250kW/500kWh BESS Proposal

120Ah Cell

Prepared by Powerv
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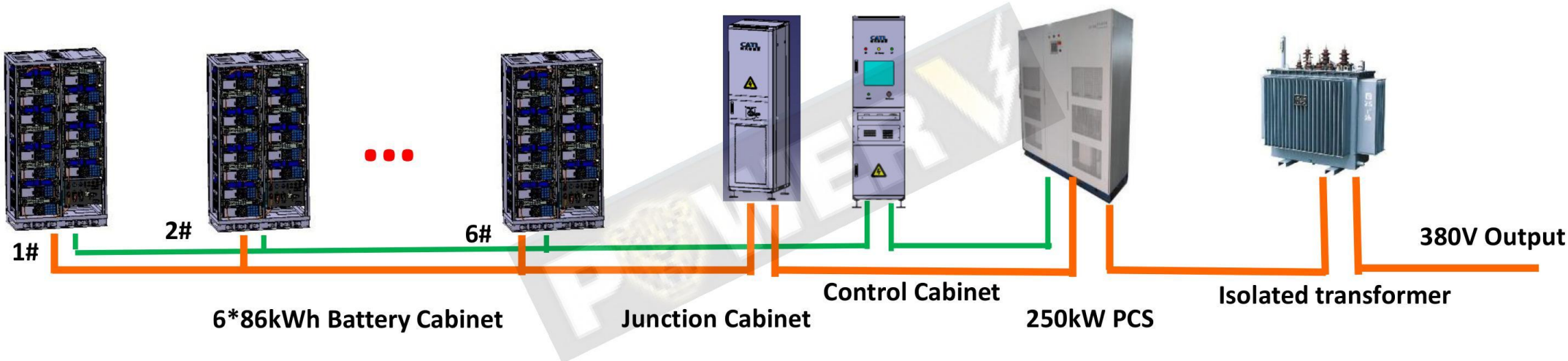
Content

System Configuration

Battery system consist of 6 battery cabinets with 86kWh each and usable 516kWh in total.



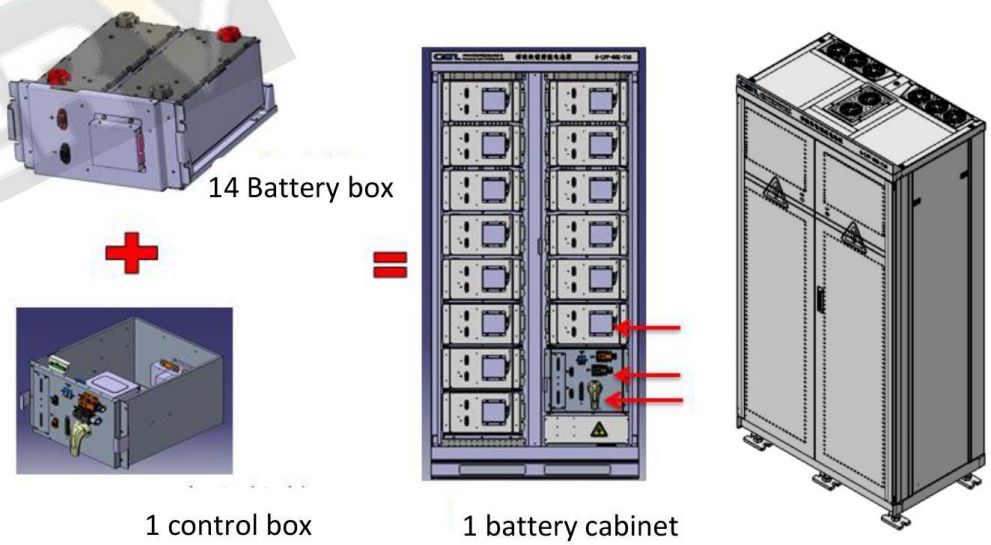
System configuration:
6 Battery cabinets, one junction cabinet, one control cabinet(with local monitoring system), one 20ft container, fire extinguishing system and HVAC etc…
Considering the construction, commissioning, maintenance and overhaul of the battery energy storage system device, the electrical cabinet inside the container is double-arranged during the design of the container, and the width of the central aisle is more than 800mm to facilitate the daily maintenance and management of the battery system; thermal management adopts industrial air conditioning and Independent duct design.

