

# Solar,Energy Storage,EV Charge Station Integration Solution



**Huizhou Yizhao Energy Technology Co., Ltd.**

**October 7, 2023**

**Project technical support: Huizhou Yizhao Energy Technology Co., Ltd.**

**Company address: No. 4, Songbai Road, South District, Sandong Digital Park, Huizhou City**

## Contents

<b>HUIZHOU YIZHAO ENERGY TECHNOLOGY CO., LTD.</b> .....	<b>1</b>
<b>1. PROJECT REVIEW</b> .....	<b>3</b>
1.1PROJECT BACKGROUND.....	3
1.2PROJECT LOCATION AND CLIMIT.....	4
<b>2. COMPOSITION OF SOLAR,ENERGY STORAGE,EV CHARGE STATION INTEGRATION SYSTEM</b> .....	<b>6</b>
2.1 SOLAR PANELS MODULE.....	7
2.2 THE DESIGN OF CARPORT' S BRACKET.....	9
2.3 ENERGY STORAGE SYSTEM(ALL-IN-ONE CABINET.....	12
2.4 EV CHARGE STATION.....	19
<b>3. SOLAR+ENERGY STORAGE+CHARGING STATION PROJECT CONFIGURATION LIST</b> .....	<b>25</b>
<b>4. PROJECT APPLICATION CASE</b> .....	<b>26</b>

## 1. PROJECT REVIEW

### 1.1 PROJECT BACKGROUND

#### 1.1.1 SOCIAL BENEFITS

With the advancement of the "double carbon" goal, the development of solar energy, energy storage, and new energy vehicles continues to progress, and the demand for charging is also increasing rapidly. The "solar energy + energy storage + charging" combination is increasingly being applied to the market. Building integrated photovoltaic, storage and charging power stations to reduce greenhouse gas emissions is of great significance to achieving the goal of carbon neutrality and peaking and transforming the energy structure.

#### 1.1.2 ECONOMIC BENEFITS

The solar + energy storage + charging model can obtain new sources of income and reduce energy costs.

#### 1.1.3 WHAT IS AN "INTEGRATED SOLAR, STORAGE AND CHARGING STATION" ?

"Integrated photovoltaic, energy storage and charging charging station" is "photovoltaic + energy storage + charging", integrating photovoltaic power generation, large-capacity energy storage batteries, smart charging piles and other technologies. Among them, photovoltaics are responsible for power generation, and charging piles are responsible for charging and energy storage. It is the bridge between the two. This design uses the battery energy storage system to absorb low valley power and support fast charging loads during peak periods to provide green power for electric vehicles. At the same time, it is supplemented by photovoltaic power generation systems to achieve auxiliary service functions such as power peak shaving and valley filling, effectively reducing the need for fast charging. The load peak and

valley difference of the station can effectively improve the system operation efficiency.

It is a high-tech green charging model that coordinates and supports new energy, energy storage, and smart charging. It is also a new model that emerged under the background of the country's vigorous promotion of electric vehicles, the expansion of the charging pile market, and the inclusion of energy storage in major energy development projects. business model.

## 1.2 PROJECT LOCATION AND CLIMIT

This optical storage and charging integrated project is a demonstration project designed, produced and installed by Huizhou Yizhao Energy Technology Co., Ltd. in this industrial park. It also solves the problem of electric vehicle charging for the company's employees.

The distribution of solar energy resources on the earth is related to the latitude, altitude, geographical conditions and climate conditions of each place. Resource abundance is generally expressed in terms of the total annual radiation and the total annual sunshine hours. my country has a vast territory and a unique geographical environment. From a national perspective, my country is a country rich in solar energy resources. More than two-thirds of the country's total area has more than 2,000 hours of sunshine per year. It has unique and superior conditions for the development of solar energy.

