

# Data Center Smart Li-ion Battery Solution

## SmartLi

### 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. Three-level BMS system realizes intelligent battery management with Huawei UPS and Network management system, which reduces Opex.

### Features

#### 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
- Cabinet-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 \*



SmartLi

### Specifications

	Item	Description
Basic Parameters	Product Model	SmartLi-512V-80AH
	Battery Cell Material	LiFePO <sub>4</sub>
	Nominal Voltage	512Vdc
	Nominal Charging Voltage	544Vdc
	Charging Current	≤ 1C, 0.5C by default
	Rated Max. Discharging Current	500A continuous discharge
	Cycle Life	5000 cycles @ 50% DOD
	Nominal Capacity	80Ah / 40.96kWh (6C); 52kWh(1C)*
	Weight	800kg
	Dimension (W*D*H)	600mm*850mm*2000mm
	Self Discharge	≤5% (0-30°C/3 months)
	Fire protection	Cabinet-level fire protection
	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	

- If a single module is faulty, remove the faulty module and connect the other modules in series to restart the system.
- The backup time is calculated based on the capacity 52 kWh (1C) and the capacity under different backup time or discharge rates.  
52kWh=25.5Ah\*40\*16\*3.2V (The battery cell is 27 Ah. The margin is calculated based on the reserved 25.5 Ah. For details, see the battery cell certification report.)

Item	Description	
Basic Parameters	IP Protection Level	IP20 according to IEC60529 standard
	Mounting Type	Can be installed against a wall at the rear, 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. Above 1000m, derating rate based on EN/IEC 62040-3.

