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HK e-Bus
En



Green public transportation-an attitude and a responsibility!

Green public transportation refers to means of public transportation not using gasoline or diesel engines. Pure electric bus is the most representative form of green public transportation. It is an attitude, but also a responsibility. Pure electric buses help reduce carbon dioxide emissions and air pollution. One internal combustion engine powered bus can emit 17.8 tons of carbon dioxide per year and China has about 500,000 of them. If all of them are converted to pure electric buses, an annual reduction of 8.9 million tons of carbon dioxide emission could be achieved.

Vehicle exhaust fumes are a major source of urban air pollution and help cause the heat island effect in urban areas. The air pollution at two meters from the ground is the most serious one. Exhaust fumes heavily pollute air in the space extending to a height of two meters above ground and cause lots of noise, thus seriously threatening people's health. Hybrid Kinetic Group's pure electric buses will help improve urban environment, reduce air pollution, and reduce carbon footprint of cities.



The HK eBus 12 meter one-step-low-entrance model is based on the German MAN technology with elegant design and a comfortable ride. It carries onboard the HK super battery that boasts long cycle life and ten minute fast charging capability. So far it is the only commercial-ly feasible pure electric bus in the market with long service life that can be quick charged/discharged.



HK eBus 12 Meter Model

The battery packs are located atop the roof and under the rear theater seats and don't take up any internal passenger space. The container of battery packs conform to the stringent IP67 standard. Vehicle wading depth is more than 700 millimeters.

HK eBus 12 Meter Right Hand Drive Model



The HK super battery can be quick charged. Capacity of battery packs onboard the bus can be customized according to conditions of different bus routes. The charger can work under high voltage at 750V and high current at 500A. Ten minutes of quick top-off charging can ensure a range of 45 kilometers. The HK eBus is most suitable for urban public transportation usage. It outperforms the gas or fuel vehicles in terms of energy efficiency and cost effectiveness. During coasting and braking, the motor can automatically convert to generator mode, recovering the kinetic energy to charge the battery.

The eBus electric motor uses highly efficient permanent magnets and outer-rotor technology to minimize the amount of permanent magnetic material used. The motor generates high torque at low rpm and can be directly connected to the conventional drive shaft differential without the need of intermediate transmission. The drivetrain is thus simplified and the whole system more reliable, economic and efficient.

Charging stations can be placed in bus terminals and transfer stations. Buses can be quick charged during terminal stops. Vehicles carry only 70kWh of batteries, enough for one-way or round-trip need. Compared with other electric buses that carry 300kWh of batteries, both the cost and weight are greatly reduced.