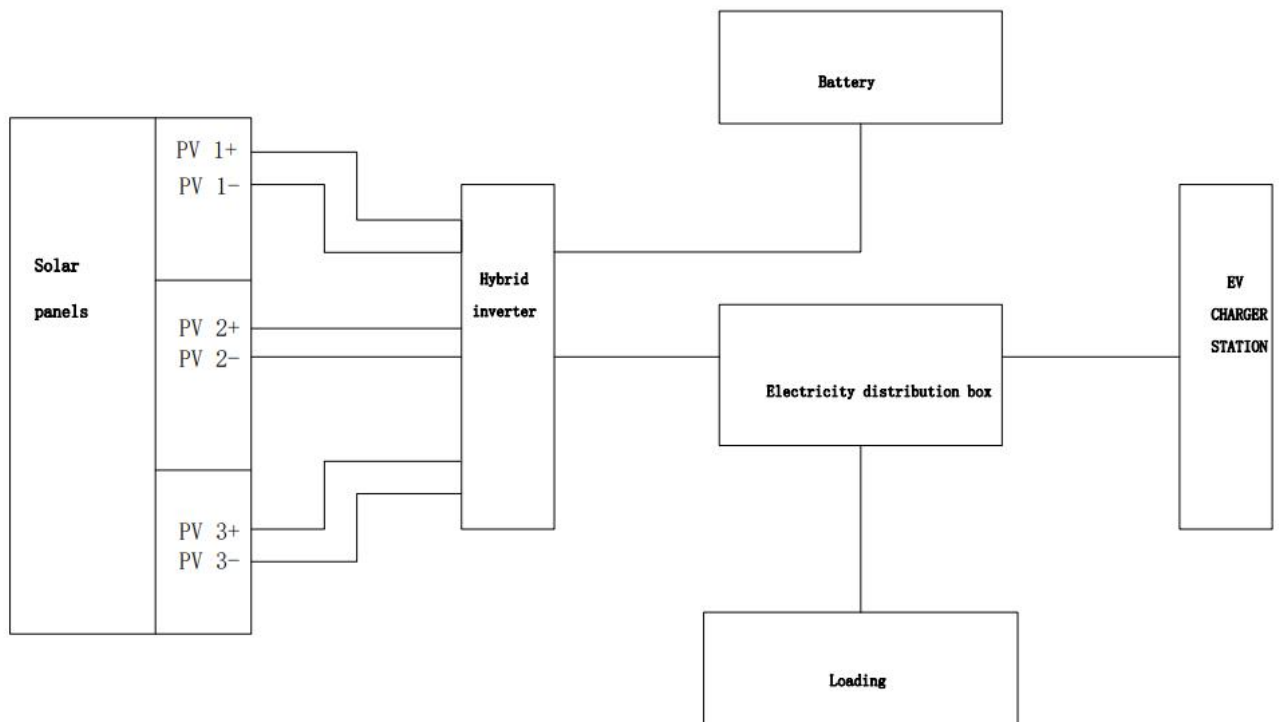
Huizhou City, Guangdong Province has a mid-subtropical monsoon climate, which is characterized by mild climate, sufficient sunlight, short frost period, long growing season, and obvious monsoon. The average temperature over the years is 19.7°C, the average temperature in January is 10.0°C, and the extreme minimum temperature is -3.6°C (January 1, 1974); the average temperature in July is 27.5°C, and the extreme maximum temperature is 38.6°C (August 15, 1989). The lowest monthly average temperature is

10.0°C, and the highest monthly average temperature is 27.5°C. The average annual temperature range is 22.3°C, and the maximum daily temperature range is 20.6°C. The average annual growing season is 323 days, and the average annual frost-free period is 308 days, with the longest being 338 days and the shortest being 301 days. The duration above 0°C is 360 days. The average annual rainfall is 1717.1 mm, and the average annual rainfall days are 170 days, with a maximum of 192 days. The maximum rainfall in an extreme year is 2580.6 mm (1975), and the minimum rainfall in an extreme year is 1066.8 mm (1999). The average annual sunshine peak value in the past 30 years is 1346.85 hours, which is suitable for photovoltaic applications. There is no acid rain and industrial pollution, there is sufficient rainfall, and the rainwater can easily clean the photovoltaic panels (self-cleaning photovoltaic glass).

The average annual sunshine hours in the area are 1346.85 hours. It is located in an area with abundant solar energy resources. The power generation capacity of photovoltaic power generation systems installed in this area is considerable. The daily power generation capacity is about 47 degrees, which is suitable for the installation of photovoltaic power generation systems.

