SmartLi Series

## Introduction

SmartLi is a battery energy storage system developed by Huawei for UPS, which has the features of safety and reliability, long lifespan, space saving and easy maintenance. LFP is the safest cell of Li-ion battery. The unique active current balance control technology supports the mix use of new and old batteries, which reduces Capex (Capital Expenditure). Three-level BMS system realizes intelligent battery management with Huawei UPS and Network management system, which reduces Opex (Operating Expense).

## Application Scenarios

- Data centers in headquarter or disaster recovery data centers
- Internet data centers
- Large cloud computing data centers



SmartLi

## Features & Value

### Reliable

- Long cycle lifespan, cycle lifetime can be up to 5000 times
- Highly stable LFP cell, no fire after thermal runaway
- Three-level BMS system ensures reliability
- PACK-level fire extinguishing, precise and quick fire fighting, non-proliferation

### Efficient

- High power density, saving 70% footprint
- Smart BMS system, saving 80% routine O&M costs

### Simple

- Active current balance control, supporting new and old battery cabinets mixed using, flexible to expand
- Smart active voltage balance control, Battery strings of different numbers of lithium batteries can be connected in parallel <sup>①</sup>
- Automatic grouping and capacity check, reducing manual capacity test costs and avoiding power failure risks

<sup>①</sup>If a single module is faulty, remove the faulty module and connect the other modules in series to restart the system.

## System Specifications

Item		Description
Basic Parameters	Product Model	SmartLi
	Battery Cell Material	LiFePO4(6C)
	Charging Current	≤ 1C, 0.5C by default
	Cycle Life	5000 cycles @ 50% DOD
	Nominal Capacity	162Ah / 82.94kWh ( 8+8 ) ; 162Ah / 72.57kWh ( 7+7 ) ; 162Ah / 62.20kWh ( 6+6 ) ;
	Capacity for calculating the backup time <sup>②</sup>	153Ah / 78.33kWh ( 8+8 ) ; 153Ah / 68.54kWh ( 7+7 ) ; 153Ah / 58.75kWh ( 6+6 ) ;
	Weight	1100kg ( 8+8 ) ; 1000kg ( 7+7 ) ; 900kg ( 6+6 )
	Dimension (W*D*H)	600mm*850mm*2000mm
	Self Discharge	≤5% (0-30°C/3 months)
	Fire protection	Module-level
	Communication Interface	FE, RS485, Dry contacts
	Protection	Over temperature, over current, short circuit, over charge/discharge, etc.
	Design Life	15 years
	Certification	UL1642, UN38.3, IEC62619, IEC62040,RoHs
	Compatibility	Huawei UPS, third-party UPS/HVDC
Discharge capability	300 kW@10 minutes or 200 kW@15 minutes (7+7, 20-30° C)	