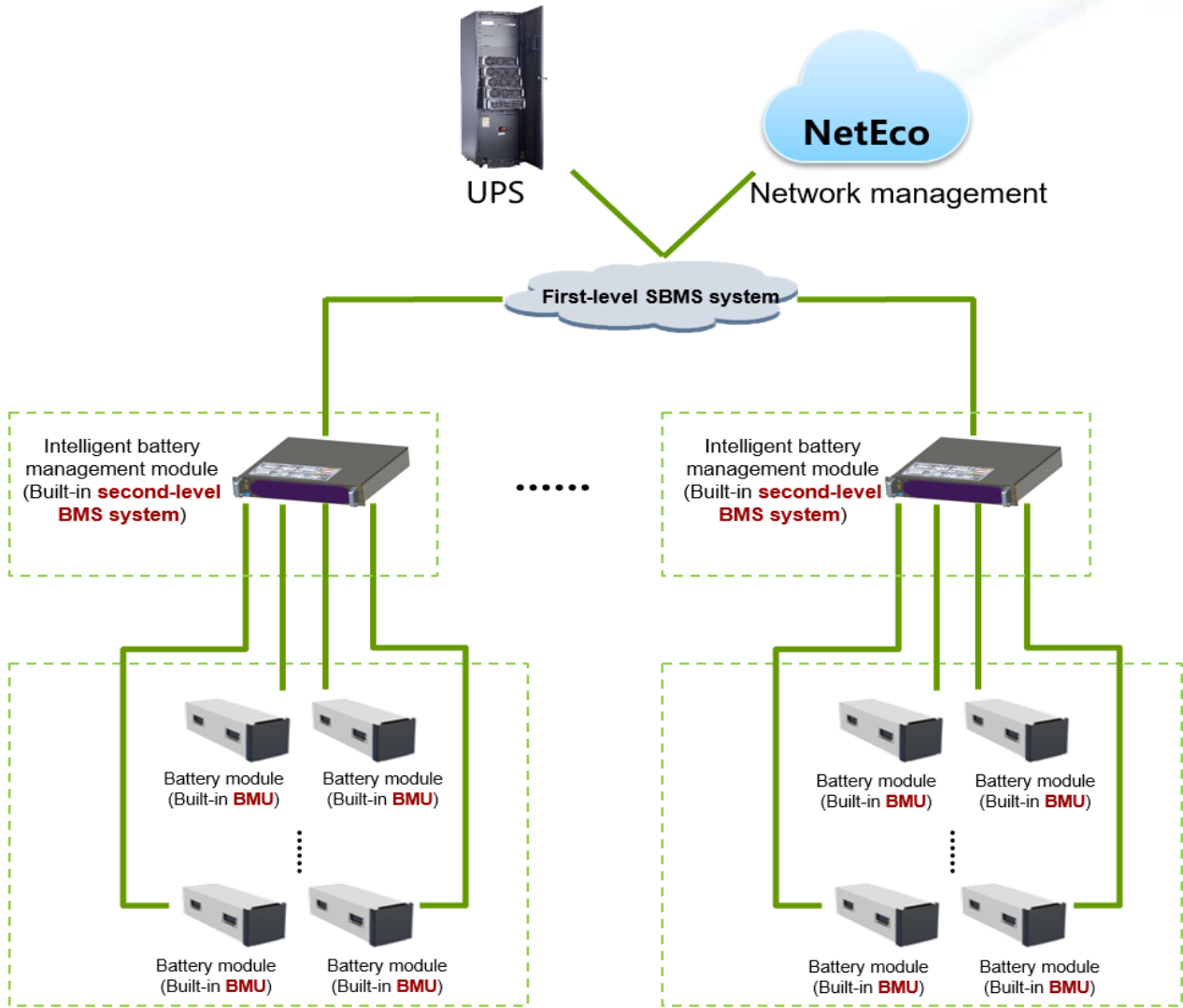
## Specifications

	Cell	Module	Full Cabinet	Half Cabinet
Configuration	Single cell	20S2P	16 module(2 groups)	8 module(1 group)
Declared Capacity (6C)	> 20Ah	40Ah	80Ah	40Ah
Nominal Voltage	3.2Vdc	64Vdc	512Vdc	512Vdc
Charging Voltage	3.4Vdc	68Vdc	544Vdc	544Vdc
Operation Voltage Range	2.5 - 3.6Vdc	50 - 72Vdc	408 - 544Vdc	408 - 544Vdc
Dimension(W*D*H: mm)	21*100*140	200.5*592*157.5	600*850*2000	600*850*2000
Weight	605g	35kg	800kg	520kg

## Back-up Time @SOL (in minutes)

0-4°C ( 8+8 can support 200kW/10 min )								
UPS Power	0.5 cabinet	1 cabinet	1.5 cabinet	2 cabinet	2.5 cabinet	3 cabinet	3.5 cabinet	4 cabinet
100kW	10	24	36	48	64	77	90	103
200kW	-	10	18	24	31	37	43	49
300kW	-	-	10	16	20	24	28	32
400kW	-	-	-	10	15	18	21	24
500kW	-	-	-	-	10	15	17	19
550kW	-	-	-	-	-	11	15	17
600kW	-	-	-	-	-	10	13	16
700kW	-	-	-	-	-	-	10	13
800kW	-	-	-	-	-	-	-	10

0-4°C ( 8+8 can support 200kW/10 min )								
UPS Power	4.5 cabinet	5 cabinet	5.5 cabinet	6 cabinet	6.5 cabinet	7 cabinet	7.5 cabinet	8 cabinet
100kW	116	129	142	155	168	181	194	207
200kW	55	64	71	77	84	90	97	103
300kW	37	41	45	49	53	57	64	69
400kW	27	30	34	37	40	43	46	49
500kW	22	24	27	29	32	34	37	39
550kW	20	22	24	27	29	31	33	36
600kW	18	20	22	24	26	28	31	33
700kW	15	17	19	21	23	24	26	28
800kW	12	14	16	18	19	21	23	24