## 2. COMPOSITION OF SOLAR,ENERGY STORAGE,EV CHARGE STATION INTEGRATION SYSTEM

The solar photovoltaic power generation system consists of photovoltaic storage components, photovoltaic storage inverters, distribution cabinet metering devices and energy storage batteries. Solar energy is converted into DC power through photovoltaic modules and stored in the energy storage battery. The DC power is then converted into a sine wave current with the same frequency and phase as the power grid through an inverter, and then connected to the power distribution cabinet grid through confluence.

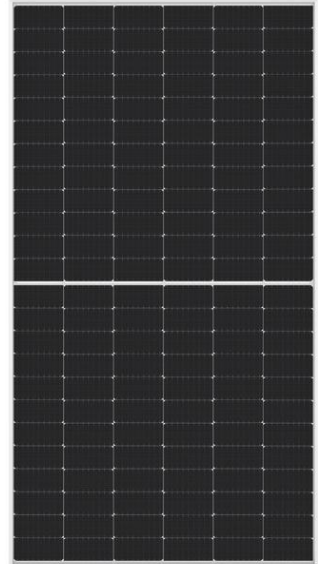


Integrated solar, storage and charging station system overview

## 2.1 SOLAR PANELS MODULE

The photovoltaic module uses a mono crystalline silicon cell module with a power of 550W. The specific parameters are as follows:

Specification	550W
Peak power	550W
Best working voltage	46.82V
Best working current	11.31A
open circuit voltage	49.8V
short circuit current	13.98A
size	2278*1134*35mm
weight	32.6KG
Cell type	Mono crystalline silicon
Number of cells	144PCS
Glass	Single glass, 3.2mm tempered glass
Junction Box	Protection grade IP68
System maximum voltage	1500V
Operating temperature range	-40°C——+85°C
(Test standard: irradiance 1000W/m <sup>2</sup> , spectrum AM1.5,25°C)	



This project plans to use 550Wp mono crystalline silicon photovoltaic modules. The total number of photovoltaic modules designed to be installed is 30, and the total installed capacity is 16.5KWp.

---

### 2.1.1 SERIES QUANTITY DESIGN OF PHOTOVOLTAIC MODULES

In order to achieve the optimal conversion efficiency of the inverter, photovoltaic modules must be connected in series and parallel according to the parameters of the inverter. The number of components in series for each parallel branch is mainly limited by the maximum power tracking voltage range of the inverter. The optimal operating point voltage of the photovoltaic string must be within the maximum power tracking voltage range of the inverter; while the total parallel branch The number is limited by the maximum input power of the inverter, and the power of the photovoltaic module array cannot exceed the maximum input power of the inverter.

The DC operating voltage range of the photovoltaic inverter is 200~1000V. Here, it is considered that the output power of the component changes with the temperature. In this project, the temperature range of the component during normal operation is between 0~60°C. In order to make the inverter For the conversion efficiency to reach the optimal value, the input voltage of the string must be within the maximum tracking voltage range of the inverter, and the number of series modules should be between 18 and 22. The maximum input voltage of the inverter is 1000V, and the maximum open circuit voltage of the photovoltaic array cannot exceed the maximum input voltage of the inverter.



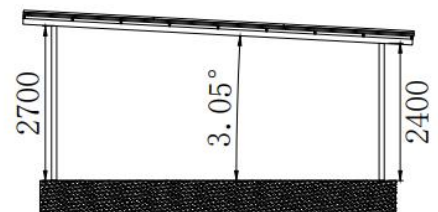
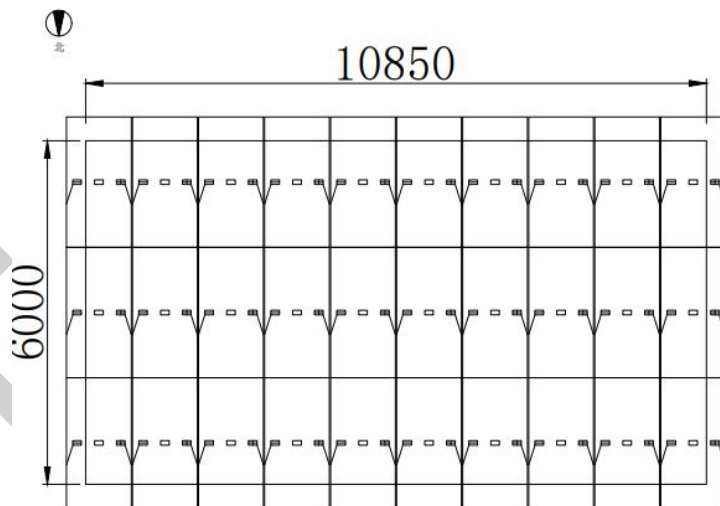
### 2.1.2 DESIGN OF THE PHOTOVOLTAIC PANELS

