



# 湖南丰日轨道交通系列产品手册

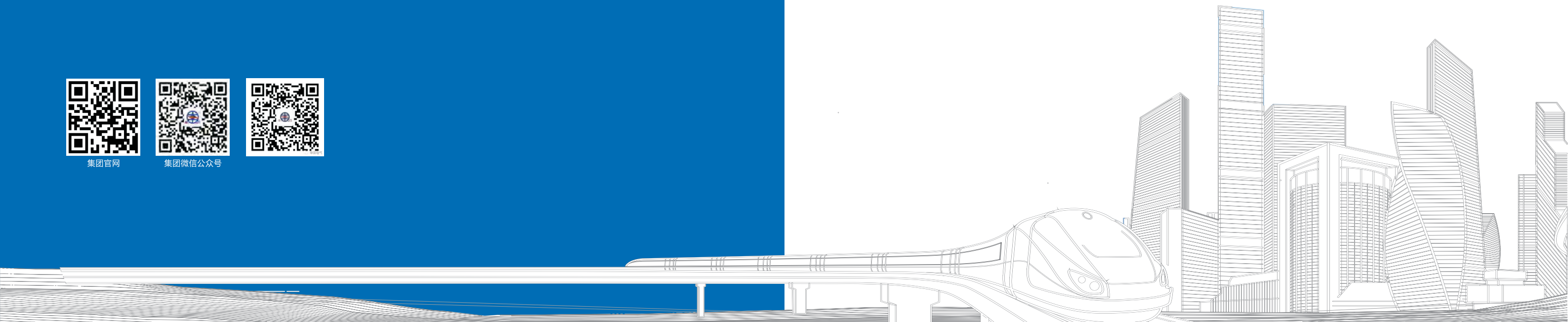
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集团官网



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## 企业简介

湖南丰日电源电气股份有限公司是一家集高性能铅酸蓄电池系列、铅炭蓄电池系列、固态锂电池系列、钠离子电池系列、直流电源、电气成套设备、电动汽车生产销售，废旧电池再生利用等于一体的民营企业集团。公司蓄电池、电源电气类产品长期供应铁路总公司、中国中车、中国地铁，丰日”牌机车蓄电池，是1998年铁路第二次大提速，根据机车蓄电池特性开发设计、装车使用，至今已有25年的运行历史，在使用中不断的改进升级，为广大客户提供高质量、高性能，安全可靠的铅酸蓄电池，得到铁路总公司、中车集团以及地方铁路的一致好评，在全路机车市场“丰日”牌机车蓄电池装车率达70%以上。

为实现绿色、环保、低碳发展新趋向，建设有品质的地铁，可回收利用的胶体铅酸蓄电池已广泛应用于城市轨道交通车辆上。截止2022年已在巴西、阿根廷及国内北京、天津、重庆、广州、深圳等20多个城市的100余条轨道交通线路上装车运营。



## Company Profile

Hunan Fengri Power & Electric Co., Ltd. is a private enterprise group, which combines high-performance lead-acid battery series, lead-carbon battery series, solid-state lithium battery series, sodium-ion battery series, DC power supply, electrical complete sets of equipment, electric vehicle production and sales, and waste battery recycling. The company's battery and power supply electrical products have long been supplied to the Railway Corporation, CRRC and China Metro. "Fengri" brand locomotive batteries were designed, installed and used based on the characteristics of the locomotive battery when the Second Major Railway Speed-up Period in 1998. It has a history of 25 years of operation so far. The battery is continuously improved and upgraded in use to provide customers with high-quality, high-performance, safe and reliable products. It has won unanimous praise from the Railway Corporation, CRRC Group and local railways, and the loading rate of Fengri locomotive batteries in the whole locomotive market has reached more than 70%. In order to realize the new trend of green, environmental protection and low-carbon development and build high-quality subways, recyclable colloidal lead-acid batteries have been widely used in urban rail transit vehicles. As of 2022, it has been loaded and operated on more than 100 rail transit lines in Brazil, Argentina, and 20 domestic cities including Beijing, Tianjin, Chongqing, Guangzhou, and Shenzhen.