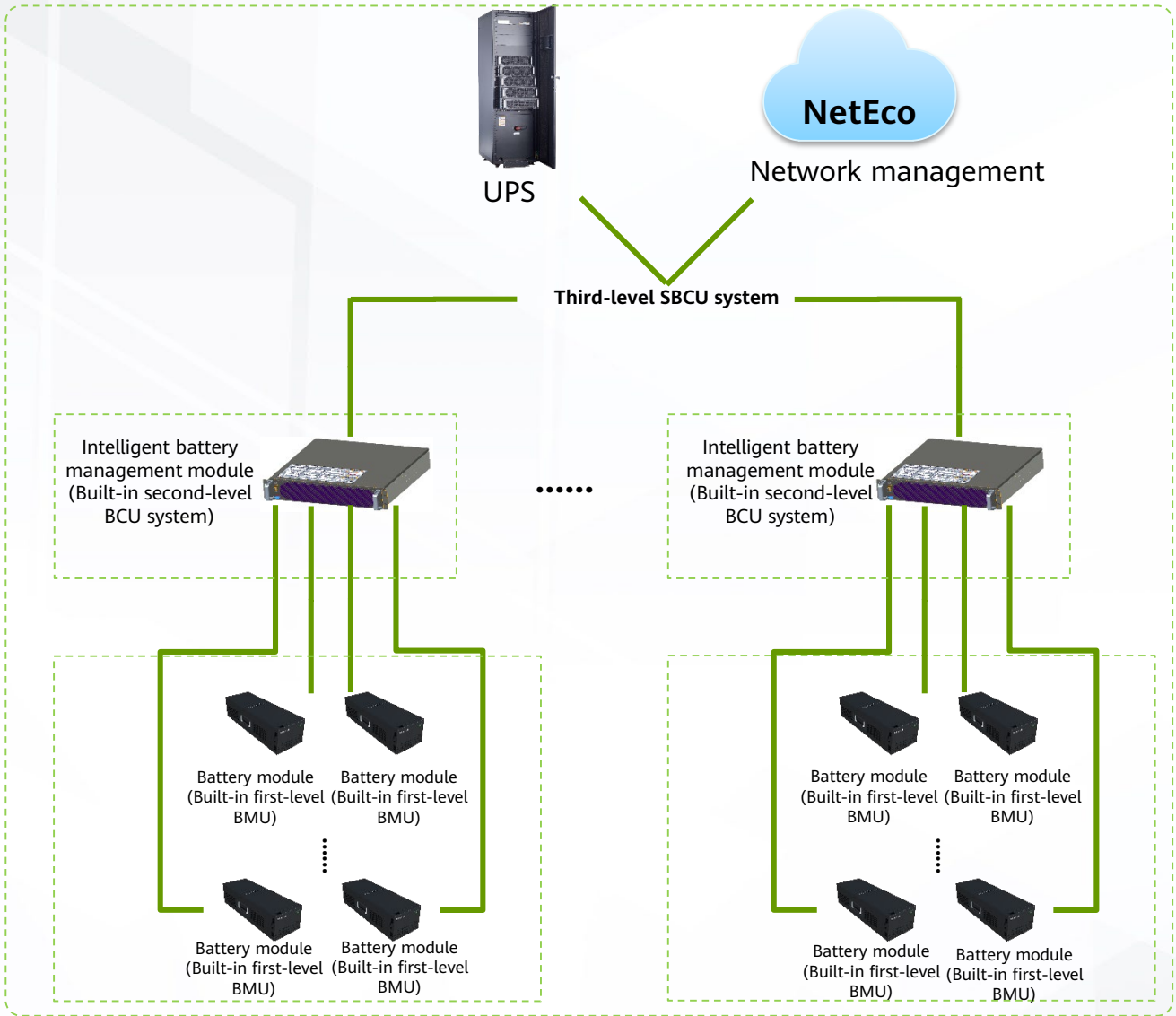
Item		Description
Basic Parameters	IP Protection Level	IP21 according to IEC60529 standard
	Mounting Type	Against the wall.Reserve at least 800 mm from the front.
EMC	Surge	IEC61000-4-5
	ESD	IEC61000-4-2
	Radiated electric fields	IEC61000-4-3
	Emission	IEC62040-3
Environment	Storage Temperature	0°C - 40°C
	Transportation Temperature	-40°C to 60°C
	Operating Temperature	0°C - 40°C (20-25° C is recommended)
	Relative Humidity	5% - 95%
	Max. Operating Altitude	0 - 4000m. Derating is required if the altitude exceeds 1000 m*