The maximum input power of the inverter planned for this project is 125% of the rated power. In order to ensure safety and achieve the best conversion efficiency of the inverter, the nominal power of the photovoltaic module array is 95% of the rated power of the inverter. ~125%:

### 2.1.3 PANELS CONNECTION METHOD

This project plans to install a total of 30 photovoltaic panels with a peak power of 550Wp, and the total installed capacity of 16.5KWp modules will be connected in series to the photovoltaic storage inverter.

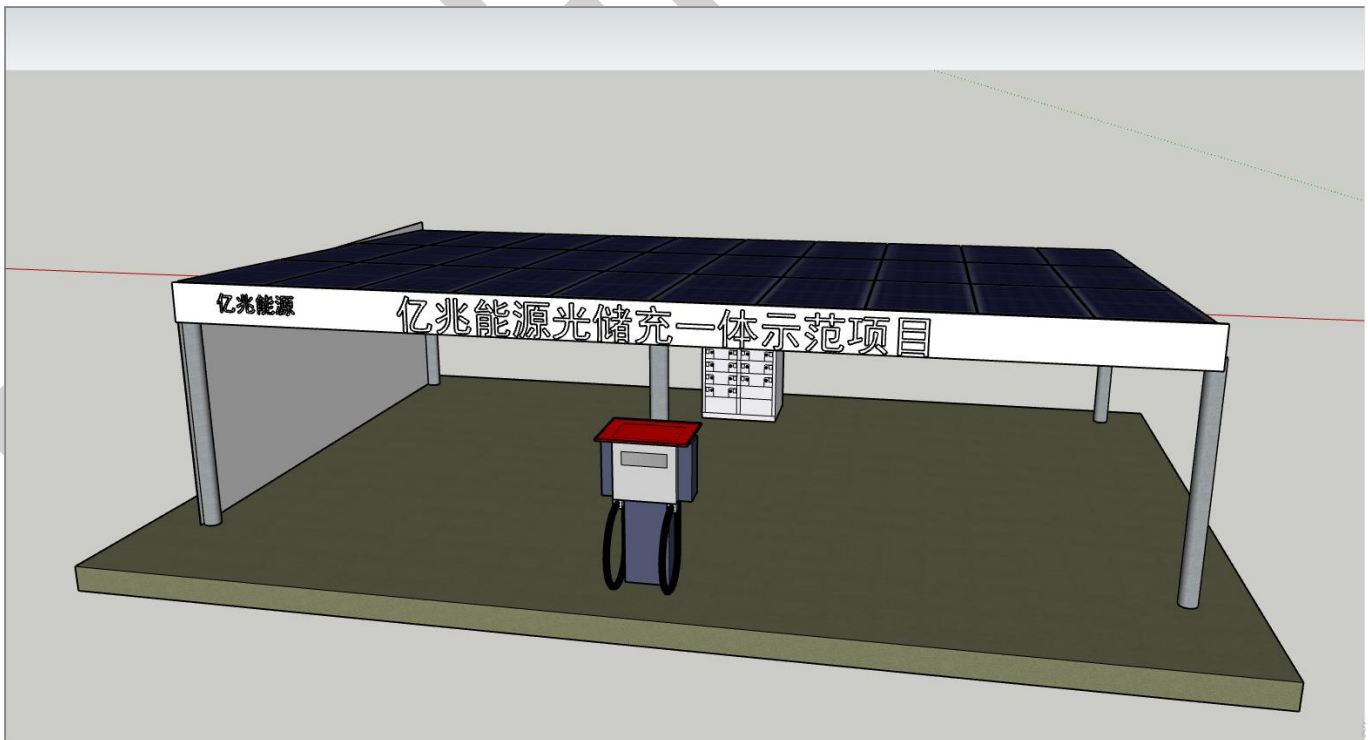
### 2.2 THE DESIGN OF CARPORT'S BRACKET

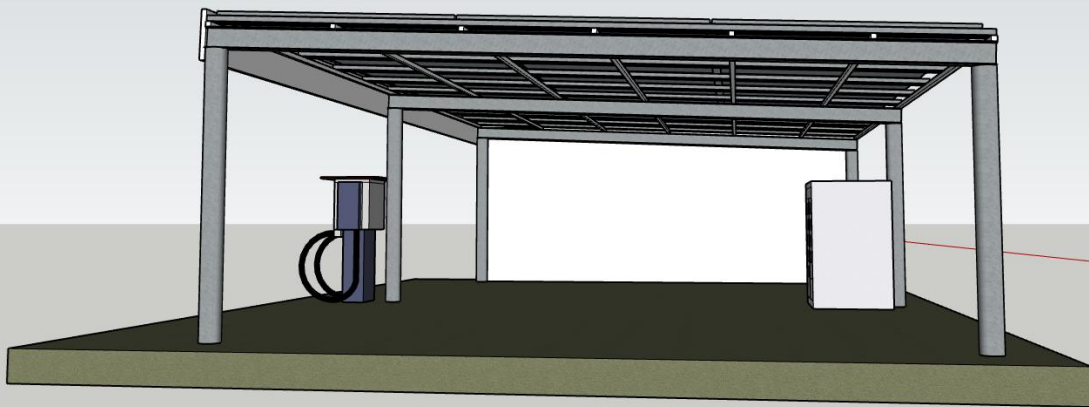


side view

Solar panels: 2278\*1134\*35 mm  
 30pcs\*550W=16.5KW  
 Carport bracket: Waterproof galvanized steel  
 Car parking qty:4

**Practical application scenario:**





### 2.3 ENERGY STORAGE SYSTEM(AIL-IN-ONE CABINET)



This series of integrated outdoor energy storage cabinets integrates energy storage battery