System parameter

Item		Parameter
Initial capacity		516kWh@25℃, 0.5C/0.5C, @DC side
Rated capacity		500kWh@25℃, 0.5C/0.5C, @DC side
Rated voltage		716.8V
Working voltage		627.2V-817.6V
Rated charge power		250kW@25℃
Rated discharge power		250kW@25℃
Working temperature		Charge:0~55℃, discharge: -20~55℃
Store temperature		-30℃~60℃
Cycle life		≥4000cycles@25℃,0.5C /0.5C,100%DOD,80%Ret
Communication		CAN,MODBUS
Balance mode		Passive
Installation		Containerized
Battery configuration	Cell	3.2V/120Ah
	Module	25.6V/120Ah(1P*8S)
	Box	51.2V/120Ah(1P*16S)
	Cabinet	716.8V/120Ah(1P*16S*14S)
	System	716.8V/840Ah(1P*16S*14S*6P）

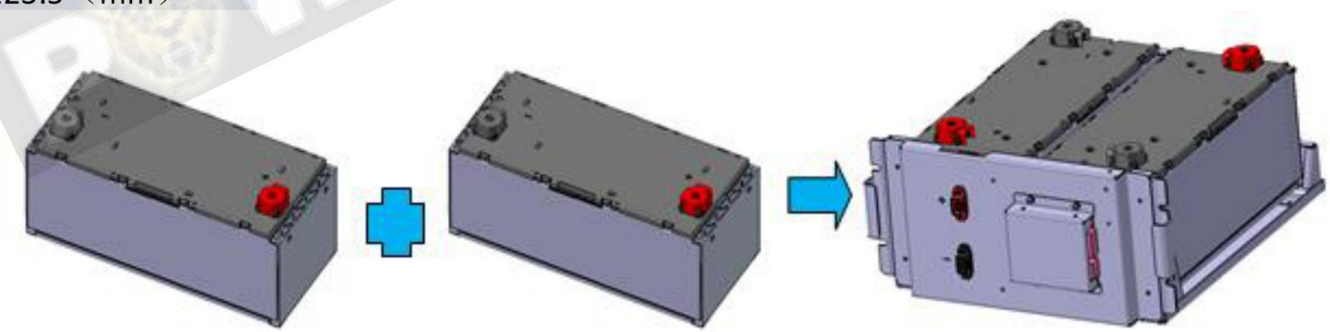
Battery Cabinet Proposal and Parameter

No.	Item	Parameter
1	Rated voltage	716.8V
2	Cell	120Ah
3	Voltage range	627.2V-817.6V
4	Capacity	86kWh
5	Battery box quantity	14pcs
6	Control box	1pcs
7	Working temperature	Charge: 0℃~55℃ Discharge: -20℃~55℃
8	Weight	~1.2T
9	Dimension(W*D*H)	1100mm*650mm*2200mm



Battery Box Proposal and Parameter

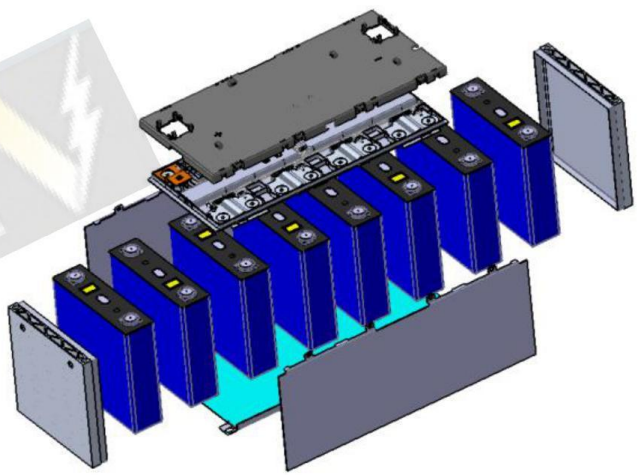
No.	Item	Parameter
1	Cell	120Ah, LFP
2	Parallel connect	1P16S
3	Rated voltage	51.2V
4	Voltage range	44.8V~58.4V
5	Capacity	6.144kWh
6	Working temperature	-20℃~55℃
7	Weight	~60kg
8	Dimension(W×D×H)	463.4* 520* 223.5（mm）