HK eBus 12 Meter Right Hand Drive Model



HK eBus 12 Meter Model

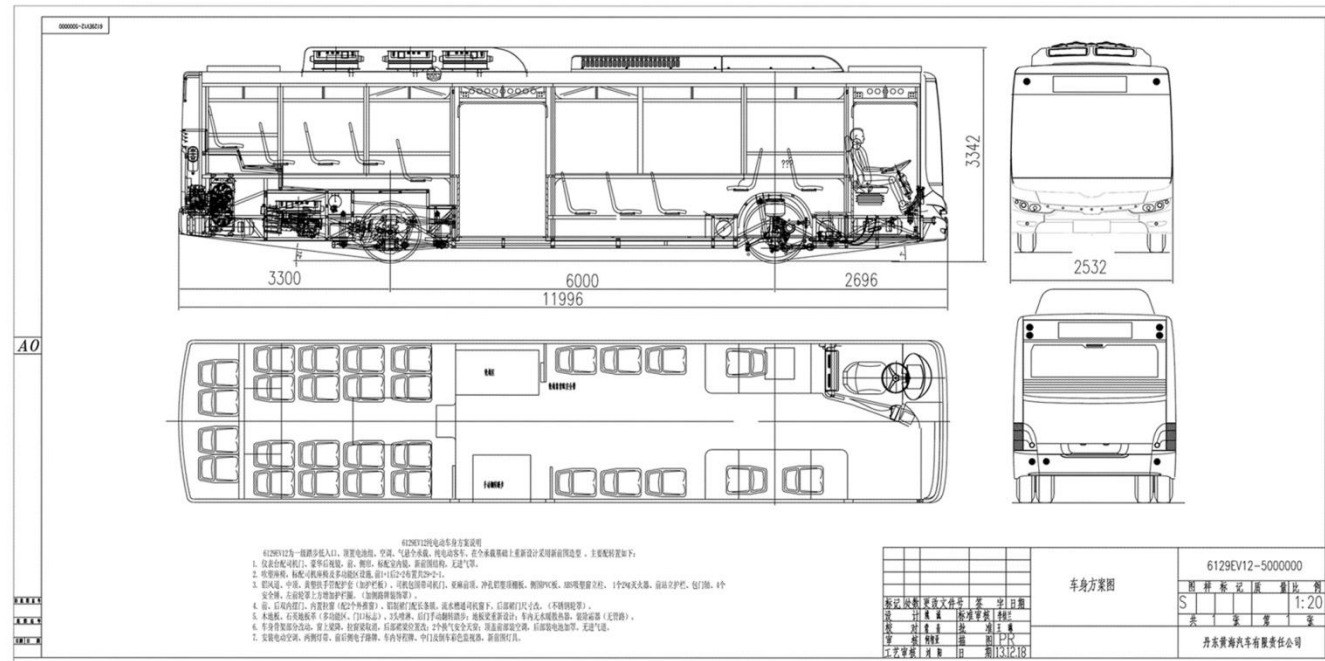
HK eBus features a user-friendly, spacious and comfortable cabin design. Buses are equipped with air conditioner that work from -30 °C to 50 °C, satisfying the needs of cold and hot areas alike. The HK eBus presents passengers a quiet cabin without the engine and exhaust noise.

With 1.25 meter wide passenger doors and 340-370 millimeter one step ground clearance, getting on and off the bus is a breeze.



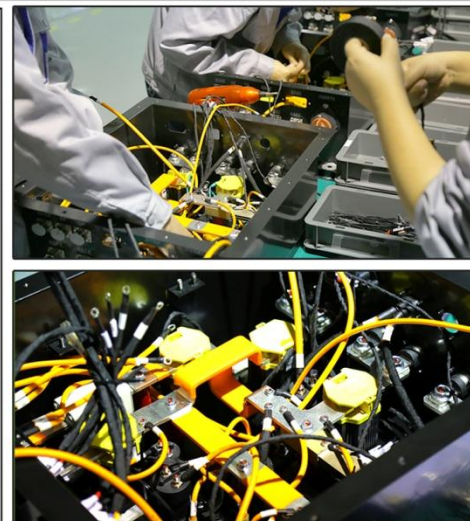
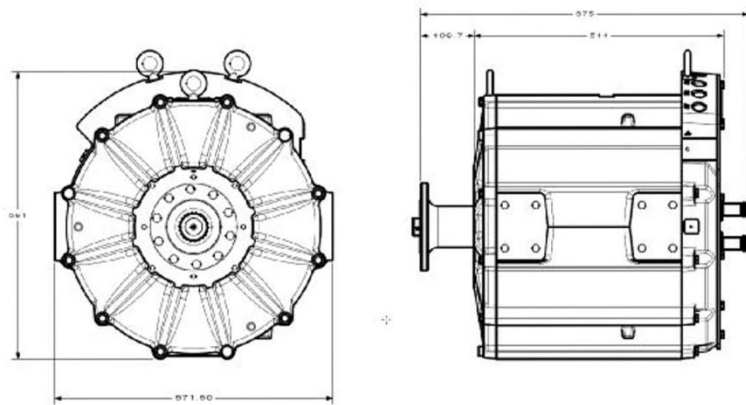
R&D

HK Group has a professional R&D team with rich experience in product development, original ideas and keen market insight, who aim to deliver customers satisfactory products. It also aims to constantly upgrade the