## Battery Module and Cabinet Specifications

	Cell	Module	Full Cabinet	Half Cabinet
Configuration	Single cell	20S3P	2 groups	1 group
Nominal Capacity	27Ah	81Ah	162Ah	81Ah
Capacity for calculating the backup time	25.5Ah	76.5Ah	153Ah	76.5Ah
Nominal Voltage	3.2Vdc	64Vdc	512Vdc(8+8) 448Vdc(7+7) 384Vdc(6+6)	512Vdc(8+0) 448Vdc(7+0) 384Vdc(6+0)
Charging Voltage	3.4Vdc	68Vdc	544Vdc(8+8) 476Vdc(7+7) 408Vdc(6+6)	544Vdc(8+0) 476Vdc(7+0) 408Vdc(6+0)
Dimension(W*D*H: mm)	21*100*140	210*765*160	600*850*2000	600*850*2000
Weight	605g	50kg	1000kg@7+7	650kg@7+0

<sup>②</sup> The backup time is calculated based on the capacity 68.54 kWh and the capacity under different backup time or discharge rates. 68.54kWh=25.5Ah\*3\*2\*3.2V\*20\*7 (The battery cell is 27 Ah. The margin is calculated based on the reserved 25.5 Ah. For details, refer to the battery cell certification report.)