1P8S module　　1P8S module　　Battery box

Battery Module Proposal and Parameter

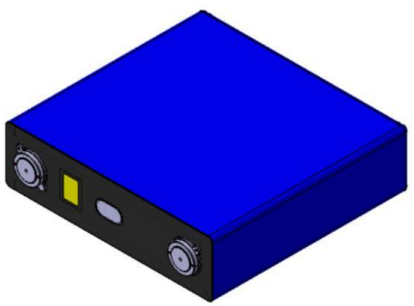
No.	Item	Parameter
1	Cell	120Ah, LFP
2	Module	1P8S
3	Voltage	25.6V
4	Capacity	3.072kWh
5	Working temperature	Charge: 0℃~55℃ Discharge: -20℃~55℃



1P8S module

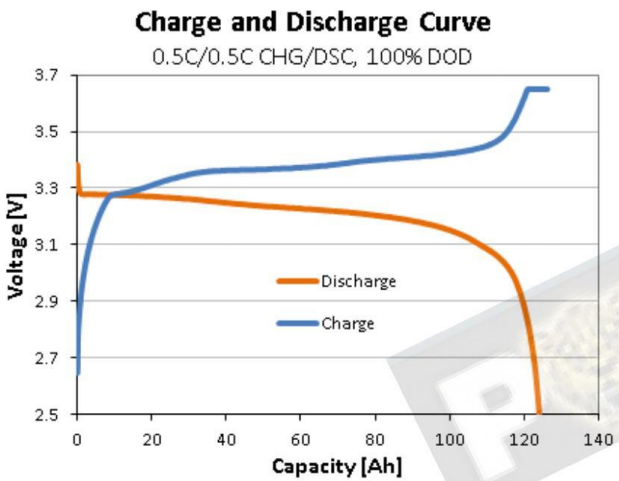
Battery Cell Parameter

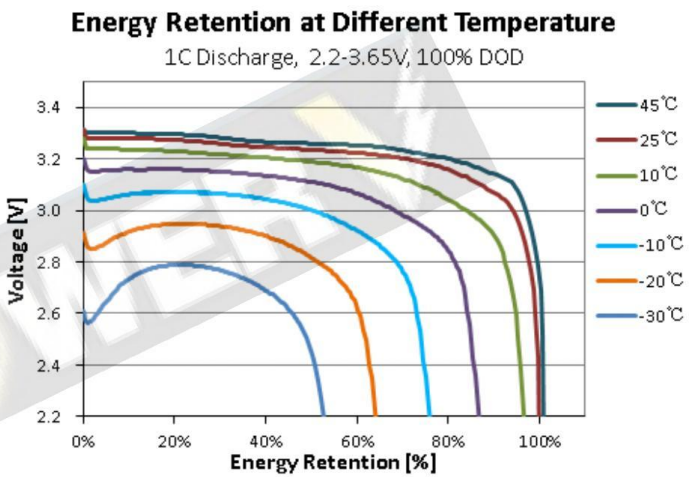
No.	Item	Parameter
1	Rated voltage	3.20V
2	Working voltage	2.8V～3.65V
3	Working temperature	Charge: 0℃~55℃ Discharge: -20℃~50℃
4	Weight	~2.89kg
5	Dimension(W*D*H)	174mm*48mm*170mm
6	Working humidity	＜RH90%, no consendation