2.5 外形尺寸

图 5 电机外形尺寸



Technical Specs of HK eBus

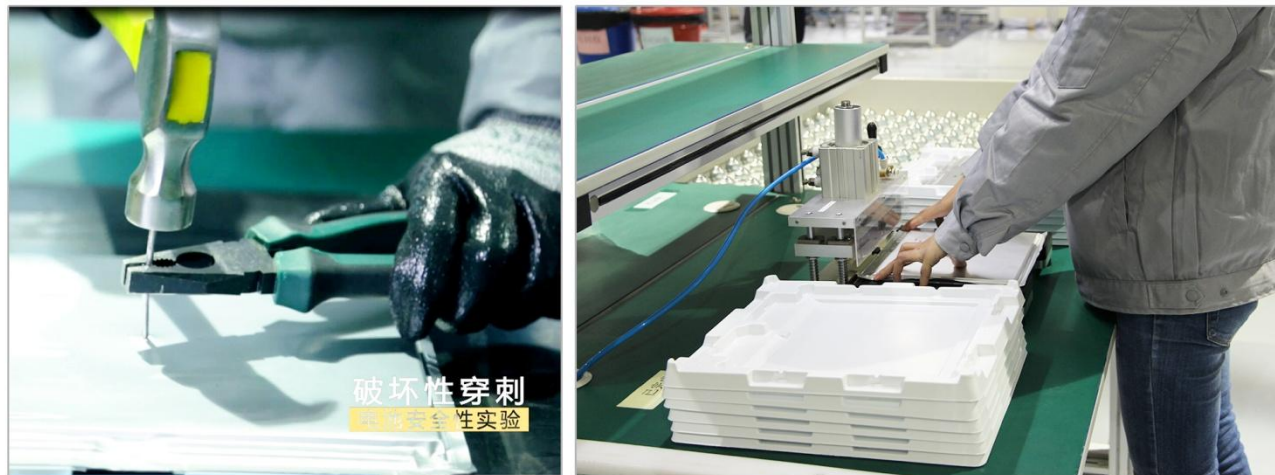
	ITEM	UNIT	SPECIFICATION	
Dimensions	Length	mm	11997	
	Width		2530	
	Height		3400	
	Wheelbase		6000	
	Front /Rear End		2697/3300	
	Front Track		2082	
	Rear Track		1860	
	Approach Angle		(°)	7
	Departure Angle		(°)	7
Weight and Structure Parameters	Max. Total Mass	kg	18000	
	Curb Weight		12563	
	Front Axle		Large Drop I Beam Gate Bridge, Disk Brakes	
	Rear Axle		Stamped and welded Axle Housing, Single-Stage Hypoid Gear Drum Brakes	
	Suspensions		Air Spring, Guide Rod Structure	
	Braking System		Multi-Pipe Air Brake, Electric Air Compressor	
	Steering System		Hydraulic Power Steering, Electric Hydraulic Pump	
	Power/Powertrain		600V/110kw	
	LTO Battery Pack		588.8V/120Ah	
	Tyre		275/70R22.5	
	Body Structure		Monocoque Body	
	Step Structure		One Step Low Floor for Front and Rear Door	
	Air Conditioning System		Electric Air Conditioner	
	Performance Parameters	Max Speed	km/h	≤69
Max Range		km	110	
Energy Consumption Rate		Wh/km	661.8	
Ekg			≤0.25	
Max Gradability		%	≥15	
Turning Diameter		m	23.7	
Seats Including driver		People	83/18-45, 89/18-45	
Rated Capacity Including driver		People	83/18-45, 89/18-45	

Core Component

HK LTO Battery

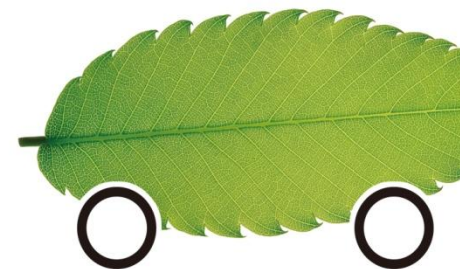
- Quick Charging: HK LTO Battery can be fully charged in 10 minutes at high C-rate without safety concern;
- Long Cycle Life: HK LTO battery can sustain over 33000 high DOD cycles and even more low DOD cycles, ten times that of other types of lithium-ion batteries;
- Excellent Environment Tolerance: Excellent performance from -30°C to 55°C;
- Highest Safety: LTO batteries are recognized as the safest lithium-ion batteries due to the stable structure of lithium titanate oxide. HK LTO batteries are puncture safe.