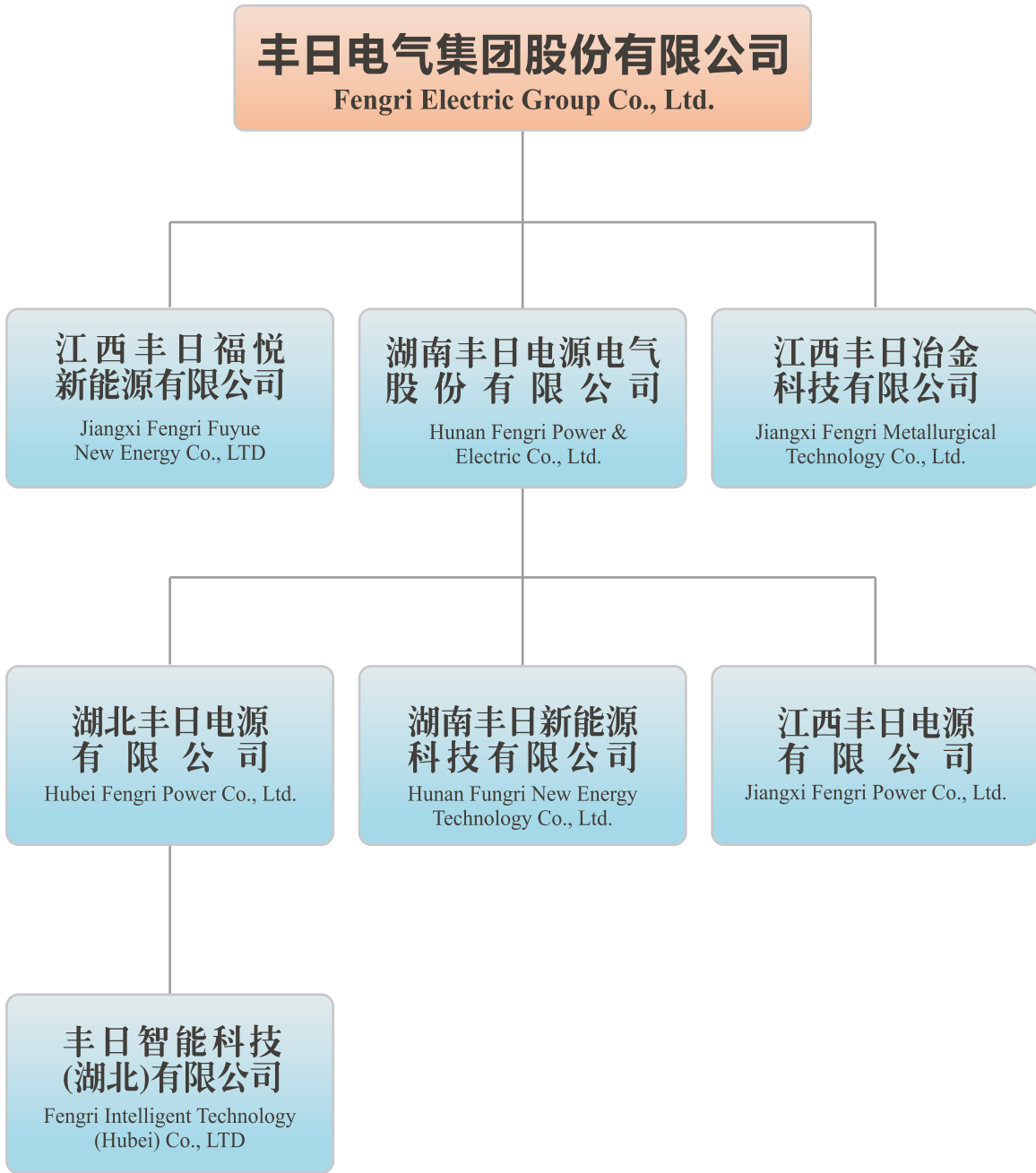


江西丰日公园航拍图 Aerial photo of Fengri Park in Jiangxi





丰日电气集团组织架构  
Organizational Structure of Fengri Electric Group





# 产品资质 Product Qualification

# 企业荣誉 Enterprise Honors

三大体系认证证书  
Certificates of Three Systems



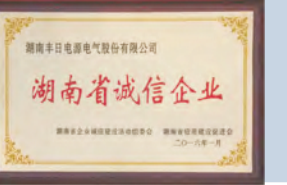
CRCC铁路产品认证证书  
CRCC Railway Product Certificates