3.2V/120Ah Cell

Temperature capability

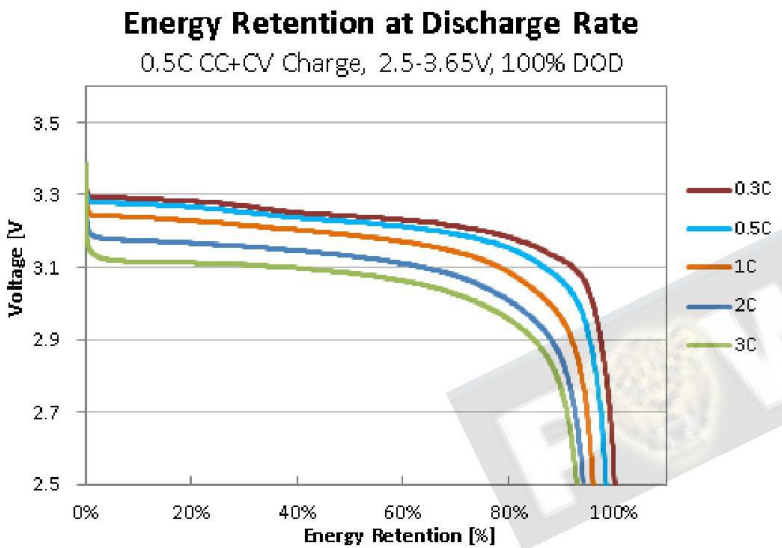


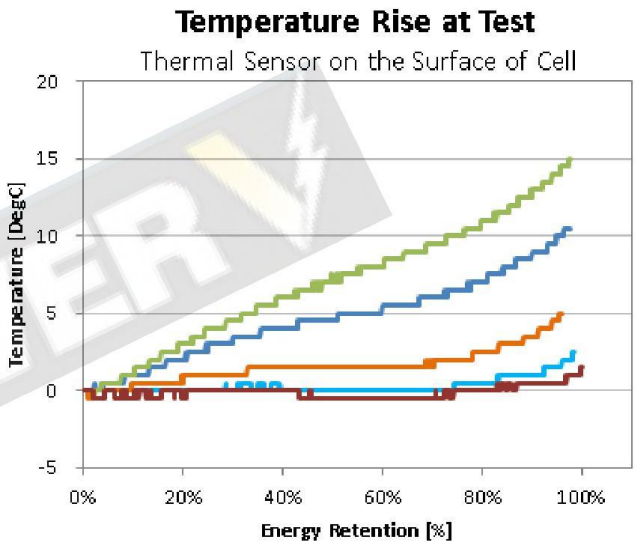


Temp.（℃）	45	25	10	0	-10	-20	-30
Capacity retention（%）	100%	100%	98%	90%	81%	72%	62%
Energy retention（%）	101%	100%	96%	87%	76%	64%	52%
Temp. rise（℃）	4	5	8	9	10	11	13

Battery Cell Test

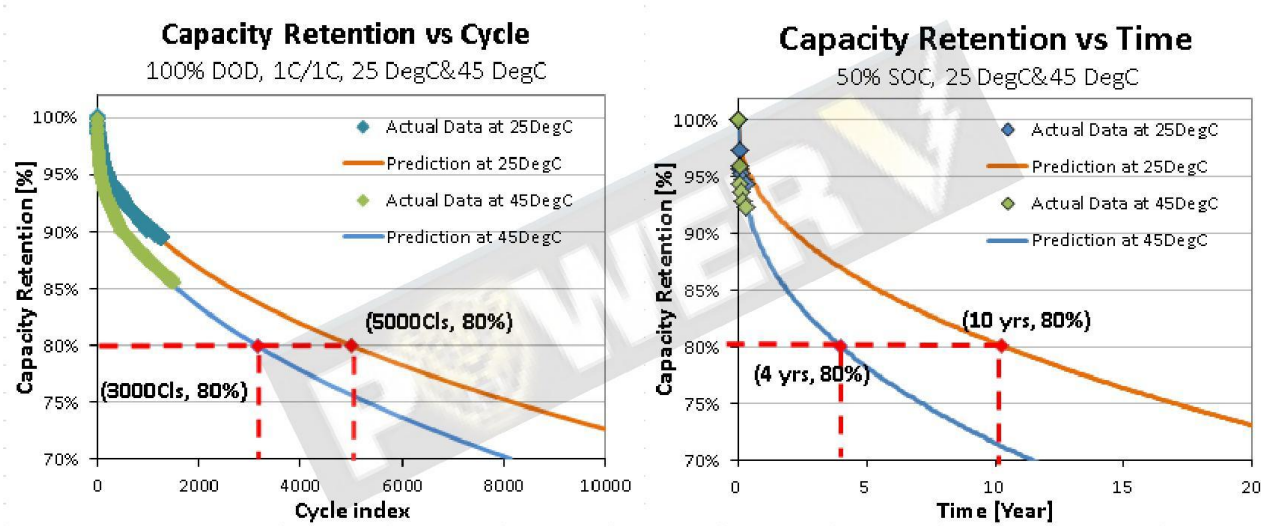
Charge and discharge capability





Discharge rate（C）	0.3	0.5	1	2
Capacity retention（%）	100%	99%	98%	98%
Energy retention（%）	100%	98%	96%	94%
Temp. rise（℃）	2	3	5	11