Battery



Battery Specifications

ITEM	SPECIFICATION
Cell Weight	1.73±0.03kg
Cell Size	Thickness:12.8±0.33mm
	Width266.0±1.5/-4.0mm
	Length 263.0±3.0mm including Sealant
Nominal Capacity	60.0Ah@1 C(60A)
Capacity Range	≥60Ah@1 /3C(20A)
Nominal Voltage	2.3V
Max Charge Voltage	2.90±0.05V
Min Discharge Voltage	1.5±0.05V
Standard Charge Current	1C, A(60.0A)
Standard Discharge Current	1C, A(60.0A)
Max Continuous Charge Current	6C, A(360.0A)
Max Continuous Discharge Current	6C, A(360.0A)
Max Peak Charge Current (10s)	10C, A(600A)(10s, 50%SOC)
Max Peak Discharge Current (30s)	10C, A(600A)(30s, 50%SOC)
Transport Voltage	2.165±0.01V
Internal Resistance	DC Internal resistance : 0.3~0.7mΩ
	(300A, 10S, 50%SOC)
	AC Internal resistance : 0.2~0.6mΩ
	(AC Impedance, 1000Hz@2.165V)
Cycle Life	≥33000 cycles

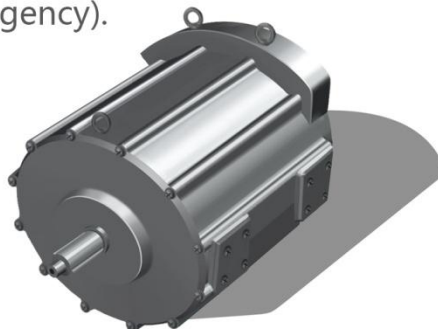


Core Component

High Power, High Torque Motor

- High-power, high-torque motor provides ample power for the vehicle in a variety of road conditions and operating modes.
- Motor system employs advanced technology. Motor systems are assembled domestically with imported major components.
- Motor is connected directly to the drive axle, eliminating gearbox and other speed reduction mechanism that not just cause noise and oil leaks but also require maintenance, making the ride more smooth and vehicle more reliable.
- Intelligent temperature management for the motor and control box controlling.
- Equipped with automatic temperature detection system that initiates lowered power operation and sends alarm in high temperature, and other security functions to prevent negative effects due to thermo concentration.
- Motor controller uses RS 485/232 and CAN communication for data exchange with strong electric controller and vehicle controller to achieve coordinated control so as to guarantee system reliability.
- Motor controllers verified by VCA (UK Vehicle Certification Agency).