轨道交通证书  
Rail Transit Certificates



3C认证证书  
3C Certificates





产品特点

Product features

- 采用独特的结构及多重密封技术，能确保在振动使用下，蓄电池不渗漏电解液。
- The unique structure and multiple sealing technology can ensure that the battery does not leak electrolyte undervibration.
- 阀控式密封，安全阀具有自动平衡蓄电池内部气体压力、防爆的功能，使用安全可靠。
- Valve-controlled sealing, the safety valve has the function of automatically balancing the internal gaspressureof the battery and explosion-proof function, which is safe and reliable to use.
- 采用先进的超细玻璃棉（AGM）隔板，使电解液全部吸附在极板和隔板中,气体复合效率98%以上，无酸雾逸出，不腐蚀设备。
- Advanced ultra-fine glass wool (AGM) separators are used to make the electrolyte completely adsorbed intheplates and separators, the gas recombination efficiency is over 98%, no acid mist escapes, and no corrosionof equipment.
- 采用多元耐腐合金和独特的板栅设计，腐蚀速率低，有效地延长了蓄电池使用寿命。
- Using multi-component corrosion-resistant alloy and unique grid design, the corrosion rate is low, which effectively prolongs the service life of the battery.
- 蓄电池极柱采用嵌入式大面积铜芯，大电流放电性能优越。
- The battery pole adopts embedded large-area copper core, which has excellent high-current discharge performance.
- 蓄电池槽采用阻燃、超强ABS材料，有效地保证蓄电池的阻燃性和耐振动冲击性。
- The battery tank is made of flame-retardant and super-strong ABS material, which effectively guarantees the flame -retardant and vibration-shock resistance of the battery.
- 采用高品质的原材料，把自放电控制在最小。
- Use high-quality raw materials to keep self-discharge to a minimum.
- 先进的工艺配方和严格的工艺控制，确保蓄电池产品具有充足的容量和整体性能均一可靠。
- Advanced process formula and strict process control ensure that the battery product has sufficient capacity and overall performance is uniform and reliable.
- DLM、TM、NM系列铁路机车车辆用阀控式密封铅酸蓄电池
- DLM, TM, NM Series Valve-regulated Sealed Lead Acid Batteries for Railway Locomotives
- 产品应用
- Product Application
- 提供列车起动或升弓前的控制系统、辅助系统、通讯系统、照明等用电。
- Provide power for the control system, auxiliary system, communication system, lighting system, etc. before the train starts or raising pantograph.
- 提供内燃机车起动所需电源。
- Provide the power required for starting the diesel locomotive.
- 型号规格见表1、表2、表3、表4
- Model Specifications
- Model specifications see Table 1, Table 2, Table 3, Table 4

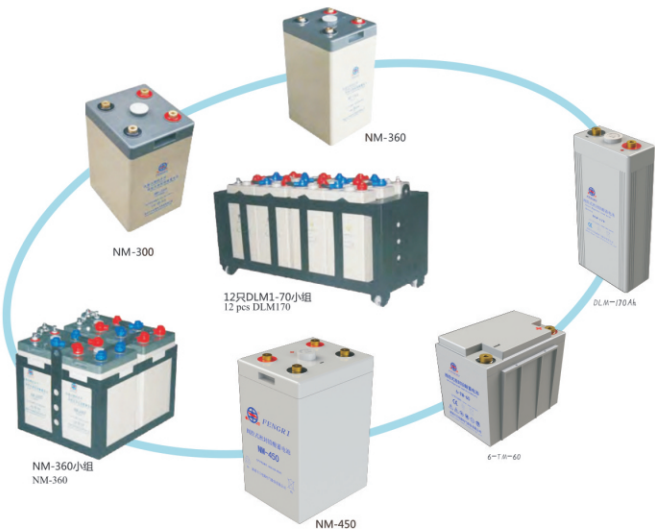


表1 铁路电力机车用蓄电池型号规格表

Table 1 Model: Specifications of Batteries for Railway Electric Locomotives

| 型号规格<br>Model | 额定电压(V)<br>Voltage(V) | 额定容量<br>Capacity(Ah) | 外型尺寸(mm)<br>Dimensions(mm) |        |        |               | 参考重量(kg)<br>Weight(kg) |
|---------------|-----------------------|----------------------|----------------------------|--------|--------|---------------|------------------------|
|               |                       |                      | 长<br>L                     | 宽<br>W | 高<br>H | 总高<br>Total H |                        |
| DLM-170       | 2                     | 170                  | 85                         | 173    | 353    | 365           | 12.5                   |
| DLM-200       | 2                     | 200                  | 85                         | 173    | 353    | 365           | 13.5                   |
| DLM-220       | 2                     | 220                  | 85                         | 173    | 353    | 365           | 14.0                   |
| DLM-200       | 2                     | 200                  | 103                        | 176    | 338    | 349           | 14.5                   |
| DLM-220       | 2                     | 220                  | 103                        | 176    | 338    | 349           | 15.0                   |
| DLM-240       | 2                     | 240                  | 98                         | 176    | 365    | 376           | 16.5                   |