## Monitoring



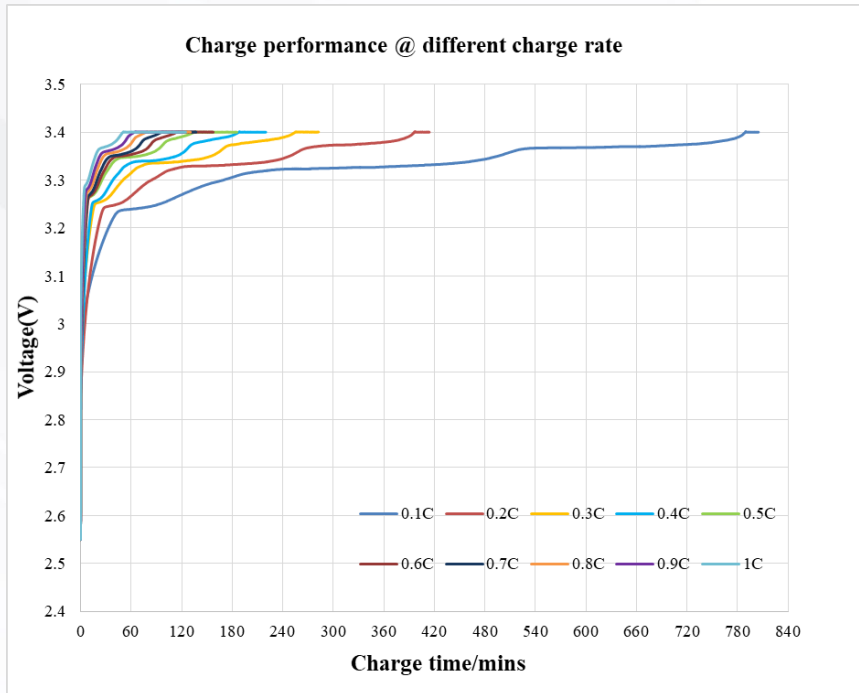
## Monitoring

	BMU	BCU	SBCU
Monitored Object	Battery Pack	Battery Rack	System
Function Description	<ul style="list-style-type: none"> <li>Measure the cell voltage, temperature.</li> <li>Electrochemical cell voltage equalization;</li> <li>Communicates with the BMS.</li> <li>Save the battery module fault information</li> </ul>	<ul style="list-style-type: none"> <li>Manages all BMUs</li> <li>Collects statistics on the battery voltage, temperature, SOC, and SOH, and reports the statistics to the SBCU.</li> <li>Detects the charge and discharge currents of battery strings to adjust the parallel current sharing.</li> <li>Protects the hardware and batteries against exceptions, disconnects the loop in a timely manner when an exception occurs, and reports the exception to the SBCU.</li> <li>Save the battery cabinet fault information.</li> </ul>	<ul style="list-style-type: none"> <li>Displays the total voltage, SOC, SOH, current, and temperature of the battery system, and battery information of each battery cabinet.</li> <li>Receives common parameters reported by each BCU and saves local data.</li> <li>Receives alarms and protection events reported by the BCU and saves the events locally.</li> <li>Communicates with the UPS, provides human-machine interaction, communications ports, and permission management for local and remote operations, sets battery management system parameters, and upgrades programs.</li> </ul>
Measurement Parameter	Cell voltage Cell temperature	Cabinet Voltage Cabinet Current	System Voltage System Current
Measurement Precision	0.2% (voltage) 2°C (temperature)	1% (voltage) 2% (> 40A); 3A (< 40A)	1% (voltage) 2% (> 40A); 3A (< 40A)
Display information	Battery Module Cell Voltage	Battery Cabinet Voltage	Battery System Voltage
	Battery Module SOH	Battery Cabinet Current	Battery System Current
	Battery Module SOC	Battery Cabinet SOC	Battery System SOC
	Battery Module Maximum Cell Voltage	Battery Cabinet SOH	Battery System SOH
	Battery Module Minimum Cell Voltage	Battery Cabinet Maximum Cell Voltage	Battery System Maximum Cell Voltage
	Battery Module Maximum Cell Temperature	Battery Cabinet Minimum Cell Voltage	Battery System Minimum Cell Voltage
	Battery Module Minimum Cell Temperature	Battery Cabinet Maximum Cell Temperature	Battery System Maximum Cell Temperature
		Battery Cabinet Minimum Cell Temperature	Battery System Minimum Cell Temperature
		Discharge Times	Battery Capacity
		Discharge Capacity	Discharge Times Discharge Capacity