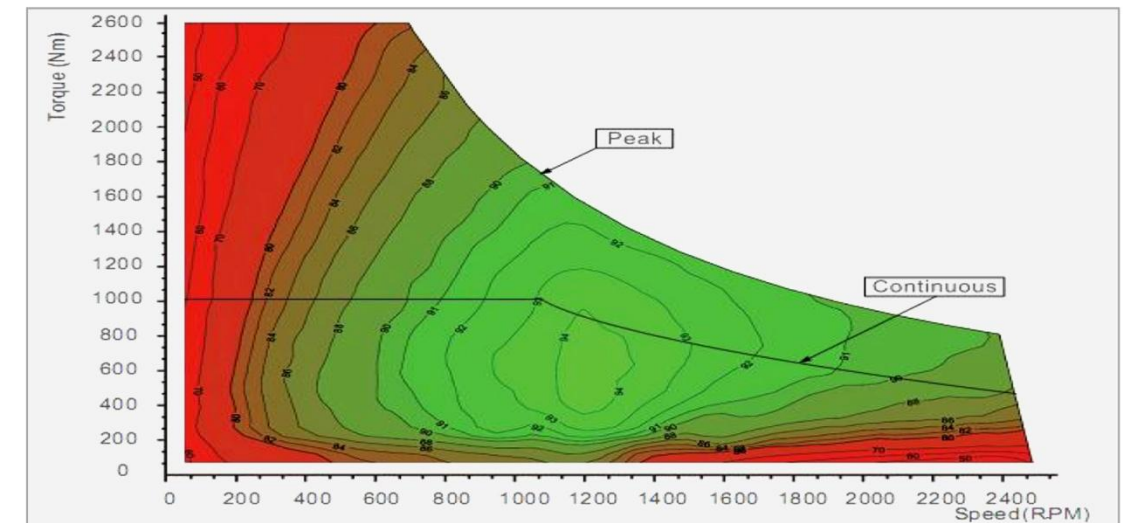
Electric Motor



Battery Specification

ITEM	SPECIFICATION
Rated Power (kW)	110
Max Power (kw)	200
Rated Torque (N.m)	1000
Peak Torque (N.m)	2600
Rated Speed (rpm)	1050
Max Speed (rpm)	2400
Operating Ambient Temperature (°C)	-40~85
Insulation Grade	H
Type of Cooling	liquid cooling
Level of Protection	IP6K5
Dimension (external diameter / length) (mm)	675*571.5*591
Weight (kg)	315

Motor System Efficiency



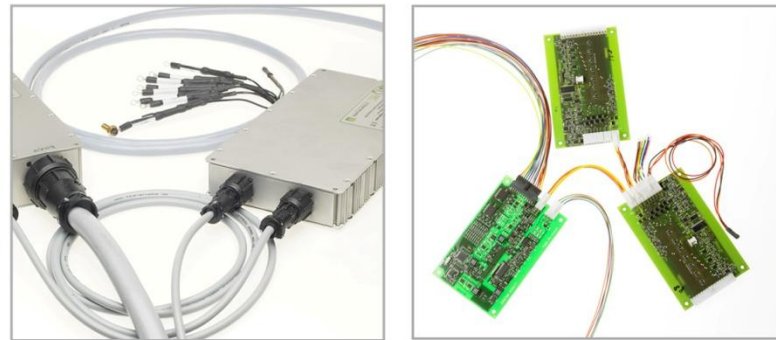
Core Component

Battery Management System (BMS)

European developed BMS collects real time work status data of each cell and passes such data and control policy to the vehicle controller in order to achieve optimal management of the cell. Cell voltage can be precisely controlled to $\pm 2\text{mV}$.

Multiple Protection

- Overvoltage Protection
- Undervoltage Protection
- Short Circuit Protection
- Overtemperature Protection
- Insulation Status Monitoring



Other Protection

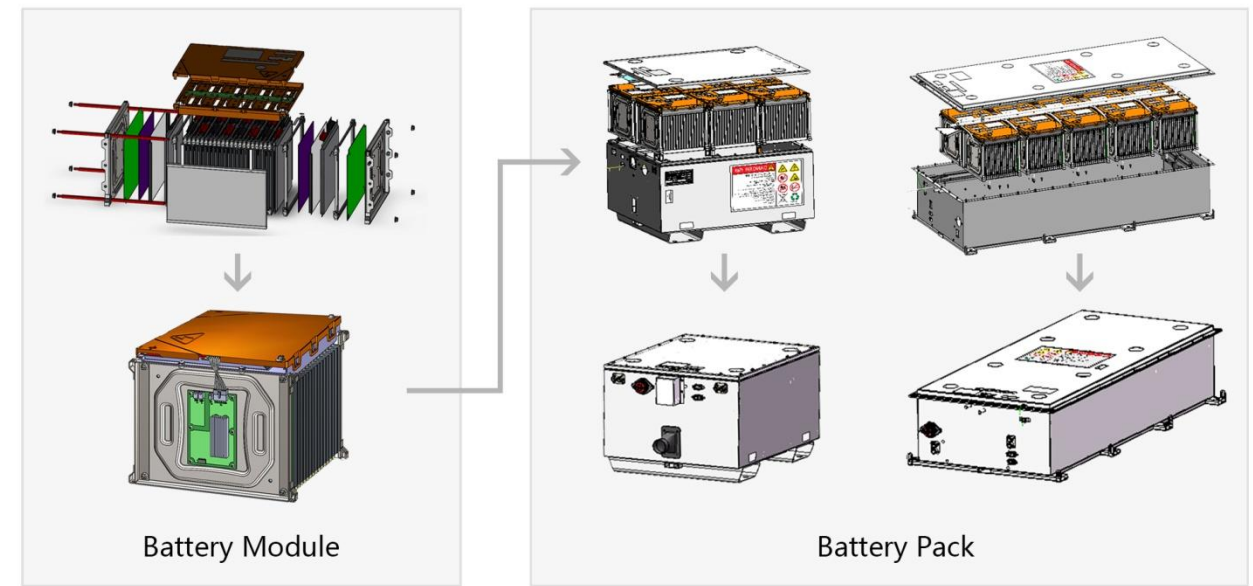
Optimal charge algorithm by discharge control (energy prediction) ensures charge balance, increases energy, shortens charging time, and extends battery life. Application interface and diagnostic management