表2 铁路客车用蓄电池型号规格表

Table 2: Model and Specifications of Batteries Used in Railway Passenger Cars

| 型号规格<br>Model | 额定电压(V)<br>Voltage(V) | 额定容量<br>Capacity(Ah) | 外尺寸 ( mm)<br>Dimensions(mm) |        |        |               | 参考重量(kg)<br>Weight(kg) |
|---------------|-----------------------|----------------------|-----------------------------|--------|--------|---------------|------------------------|
|               |                       |                      | 长<br>L                      | 宽<br>W | 高<br>H | 总高<br>Total H |                        |
| TM-450        | 2                     | 450                  | 220                         | 176    | 335    | 360           | 35.0                   |
| 6-TM-60       | 12                    | 60                   | 265                         | 190    | 222    | 222           | 21.0                   |
| 6-TM-120      | 12                    | 120                  | 410                         | 172    | 240    | 260           | 38.0                   |
| 6-TM-200      | 12                    | 200                  | 520                         | 238    | 220    | 234           | 66.0                   |

表3 铁路内燃机车用蓄电池型号规格表

Table 3: Model Specifications of Batteries for Railway Diesel Locomotives

| 型号规格<br>Model | 额定电压(V)<br>Voltage(V) | 额定容量<br>Capacity(Ah) | 外尺寸 ( mm)<br>Dimensions(mm) |        |        |               | 参考重量(kg)<br>Weight(kg) |
|---------------|-----------------------|----------------------|-----------------------------|--------|--------|---------------|------------------------|
|               |                       |                      | 长<br>L                      | 宽<br>W | 高<br>H | 总高<br>Total H |                        |
| NM-200        | 2                     | 200                  | 87                          | 186    | 353    | 364           | 13.0                   |
| NM-200(B)     | 2                     | 200                  | 103                         | 176    | 338    | 349           | 15.0                   |
| NM-300        | 2                     | 300                  | 200                         | 174    | 275    | 286           | 23.5                   |
| NM-300(B)     | 2                     | 300                  | 145                         | 176    | 338    | 349           | 20.0                   |
| NM-360        | 2                     | 360                  | 185                         | 158    | 355    | 366           | 28.0                   |
| NM-360        | 2                     | 360                  | 200                         | 174    | 326    | 337           | 29.0                   |
| NM-400        | 2                     | 400                  | 200                         | 174    | 326    | 337           | 29.0                   |
| NM-450        | 2                     | 450                  | 223                         | 187    | 355    | 366           | 34.5                   |
| NM-500        | 2                     | 500                  | 223                         | 187    | 355    | 366           | 34.5                   |
| NM-500(A)     | 2                     | 500                  | 200                         | 174    | 326    | 337           | 32.0                   |
| NM-500(E)     | 2                     | 500                  | 200                         | 174    | 326    | 337           | 32.0                   |
| NM-500(D)     | 2                     | 500                  | 200                         | 174    | 326    | 337           | 32.0                   |

3、适用车型

Applicable models

- 电力机车：
- Electric locomotive:
- DLM170：SS1,SS2,SS3,SS4,SS5,SS6,SS7,SS7C,SS7D,SS8,SS9,HXD1系列，HXD2系列，HXD3系列，FXD1,FXD3等；
- DLM170: SS1, SS2, SS3, SS4, SS5, SS6, SS7, SS7C, SS7D, SS8, SS9, HXD1series, HXD2 series, HXD3 series, FXD1, FXD3, etc.;
- DLM200：HXD1系列，HXD2系列,HXD3系列扩容
- DLM200: HXD1 series, HXD2 series, HXD3 series expansion
- DLM220：HXD1系列，HXD2系列,HXD3系列扩容
- DLM220: HXD1 series, HXD2 series, HXD3 series expansion
- DLM240：HXD1系列，HXD2系列,HXD3系列扩容
- DLM240: HXD1 series, HXD2 series, HXD3 series expansion
- 内燃机车：
- Diesel locomotive:
- NM-450：DF系列，HXN3B，HXN5
- NM-450: DF series, HXN3B, HXN5
- NM-360：GKD1，GKD0,DF系列
- NM-360: GKD1, GKD0, DF series
- NM-300：GK1C，东方红系列
- NM-300: GK1C, Dongfanghong series
- NM-200：金鹰重型、宝鸡中车（JW4G、GCY-300）等工矿作业车
- NM-200: Jinying Heavy Duty, Baoji CRRC (JW4G, GCY-300) and other industrial and mining vehicles