PACK, battery management system BMS, modular PCS, energy management system EMS, power distribution system, fire monitoring system, etc. The battery PACK is modular and the PCS modular design facilitates maintenance and capacity expansion. It has the advantages of small footprint, high integration, safety, reliability, low cost, high energy efficiency and intelligent management.

In common application scenarios, the operation strategy of the energy storage system is as follows:

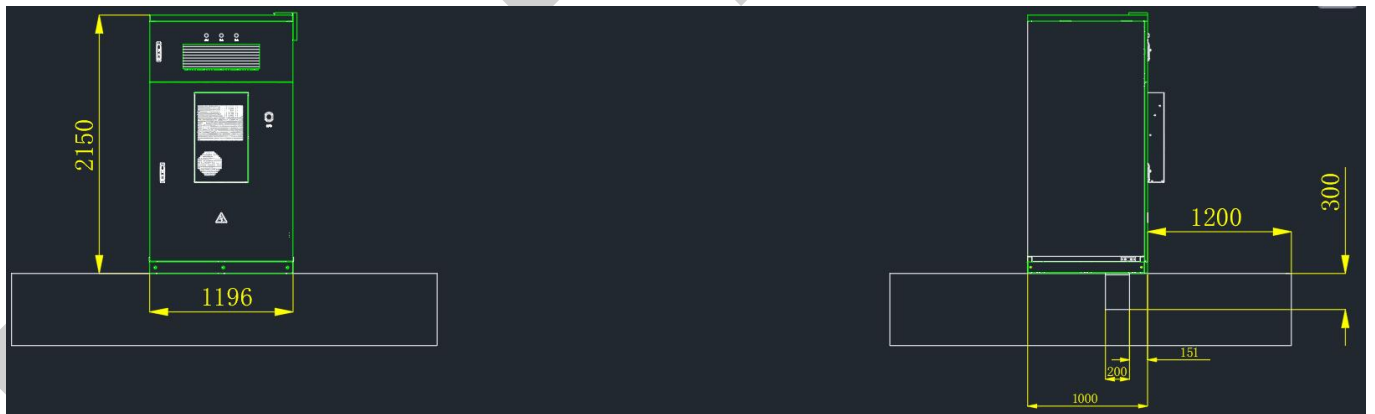
**Peak shaving and valley filling:** When the time-of-use electricity price is in the valley section, the energy storage cabinet automatically charges and stands on standby after being fully charged; when the time-of-use electricity price is in the peak section, the energy storage cabinet automatically discharges; arbitrage of the electricity price difference is realized and the economic benefits of the optimal storage and charging system are improved.