BMS



Battery Module

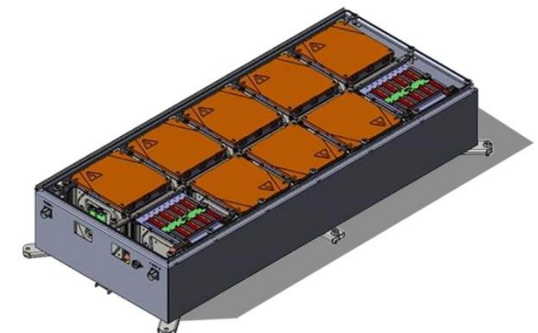
A battery module is a physical unit of multiple cells connected in series or in parallel. Modules are basic units of HK battery systems.



Battery Pack

A battery pack is made with multiple modules in a container designed for specific vehicles.

Battery Module & Pack



Core Component

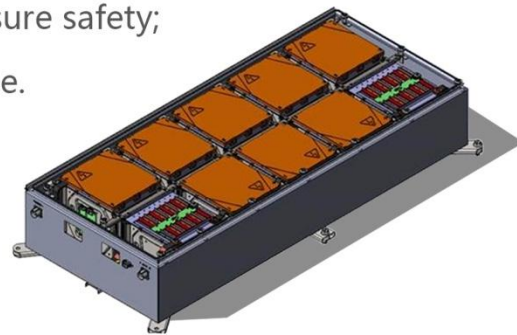
Battery Module Design

Each module is equipped with voltage and temperature acquisition device, which monitors the real time status of cells in the module. Module design takes into consideration the heat generated during charging and discharging of cells. Each cell has a cooling fin to disperse the heat.

Battery Pack Design

Depending on capacity requirement, numerous modules are arranged into a total of four battery packs, which are placed atop the roof and beneath the theater seats in the rear without sacrificing cabin space. HK battery pack design also takes into account the following factors:

- Thermo insulation for cold weather in northern part of China;
- High performance turbofan for heat dispersion and cooling;
- Container/case protection level conforming to IP67 standard;
- National standard charging port design with single-gun charging current is up to 250A;
- Equipped with hardware protection circuit to prevent battery short circuit or overcurrent;
- Each pack has a separate maintenance switch to ensure safety;
- High standard container/case with 10 year guarantee.



Battery Module & Pack

Battery Pack Specifications

ITEM	SPECIFICATION	UNIT	REMARK
Nominal Voltage / Voltage Range	588.8 / 499~742	V	2p256s
Nominal Capacity / Voltage Range	120 / (499~742V)	Ah	
Total Energy	70.6	kWh	
Continuous Discharge Current	180	A	
Max Peak Discharge Current (30s)	450	A	
Continuous Charge Current	250	A	One Gun
Max Peak Charge Current (10s)	450	A	
Insulation Resistance	≥2	MΩ	Insulation resistance of pack
Cycle Life	≥33000	cycles	
Dimensions (L*W*H)	Roof Pack	mm	1910*870*345
	Saddle Pack	mm	1015*718*537
Level of Protection	IP67 (excl. air intake)		
Protection Strategy	Dual protection mechanism with internal fuse and BMS protection signal		BMS sends signal to vehicle controller to trigger protection action. BMS disconnects contactor to protect equipment in serious
Thermal Management	Forced air cooling		
Communication Mode	CAN		
DC Insulation Resistance of Pack	≤180	mΩ	
Total Weight of Pack	≤1400	Kg	

Battery Technology Team

HK Group has set up a professional battery technology R&D team which is led by world's leading experts and coordinated by domestic experts. At the same time, HK Group has set up a battery technology company in Lianyungang, Jiangsu Province, assembling battery modules and packs for electric buses and other EVs.