产品应用 Product Application

- 列车在无网压时，蓄电池供电保障列车内部紧急照明、外部照明、紧急通风、车载安全设备、广播、显示屏、通讯系统等紧急负载工作，并保障列车开关一次车门，网压恢复时能保障辅助电源启动及应急升弓。
- When the train has no network voltage, the battery power supply guarantees the work of emergency loads such as internal emergency lighting, external lighting, emergency ventilation, on-board safety equipment, broadcasting, display screens, and communication systems. And ensure that the train door is opened and closed once, and when the network voltage is restored, it can ensure the start-up of the auxiliary power
- 蓄电池供电保障列车牵引用电需求，能满足在特定条件下列车在平直轨道上的牵引速度和距离要求，在蓄电池用做牵引时可保障基本的DC110V负载工作，同时保障紧急负载正常工作。
- The battery power supply guarantees the power demand for train traction, and can meet the traction speed and distance requirements of the loaded train on the straight track under certain conditions. When the battery is used for traction, it can guarantee the basic DC110V load operation, and at the same time ensure the normal operation of the emergency load.
- 在列车休眠状态下，蓄电池供电保障给所需负载，并在休眠后能通过辅助空压机工作并进行升弓。
- In the dormant state of the train, the battery supplies power to the required loads, and after the dormancy, the auxiliary air compressor can work and raise pantograph.
- 型号规格  
型号规格见表1
- Model specifications  
Model specifications see Table 1

表1 蓄电池型号规格表

Table 1 Model: Specifications of Batteries for Railway Electric Locomotives

| 蓄电池型号<br>Model | 额定电压(V)<br>Voltage(V) | 额定容量 (Ah)<br>Capacity(Ah) |                       | 外形尺寸(mm)<br>Dimensions(mm) |        |        |               | 最大重量(Kg)<br>Weight(Kg) | 内阻(mΩ)<br>Internal Resistance (mΩ) |
|----------------|-----------------------|---------------------------|-----------------------|----------------------------|--------|--------|---------------|------------------------|------------------------------------|
|                |                       | C <sub>5</sub> /1.75V     | C <sub>1</sub> /1.70V | 长<br>L                     | 宽<br>W | 高<br>H | 总高<br>Total H |                        |                                    |
| DTM-120-3      | 2                     | 120                       | 84                    | 99                         | 152    | 322    | 331           | 10.5                   | ≤0.90                              |
| DTM-140-3      | 2                     | 140                       | 98                    | 111                        | 152    | 322    | 331           | 12.0                   | ≤0.85                              |
| DTM-160-3      | 2                     | 160                       | 112                   | 123                        | 152    | 322    | 331           | 13.5                   | ≤0.80                              |
| DTM-180-3      | 2                     | 180                       | 126                   | 135                        | 152    | 322    | 331           | 15.0                   | ≤0.75                              |
| DTM-200-3      | 2                     | 200                       | 140                   | 147                        | 152    | 322    | 331           | 16.5                   | ≤0.70                              |
| DTM-220-3      | 2                     | 220                       | 154                   | 159                        | 152    | 341    | 350           | 18.0                   | ≤0.65                              |
| DTM-240-3      | 2                     | 240                       | 168                   | 147                        | 152    | 356    | 365           | 19.5                   | ≤0.60                              |
| DTM-140-3W     | 2                     | 140                       | 98                    | 93                         | 160    | 431    | 440           | 12.0                   | ≤0.85                              |
| DTM-160-3W     | 2                     | 160                       | 112                   | 93                         | 160    | 431    | 440           | 13.5                   | ≤0.80                              |
| DTM-180-3W     | 2                     | 180                       | 126                   | 93                         | 160    | 475    | 484           | 15.0                   | ≤0.75                              |
| DTM-200-3W     | 2                     | 200                       | 140                   | 93                         | 160    | 520    | 529           | 16.5                   | ≤0.70                              |

注：外形尺寸±2mm；  
Note: Dimensions ± 2mm;