**Photovoltaic-storage combination:** Obtain local load power in real time, photovoltaic power generation is given priority for self-use, and excess power is stored. If photovoltaic power generation is insufficient to provide local loads, batteries are used first to store power.

**2.3.1 SCHEMATIC DIAGRAM OF ALL-IN-ONE CABINET(100KWH/50KW)**



**2.3.2 DIMENSIONAL DIAGRAM**



**2.3.3 ALL-IN-ONE CABINET PARAMETERS**

No.	Item	Parameter	Unit	Remark
<b>DC parameters</b>				
1	Product Model	<b>100kWh/50kW</b>		<b>All-in-one cabinet with 100kwh batteries, 50kw hybrid inverter, air conditioner, fire fighting system, EMS, ect</b>
2	Cell Chemical	120	Ah	LiFePO <sub>4</sub> , prismatic
3	Rated voltage	768	V <sub>DC</sub>	600~876
4	Rated Capacity	120	Ah	
5	Rated Energy	92.16	kWh	
6	Charging Current	Standard charging current	60	A
		Max Continuous Charging Current	120	A
7	Discharge Current	Standard Discharge Current	60	A
		Max Continuous Discharge Current	120	A
<b>AC parameters</b>				
8	Rated AC power	50	kW	PCS power
9	Rated AC Voltage	400	VAC <sub>-</sub>	3P+N+PE, 50Hz
10	Rated AC Current	72	A <sub>AC</sub>	
11	Power factor	-0.9 ~ + 0.9		
12	Current harmonic	<3%		rated power

	total distortion rate (THDI)			
<b>System parameters</b>				
13	Communication Port	CAN or RS485 or Ethernet TCP/IP		
14	Charge Discharge Port	Same terminal		
15	Temperature Control System	fan + air conditioning (refrigeration, heating)		
16	Fire Fighting System	Aerosol fire extinguishing device smoke detector water immersion sensor		
17	Protection level	IP54		
18	Cycle Life	≥ 7500	times	0.5C / 0.5C, 25 °C
		≥ 6000		1.0C/1.0C, 25 °C
19	Dimension	Width :1196 Deep :1000 High: 2150	mm	
20	Weight	≈ 1600	kg	
21	altitude Altitude	≤ 3000	m	Derate over 3000m
22	Operating Temperature	Charge: 0 ~ +55 Discharge: -20 ~ +55	°C	Derate above 45 °C



**2.3.4 ELECTRICAL CONTROL PARAMETERS**

No.	Item	Parameter	Remark
<b>1</b>	<b>AC side</b>		
1.1	AC wiring	3P3W+PE	
1.2	AC voltage range	400±10%Vac; rated: 400Vac	3P3W+PE
1.3	frequency adaptability	Range: 45Hz~65Hz; Rating: 50/60Hz	
1.4	Static withstand voltage	Can withstand 1100V input high voltage impact without damaging the module	Allow the module to enter the protected state.
1.5	power factor	-1~+1	Adjustable
1.6	THDI	≤3%	
<b>2</b>	<b>Protective function</b>		
2.1	Over current protection	All three AC phases are protected by fuses	
2.2	Over voltage protection	Protection point: 440±5V	Any one of the three phases will automatically recover
2.3	Over voltage recovery	Can automatically recover, the return difference is not less than 10V.	
2.4	Under voltage protection point	Protection point: 360±5V	Any one of the three phases will automatically recover