Cycle life



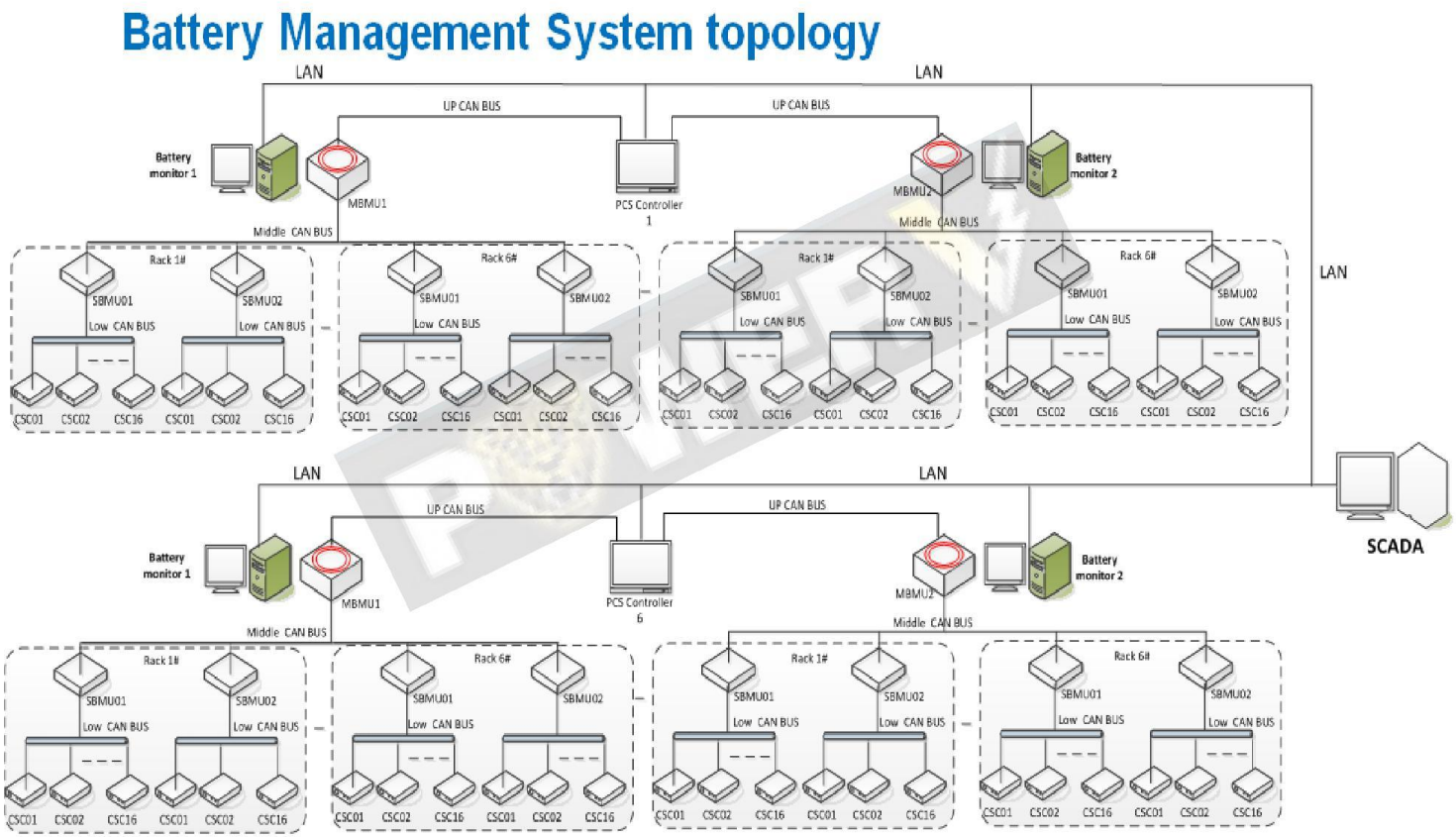
@25℃, the cycle life of 120Ah cell exceed 5000, retention capacity is 80%.

BMS Principle

BMS is self-designed by Powerv to manage the whole battery system

- Charge/discharge management: manage C/D according to requirement
- Battery monitoring and equalization: real-time monitor cell voltage, temperature, and active equalize the unbalance condition
- Communication: established by RS485. In case multiple systems connected in parallel, the master MBMU manage battery parameter, confirm battery SoC and working condition requirement, communicate with switching power supply and external communication.
- Safety protection: battery box over-voltage protection, cell over-voltage protection, over-current protection, short circuit protection and temperature protection etc..
- Data real time record: come with real-time clock module and data memory space, to record significant warning information of battery system.
- Dormant function: if the system work in no-load for a certain time, it will go into dormant station automatically.