- 主要车型：  
Main models:
- A型地铁列车：一列车采用两组DTM系列电池。主要运行项目业绩：广州1号线、广州2号线、广州8号线、深圳2号线、深圳5号线、深圳7号线、武汉8号线、石家庄1号线、石家庄2号线、石家庄3号线等；
- Type A subway train: one train uses two sets of DTM series batteries. Performance of major operating projects: GuangzhouLine 1, Guangzhou Line 2, Guangzhou Line 8, Shenzhen Line 2, Shenzhen Line 5, Shenzhen Line 7, WuhanLine 8, Shijiazhuang Line 1, Shijiazhuang Line 2, Shijiazhuang Line 3, etc.;
- B型地铁列车：一列车采用两组DTM系列电池。主要运行项目业绩：北京7号线、北京房山线、天津4号线、天津10号线、广州7号线、广州9号线、广州14号线、武汉2号线、武汉3号线、武汉6号线、昆明1号线、昆明3号线、昆明6号线、南京4号线、重庆1号线、重庆6号线、杭州4号线、杭州6号线、绍兴1号线、长沙1/2/3/4/5号线、贵阳1号线、贵阳2号线、厦门1号线、厦门2号线、厦门3号线、长春1号线、长春2号线、南昌2号线、徐州1号线、徐州2号线、东莞2号线、合肥1/2/3/4/5号线、大连3号线等。
- Type B subway train: one train uses two sets of DTM series batteries. Performance of major operating projects: Beijing Line 7, BeijingFangshan Line, Tianjin Line 4, Tianjin Line 10, Guangzhou Line 7, Guangzhou Line 9, Guangzhou Line 14, Wuhan Line 2, Wuhan Line 3, Wuhan Line 6, Kunming Line 1, Kunming Line 3, Kunming Line 6, Nanjing Line 4, ChongqingLine 1, Chongqing Line 6, Hangzhou Line 4, Hangzhou Line 6, Shaoxing Line 1, Changsha Line 1/2/3/4/5, Guiyang Line 1, Guiyang Line 2, Xiamen Line 1, Xiamen Line 2, Xiamen Line 3, Changchun Line 1, Changchun Line 2, Nanchang Line 2 Line, Xuzhou Line 1, Xuzhou Line 2, Dongguan Line 2, Hefei Line 1/2/3/4/5, Dalian Line 3, etc.





## CM-KGCF40系列智能型充放电电源

### CM-KGCF40 Series Intelligent Recharging/discharge Power Supply

#### 产品特点

#### Product features

- 可实现静电、充电、放电、反充电等多种控制方式。
  - Multiple control models, such as static, recharging, discharge and reverse recharging models.
- 可设置脉宽/脉幅，实现脉冲充电。
  - Setting pulse width/amplitude to realize pulse recharging.
- 具有恒流、恒压、恒压限流、恒流限压充电；恒流放电等多种工作方式。
  - Multiple operation models: constant current charging, constant voltage charging, constant voltage and limited current charging, constant current and limited voltage charging and constant current discharging.
- 具有定时间、电压等阶段转换方式，实现自动转换。
  - Fixed time and voltage transfer model to realize automatic transfer function.
- 具有掉电存储功能，来电自动恢复到掉电前工作状态，实现无人值守。
  - The storage function in case of power cutoff to finish the original status and realize unmanned shift.
- 具有过流、过压、过温、断流、欠压及设备故障的报警、显示功能。
  - The alarm and display functions of over-current, over-voltage, excess temperature, current breaking, under-voltage and equipment fault.
- 可接蓄电池巡检仪，检测单体电池电压。（选配）
  - Can connect with the patrolling inspector of accumulator and inspect the voltage of monomer battery (optional).
- 可采用工业触摸屏监控，实现脉冲充电、设备安时数、设置循环起始点、设置循环次数，与温度补偿。（选配）
  - The industrial touch screen realize pulse recharging, equipment Ampere setup, circulation start point setup, circulation frequency setup and make temperature compensation (optional).
- 可通过与PC机接口，实现多台电源的集中控制和数据处理，记录、存储、打印当前历史数据曲线。（选配）
  - Can be connected with PC computer, realize concentrated control and data processing of numerous power supplies, record, store and print the existing historical data curve (optional).