2.5	Under voltage recovery point	The return difference is not less than 15V	
2.6	Over temperature protection	Has over temperature protection	Long-term overheating will not damage the machine
<b>3</b>	<b>DC side</b>		
3.1	DC voltage range	600Vdc~1000Vdc	
3.2	Rated output power	50kW	
3.3	Rated DC current	83A	
3.4	Switching machine overshoot amplitude	$\leq \pm 5\%$	Full voltage input range, full load output
3.5	Charge and discharge switching time	$\leq 20\text{ms}$	-100%~+100% switching
3.6	efficiency	$\geq 98.5\%$	Rated output voltage, 100% load current test
3.7	Voltage stabilization accuracy	$\leq \pm 1\%$	
3.8	Steady flow accuracy	$\leq \pm 1\%$	At 20% ~ 100% rated current
3.9	Current imbalance	$\leq 5\%$	More than 20% of rated current (system tested)
<b>4</b>	<b>Protection characteristics</b>		
4.1	DC over voltage protection	1000Vdc $\pm$ 5Vdc	Can be set

4.2	AC short circuit protection	Short circuit is not damaged and needs to be restored manually.	
4.3	Battery reverse polarity protection		Reverse battery connection will not cause personal safety hazards

## 2.4 EV CHARGE STATION



This product is a 60KW DC double-gun wall-mounted charger. The input adopts a three-phase five-wire system, the output voltage is 200-700Vdc (can be extended to 1000Vdc), and the maximum output current can reach 200A (national standard limit: single-gun output current of the charging gun 250A maximum).

This charger provides LED matrix screen instructions, which is concise and tidy, and has corresponding control, communication and protection functions. The charger integrates power conversion, charging

control, management, query and communication. By communicating with the battery management system (BMS), Realize intelligent control of the entire charging process.

This DC double-gun wall-mounted charger adopts a modular design, has power allocation function, multiple protection functions, and automatic charging control. The product provides CAN, serial port and other communication interfaces to communicate with the monitoring center in real time, and accepts the instructions of the monitoring center. Limit the output power of the on-board charger, etc., and monitor the connection status of the charging rack in real time. If the connection is abnormal, charging will be terminated immediately to ensure personal and vehicle safety during the charging process.

#### 2.4.1 PRODUCT FUNCTIONS AND FEATURES

- The charging power module has a built-in MCU to achieve intelligent management and automatic control functions.
- This charger uses a QR code to scan the charging display, and the charging data displayed on the mobile phone is more intuitive and convenient.
- Can adapt to various BMS battery management communication protocols. Realize charging of vehicles of different brands, realize real-time monitoring of batteries, and accurately adjust DC charging output according to needs.
- This charger has a charging gun detachment detection to ensure charging safety.
- This charger has a variety of input and output detection protections, and can accurately detect input and output voltage over voltage and under voltage, short circuit, insulation and other faults.
- This charger has CAN communication interface, serial port, etc. to communicate with the background monitoring platform in real time, reporting various times and records in a timely manner to ensure that

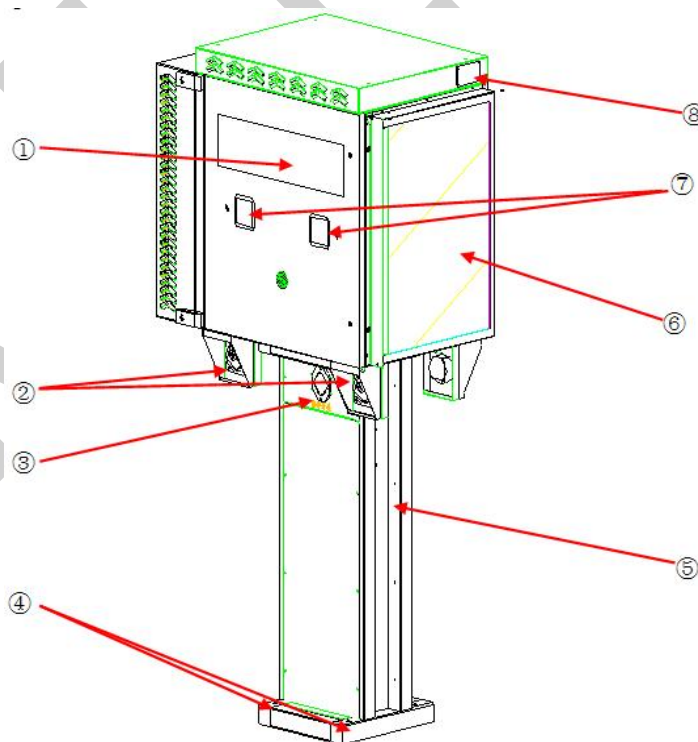
the monitoring platform monitors the charger in real time.