## Monitoring

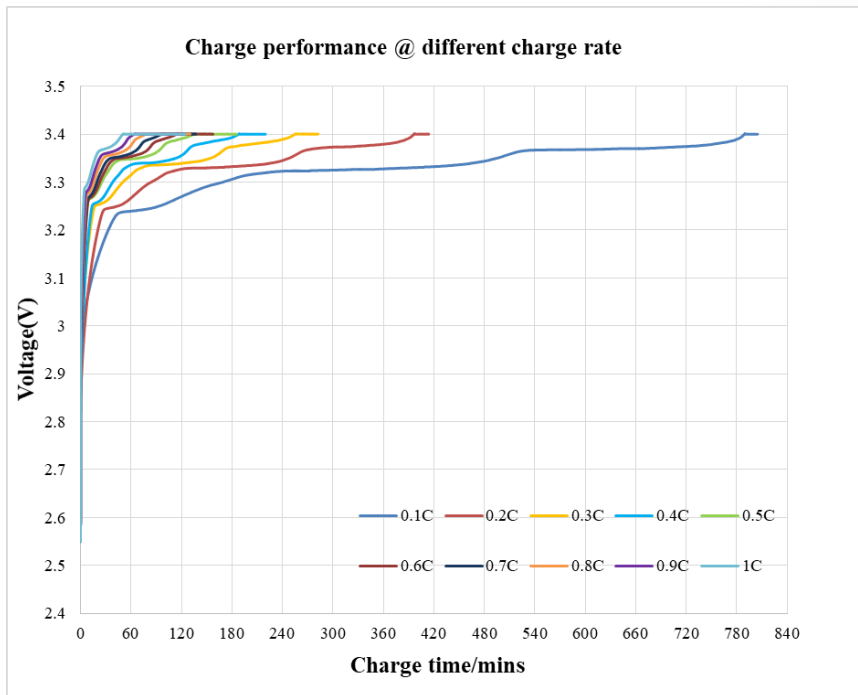
	BMU	BCU	SBCU
Monitored Object	Battery Pack	Battery Rack	System
Function Description	<ul style="list-style-type: none"> <li>Measure the cell voltage, temperature.</li> <li>Electrochemical cell voltage equalization;</li> <li>Communicates with the BMS.</li> <li>Save the battery module fault information</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	Cabinet Voltage	System Voltage
	Cell temperature	Cabinet Current	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 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

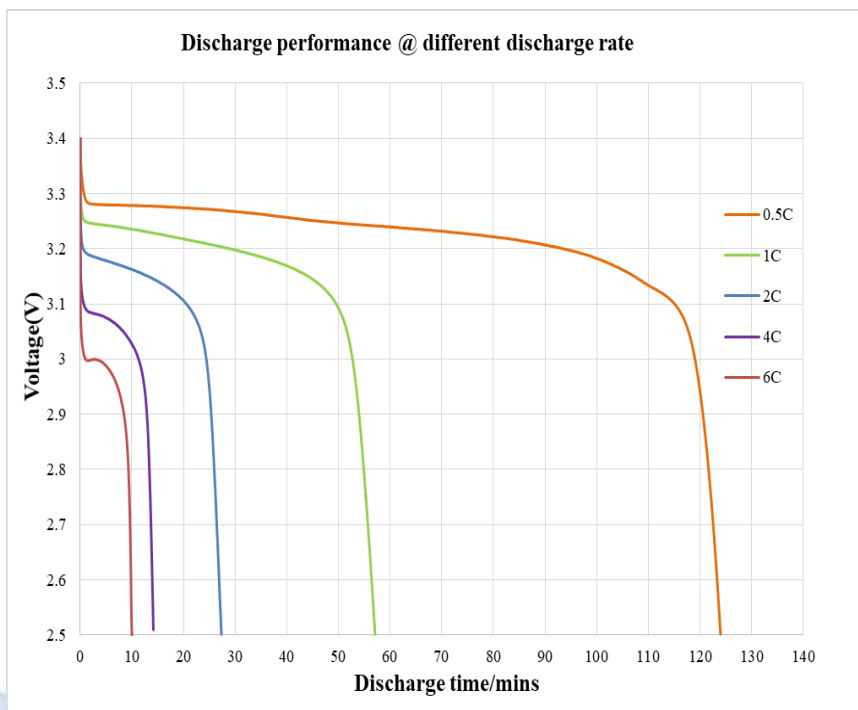
Alarm Type	Alarm Description	Alarm Cause	Alarm Confirmation Time	Solution
Battery charge protection	Low temperature protection under battery charge	The temperature of battery cell is under 0°C.	30s	Trip off battery breaker
	Over temperature protection under battery charge	The temperature of battery cell above 65°C.	10s	
	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	>200A	20ms	
Battery discharge protection	Low temperature protection under battery discharge	The temperature of battery cell is under 0°C	5s	Trip off battery breaker
	Over temperature protection under battery discharge	The temperature of battery cell above 65°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	
	Over current protection of battery discharge	>520A	30s	
Battery charge alarm	Low temperature alarm under battery charge	The temperature of battery cell is under 5°C	30s	Alarm
	Over temperature alarm under battery charge	The temperature of battery cell above 55°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	>96A	5s	
Battery discharge alarm	Low temperature alarm under battery discharge	The temperature of battery cell is under 5°C	30s	Alarm
	Over temperature alarm under battery discharge	The temperature of battery cell above 60°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	>500A	5s	