Production and Testing

LTO Battery Cell Production

HK LTO battery cells are made in world's most advanced cleanroom workshops. The manufacturing process takes place in a clean and dry environment:

- Class 1,000 cleanroom, 1% humidity;
- Class 10,000 cleanroom, 10% humidity.



Battery Pack Production

Battery pack production line includes: automated module stacking/conveyor unit; automated module turning unit; automated ultrasonic tab welding unit; assembly conveyor line;

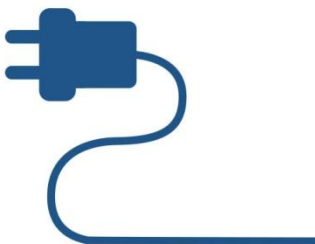
Comprising: a cell sub-assembly line; a cooling fin sub-assembly line; a module assembly line; two module+PDU assembly lines; module/battery pack cycle life test post.

Battery Production Quality Control

- Rigorous and 100% raw material acceptance testing;
- Refined logistics management to minimize pollution;
- Automated manufacturing, eliminating hand contact with electrodes;
- Complete product traceability with a unique bar code on each cell;
- Quality inspection throughout the process, including ubiquitous automated optical inspection and various thickness/size verification. Accurate coating control at $\pm 3\mu\text{m}$. Accurate control of cell capacity, open circuit voltage, internal resistance and cell classification.

Ultrasonic Welding

World's best ultrasonic welding equipment guarantees the quality of tab welding, which is the most important process in battery module manufacturing. Automatic ultrasonic welding head movement guarantees consistency and quality.