- This charger adopts a modular design, which is more convenient for use, maintenance and updates.

#### 2.4.2 CHARGING PILE PARAMETER

The charging pile is designed as an outdoor electrical device, and its overall dimensions are (length × width × height) 888 mm × 357 mm × 1715mm (the height will vary slightly depending on the height of the standard column and optional top cover. ) wall-mounted cabinet (standard configuration is column type, and a ventilation distance of more than 600mm must be left for incoming and outgoing wind), anti-moisture, anti-mildew, anti-salt spray, windproof performance, and anti-electromagnetic interference shielding function, and fully Considering the heat dissipation requirements, it has good dust proof and waterproof functions (optional rainproof roof is required), and the protection level meets IP54.

#### 2.4.3 STRUCTURE OF CHARGING PILE



No.	name	Function
1	Display	Charging capacity and working status indication, etc.
2	Gun mount	The area where the charging gun is placed when it is not charging
3	emergency button	Cut off output in case of emergency
4	Post fixing hole	Bottom installation and fixation
5	Column	Support charging pile/input cable entry
6	air inlet door	Dust proof/Open the door to see the charger switch, etc.
7	QR code	Place the QR code on the charging pile
8	Nameplate	Charging pile model, input and output parameters, etc.

#### 2.4.4 PARAMETER OF CHARGING PILE

No	Project	Item	unit	parameter	Remark
1	Electrical parameters	AC input voltage	V	Three-phase: 323-437Vac	
2		AC power frequency	Hz	50±5	
3		Input power factor		≥0.97	50%-100%
4		DC voltage adjustment range	V	200~700	Can be extended to 1000V

5		input power	KW	Max 66	
6		Input Current	A	Max 125	
7		efficiency		Maximum is greater than 95%	
8		DC current output	A	6~200	The maximum output of a single gun is 200A, and the maximum output of each gun is 100A at the same time.
9	Charging	automatic charging		support	
10	mode	Manual output		Only for testing	Requires computer operation
11		noise	dB	≤65	
12		Low voltage auxiliary power supply	V	24V/5A;12V/10A	Default 12V, manual switching
13		Short circuit protection		have	
14	Protective function	Over current protection		have	
15		Over/under voltage		have	
16		Overheating		have	

		protection			
17		Lightning protection		have	
18		IP		IP54	Requires optional rainproof roof
19		Operating temperature	°C	-20 ~ +50	
20		environment humidity		10%-90%	
twenty one		CAN		Comply with CAN2.0 B standard, extended frame,	
				Speed 250kbps	
twenty two		RS485	bps	Baud rate: 2400/4800/9600	



### 3. SOLAR+ENERGY STORAGE+CHARGING STATION PROJECT CONFIGURATION LIST

No.	Item	Models	Unit	Qty	Remark
1	Solar system	16.5KW	set	1	30PCS*550W PVpanels + carport' s bracket (galvanized material steel,4 cars parking positions)
2	All-in-one cabinet	100KWH/50KW	set	1	Battery capacity 100kwh, solar power input 50kw, 400VAC output 50kw,airconditioner,fire fighting system,EMS
3	EV Charging station	60KW	set	1	2 EV charger
4	Auxiliary materials		set	1	MC4 connectors , DC lines , AC cables , tape , wire lugs and other auxiliary materials and accessories

Our company can provide a complete set of project design, product supply and construction guidance according to different customer needs.

#### 4. PROJECT APPLICATION CASE