## FRJT系列静调电源柜

### FRJT series static- adjustment power supply cabinet

#### Functions features of static- adjustment power supply cabinet

- 工作电源分1500V（750V）直流电源和220V交流两部分。其中1500V（750V）直流电源引自库内接触网隔离开关，220V交流电源引自车辆基地混合变电所或跟随所。
  - The working power supply includes 1500V（750V）DC and 220V AC types. To be specific, the former is introduced from the catenary isolating switch in garage while the latter from the hybrid substation or following station in the vehicle base.
- 静调电源柜通过从外部获得DC1500V（750V）电源和220V电源，输出满足车辆要求的DC1500V（750V）和DC110V，连接到车辆侧的插座。
  - The cabinet outputs DC1500V（750V）and DC110V meeting vehicles' requirements by obtaining DC 1500V（750V）and 220V power externally, and is connected to the socket on vehicle side.
- 电源柜具有接地、过流、过载、过压、欠压、过热等相应的保护措施。
  - The cabinet is fitted with corresponding protection measures for grounding, overcurrent, overload, overvoltage, undervoltage, overheating, etc.
- 具有人员及设备安全联锁控制及保护功能，设备采用无损保护，并有明显的工作状态指示功能。
  - With safety interlock control and protection functions for personnel and equipment, the cabinet is designed with non-destructive protection and obvious working status indication function.
- 设有紧急按钮，在紧急状态下可通过按压车库内任意一个紧急按钮使车库内电源设备停止工作。当紧急按钮动作后，有蜂鸣器进行报警，报警必须手动复位才能解除，复位按钮设于柜体面板上。
  - Any of the cabinet's emergency buttons inside the garage can be pressed under emergencies to stop the working power equipment inside the garage. After the emergency button is activated, the buzzer will give out an alarm. The alarm cannot be released until resetting is made manually. The reset button is set on the cabinet panel.
- 通过电磁接触器、直流快速断路器通断1500V（750V）电源，直流快速断路器具有快速分断能力，在下级负载短路的情况，可快速、自动分断1500V（750V）电源，避免对电网造成破坏。
  - The 1500V（750V）power supply can be switched on/off through the electromagnetic contactor and the DC fast circuit breaker. The DC fast circuit breaker has fast breaking capacity. In case of short circuit occurred to the lower load, the 1500V（750V）power supply can be quickly and automatically cut off to avoid damaging the power grid.
- 使用安全，具有列车连接线漏电保护功能，当连接线绝缘层超阈值或破损等情况时，可自动分断1500V（750V）电源，以确保人身安全。
  - Ensuring use safety, the cabinet has the leakage protection function of train connection line so it can automatically cut off the 1500V（750V）power supply when the insulating layer of connecting line exceeds





产品介绍 Product introduction

钠离子电池主要结构包括正极、负极、电解液、隔膜和集流体，其中，正极采用含钠的层状金属氧化物或聚阴离子材料，负极采用硬碳材料。钠离子电池为“摇椅式电池”，工作原理是利用钠离子在正负极之间嵌脱过程实现充放电。钠离子电池安全性高、高低温适应范围广、倍率性能优异，在轨道交通、储能、数码产品、电动工具、电动汽车、电动两轮车等领域具有广阔的应用前景。我公司生产的钠离子电芯共有三种型号，分别为71173204E-220方形电芯、18650E-1500圆柱电芯和26700E-3500圆柱电芯。

The main structure of the sodium-ion battery includes a positive electrode, a negative electrode, electrolyte, a diaphragm and a current collector. Among them, the positive electrode is made of laminated metal oxide or polyanionic material containing sodium, and the negative electrode is made of hard carbon material. The sodium-ion battery is a "rocking chair battery". Its working principle is charging and discharging by using the process of deintercalation of sodium ions between the positive and negative electrodes. Sodium-ion batteries have high safety, adapt to a wide range of high and low temperatures, and have excellent rate capacity. They have broad application prospects in the fields such as rail transit, energy storage, digital products, electric power tools, electricvehicles, and electric two-wheel vehicles. Sodium ion cells produced by our company have three models, including 71173204E-220 square cells, 18650E-1500 cylindrical cells and 26700E-3500 cylindrical cells.

产品特点 Product feature

- 安全性能优异，在过充放电、短路、外力破坏等测试中无起火、无爆炸发生；
  - They have excellent safety performance. No fire or explosion occurred in the tests such as overcharge and discharge, short circuit and damage by external force;
  - 低温性能好，-20℃下容量保持率在90%左右，-40℃时容量仍能保持70%左右；
  - They have good low temperature performance. The capacity retention ratio is about 90% at -20℃and the capacity retention ratio is still about 70% at -40℃;
  - 工作温度区间广，-40～80℃均可正常使用，适合不同环境与地区的工作需求；
  - The operating temperature range is wide. At the temperature from -40 to 80℃, it can be used properly. It can meet the work demands in different environments and regions;
  - 循环寿命长：其循环次数可达3000次左右，且容量保持率≥80%；
  - Long cycle life: The number of cycles can be up to about 3,000 and the capacity retention ratio is equal to or greater than 80%;
  - 倍率性能优异，可高倍率快速充电，充电15分钟即可恢复80%电量。
  - With excellent rate performance, it can charge fast at a high rate. After charging for 15 minutes, 80% of battery power can be restored.