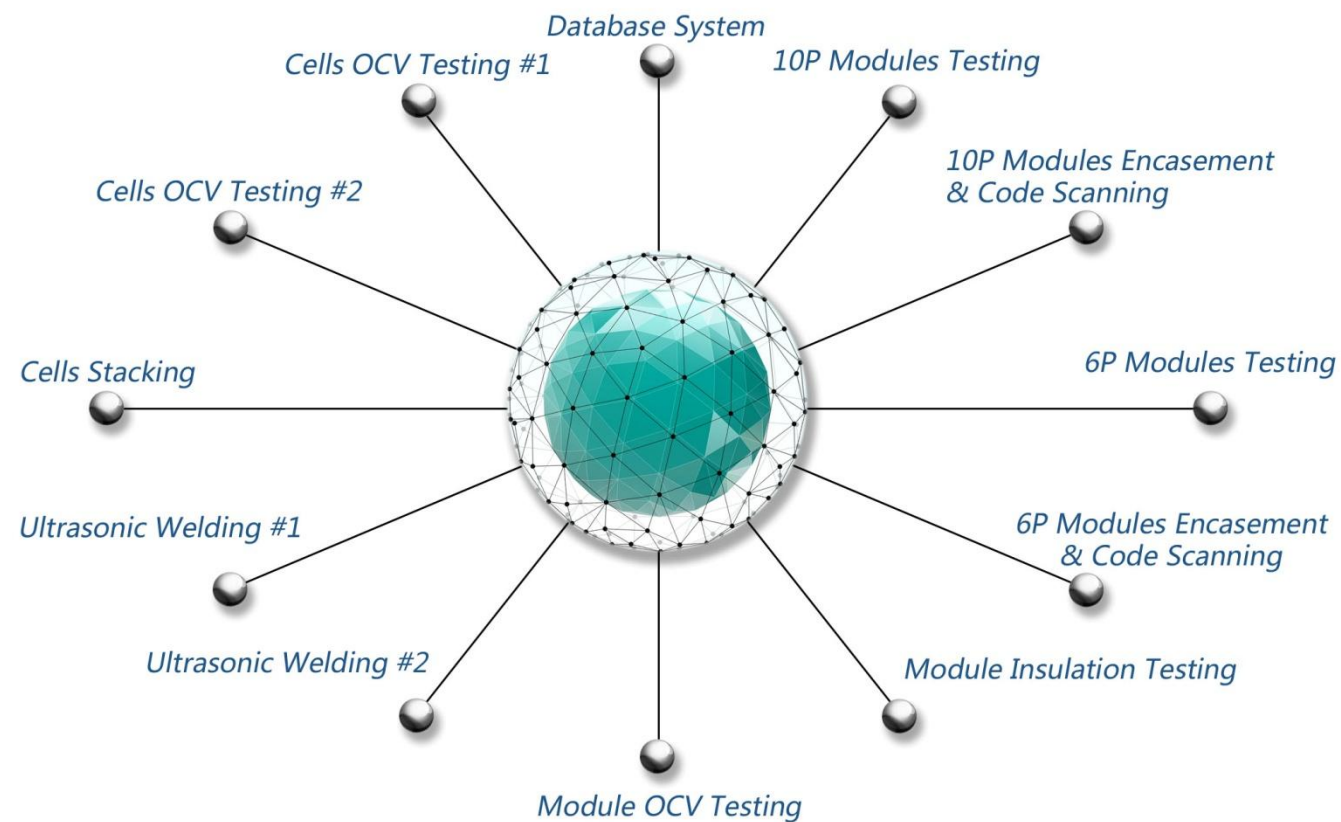


Production and Testing

Battery Production Quality Control

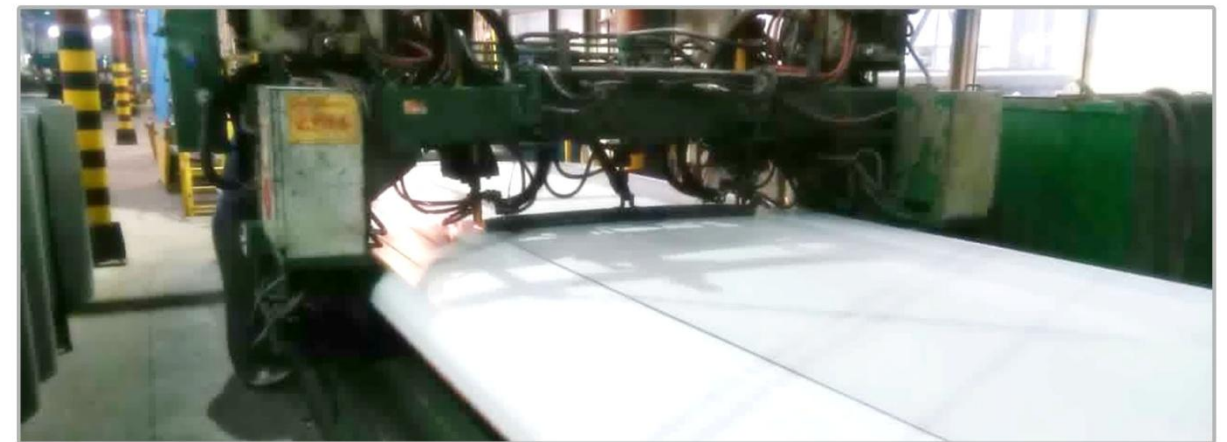
Detailed inspection standards are made for raw material acceptance, production process, and final products inspection to guarantee quality. Inspections happen at all stages from cells to modules to packs, and cover the performance and safety elements in order to guarantee quality from beginning to end.

Manufacturing Execution System (MES) is applied to meet the production and quality data collection, control and traceability requirements along the whole production process.



Vehicle Production

HK Group will consolidate manufacturing capacity all over the country. Besides strictly controlling the production process and material quality, taking advantage of the plants' technical superiority, it will also dispatch experienced production managers and technical experts to the plants and contribute its expertise in production and management. Such a multiple-win solution will guarantee quality consistency, improve the plants' capabilities, and reduce capital investment. The light-asset operation mode will also help release the idle or spare production capacity.



Financial and Other Services

Resource Integration

HK Group will consolidate resources and capacity of manufacturing plants all over the country and work with local public transportation companies to promote new energy buses and help the local governments realize the dream of green transportation.

Equity Investment

HK Group will help local businesses maximize their assets by means of equity investment and work together with them to achieve steady growth in the new energy bus industry.

Financial Leasing

HK Group will work with local public transportation companies through financial leasing service so that they could acquire our buses with minimum upfront cost and have access to the optimal green transportation solution.

After Sales Service

The HK eBus carries onboard the HK super battery that boasts long cycle life and ten minute fast charging capability. So far it is the only commercially feasible pure electric bus in the market with long service life that can be quick charged/discharged. Vehicle life is guaranteed for 10 years, and HK super batteries are