BMS Topology



BMS Principle

The system designed and optimized according to More than 10 patents and multiple referenced project .

- Equalization Management. Equilibrium by Voltage mode, time mode, cell SoC mode, Bidirectional active equilibrium
- Safety Protection. Over charge and discharge, Over-current, over temperature, low temperature protection, Multistage fault diagnosis, Smart thermal management.
- SoC/SoH Detection. SoC/SoH Detection, High precision capacity integral
- HV safety Management. HV Intelligent safety control, HV Isolation monitoring, HV Switch diagnosis
- Battery parameter detection. Voltage, current and temperature detection and analyzation
- Scalable. Flexibly extend single or multiple cabinets
- Communication. Ethernet/CAN/RS485
- Others. History data recording, CRC data check, remote signal wakes up.

MBMU：
Overall manage battery system, communication with switching power supply, external communication etc..

SBMU：

Collecting data of single cell voltage, temperature and general voltage auto-coding cascaded CSC, diagnose input state etc..

CSC：

Collecting data of single cell voltage, current and balance control

PCS Principle

Energy Storage in distributed grid could effectively control the electric resources, balance peak from day to nigh and season to season, manage the demand change and secure the safety of the grid.
PCS in this proposal is a very suitable product for distributed grid construction. It has a series of special functions and characteristics. It could be used in different applications and situations such as grid-connected mode, island mode and mixed mode. Charge and discharge functions of batteries reply on PVCS.
Product Function

- Support Grid control and scheduling ,RS485 communication
- two way AC-DC control, battery discharge/charge
- Constant current charge, constant voltage current-limiting charge, constant power charge, and timing charge etc.
- Constant discharge, constant voltage current-limiting discharge, constant power discharge and timing discharge
- Active frequency regulation and controlled frequency regulation
- Connection to various batteries such as lead acid battery, flow cell, lithium battery and super capacitor.
- Perfect communication and protection.
- Reactive power compensation, active power adjustment.

PCS Parameter

DC side	DC voltage range	500 - 800 V
	Max. DC current	550 A
AC Side	Nominal AC power	250 kW
	Max. AC power	275 kVA
	Max. AC current	397 A
	Max. THD	< 3% (at nominal power)
	DC Component	< 0.5%
	Nominal grid voltage	400 V
	Grid voltage range	310 - 450 V
	Nominal grid frequency	50 / 60 Hz
	Grid frequency range	45 - 55 Hz / 55 - 65 Hz
	Power factor at nominal power	> 0.99
	Power factor range	0.9 (leading) - 0.9 (lagging)
Output Data	Nominal output power	250 kW
	Overload Capacity	1.1 times (long time operation)
	Nominal output voltage	400 V ±3% (3-phase 4 lines)
	Nominal frequency	50 Hz
	Off grid output voltage distortion	<3% (Liner load)
Efficiency	Max. efficiency	97.30%
General Data	Dimensions (W×H×D)	1006×2043×850 mm
	Weight	1600 kg
	Ingress protection rating	IP21
	Operating ambient temperature range	-30℃ - 55℃
	Relative humidity	0 - 95% (Non-condensing)
	Max. operating altitude	6000 m (> 4000 m derating)
	Cooling concept	Temperature-controlled forced air cooling
	Insulation	Transformer
	Communication port	RS485, Ethernet, CAN
	Communication protocol	Modbus RTU/TCP, IEC104
	Certificates	CE, TUV, G59

Supply Scope

No.	Item	Name	Specification	Qty.	Remark
1	LFP battery system	Battery cabinet	Dimension(W*D*H):1100*650*2200mm	6	Including battery, battery box, battery cabinet and BMS
		Control cabinet	Dimension(W*D*H):600*600*2200mm	1	Including display
		Junction box	Dimension(W*D*H):600*600*2200mm	1	
2	250kW PCS	PCS	Dimension(W*D*H):1006*850*2043mm	1	
3	Local monitoring system	——	TBC	1	Including UPS, monitoring system, HMI, monitoring system, CAN server
4	Monitoring system	Monitoring system	--	1	
5	Power cable	Cable	--	1	
6	Distribution cabinet	AC distribution cabinet	--	1	
7	Container	20ft	Dimension(W*D*H):6058*2438*2591mm	1	Including HVAC system