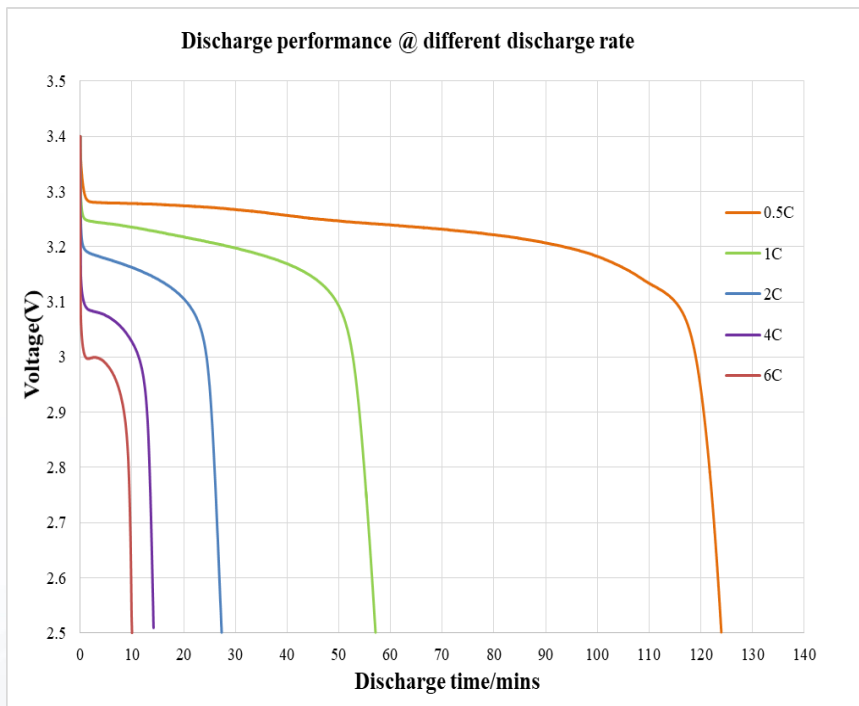
## Protection Function

Alarm Type	Alarm Description	Alarm Cause	Alarm Confirmation Time	Solution
Battery charge protection	Low temperature protection under battery charge	The temperature of battery cell is under $-5^{\circ}\text{C}$ .	30s	Alarm
	Over temperature protection under battery charge	The temperature of battery cell above $67^{\circ}\text{C}$ .	30s	Trip off battery breaker
	Over voltage protection of battery cell	The voltage of battery cell is above 3.9V	1s	
	Over voltage protection of battery string.	The voltage of battery string is above 3.625N V	1s	
	Over current protection of battery charge	$>200\text{A}$	20ms	
Battery discharge protection	Low temperature protection under battery discharge	The temperature of battery cell is under $-5^{\circ}\text{C}$	30s	Trip off battery breaker
	Over temperature protection under battery discharge	The temperature of battery cell above $67^{\circ}\text{C}$	30s	
	Low voltage protection of battery cell	The voltage of battery cell is under 2.3V	700ms	
	Low voltage protection of battery string	The voltage of battery string is under 2.55N V	2s	Alarm
	Over current protection of battery discharge	$>580\text{A}$	30s	Trip off battery breaker
Battery charge alarm	Low temperature alarm under battery charge	The temperature of battery cell is under $5^{\circ}\text{C}$	30s	Alarm
	Over temperature alarm under battery charge	The temperature of battery cell above $55^{\circ}\text{C}$	30s	
	Over voltage alarm of battery cell	The voltage of battery cell is above 3.8V	5s	
	Over voltage alarm of battery string.	The voltage of battery string is above 3.55N V	5s	
	Over current alarm of battery charge	$>96\text{A}$	5s	
Battery discharge alarm	Low temperature alarm under battery discharge	The temperature of battery cell is under $5^{\circ}\text{C}$	30s	Alarm
	Over temperature alarm under battery discharge	The temperature of battery cell above $60^{\circ}\text{C}$	30s	
	Low voltage alarm of battery cell	The voltage of battery cell is under 2.6V	5s	
	Low voltage alarm of battery string.	The voltage of battery string is under 2.8N V	5s	
	Over current alarm of battery discharge	$>500\text{A}$	10s	

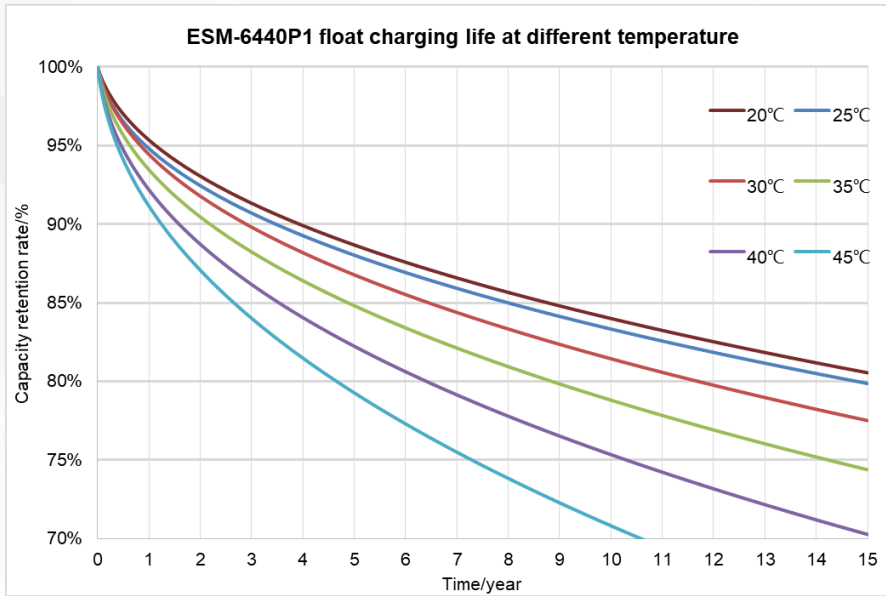
## Charge at Different Charging Rate



## Discharge at Different Discharge Rate



## Lifetime at Different Temperature



## Cycle Lifetime at Different Temperature and DOD