\* N is the number of battery cell per string

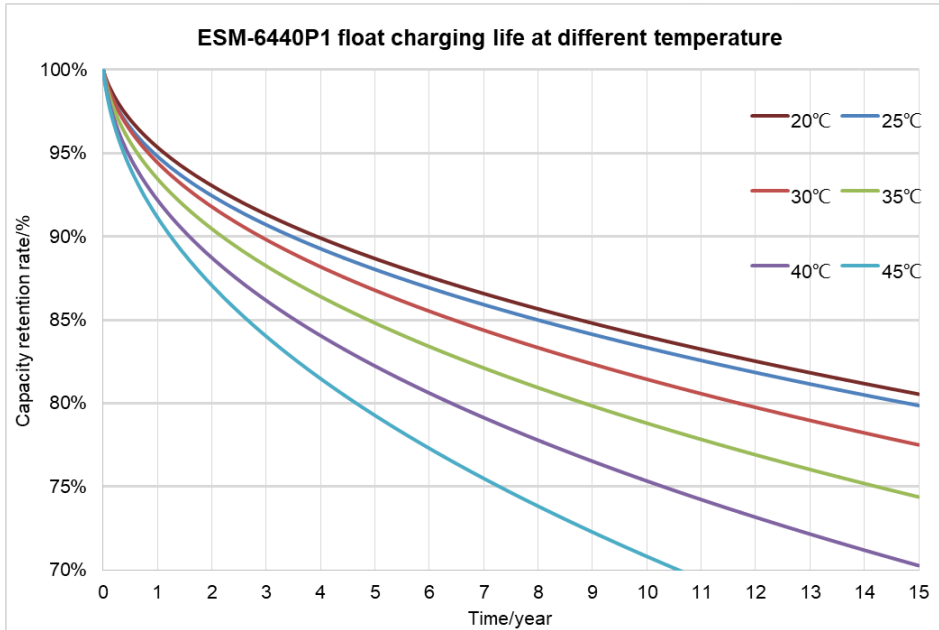
## Charge at Different Charging Rate



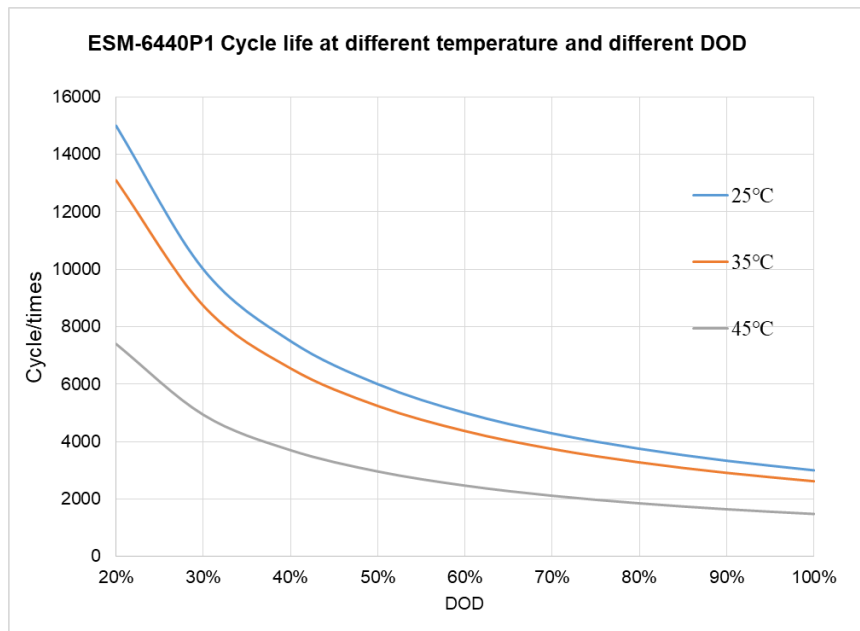
## Discharge at Different Discharge Rate



## Lifetime at Different Temperature



## Cycle Lifetime at Different Temperature and DOD



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