钠离子电池电芯主要参数

Main parameters of sodium-ion battery cell



|                                    |   |
|------------------------------------|---|
| 型号<br>Model                        | 71173204E-220   |
| 标称容量<br>Nominal capacity           | 220Ah@1C<br>215Ah@2C  |
| 标准电压（V）<br>Standard voltage (V)    | 3.2   |
| 工作电压（V）<br>Operating voltage (V)   | 1.5~4.0   |
| 重量 / 单个电芯（kg）<br>Weigh/cell (kg)   | 4.9±0.5   |
| 电芯尺寸（mm）<br>Dimension of cell (mm) | W 173.60± 0.50<br>D 71.25 ± 0.50<br>H 203.70 ± 0.50           |
| 能量密度<br>Energy density             | 166Wh/Kg  |
| 循环寿命<br>Cycle life                 | 3000次<br>3000times  |
| 工作温度<br>Operating temperature      | 充电：0~55℃<br>Charge: 0~55℃<br>放电：-40~80℃<br>Discharge: -40~80℃ |



|                                    |   |
|------------------------------------|---|
| 型号<br>Model                        | 18650E-1500   |
| 标称容量<br>Nominal capacity           | 1500mAh@1C<br>1450mAh@2C  |
| 标准电压（V）<br>Standard voltage (V)    | 3.1   |
| 工作电压（V）<br>Operating voltage (V)   | 1.5 ~ 4.1   |
| 重量/单个电芯（g）<br>Weight/cell (g)      | 37.00 ± 0.50  |
| 电芯尺寸（mm）<br>Dimension of cell (mm) | D 18.40±0.10<br>H: 65.30±0.10                                     |
| 能量密度<br>Energy density             | 128Wh/Kg  |
| 循环寿命<br>Cycle life                 | 3000 次<br>3000 times  |
| 工作温度<br>Operating temperature      | 充电：0~55℃<br>Charge: 0 ~ 55℃<br>放电：-40~80℃<br>Discharge: -40 ~ 80℃ |



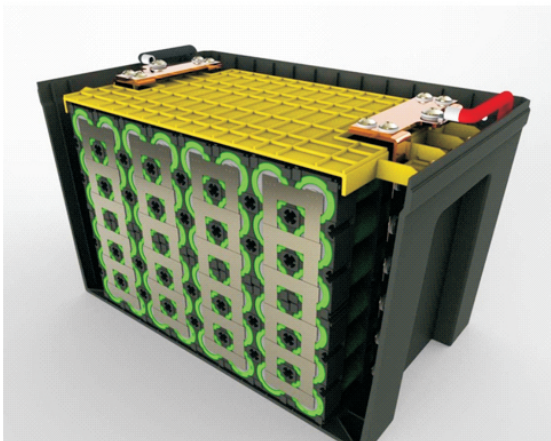
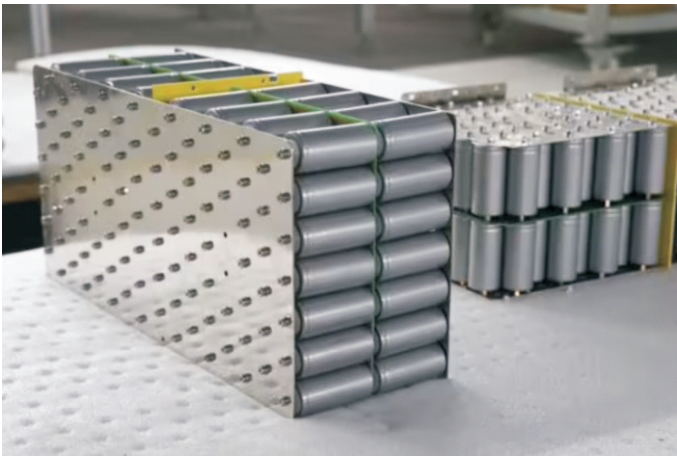
|                                    |   |
|------------------------------------|---|
| 型号<br>Model                        | 26700E-3500   |
| 标称容量<br>Nominal capacity           | 3500mAh@1C<br>3450mAh@2C  |
| 标准电压（V）<br>Standard voltage (V)    | 3.1   |
| 工作电压（V）<br>Operating voltage (V)   | 1.5~4.0   |
| 重量/单个电芯（g）<br>Weight/cell (g)      | 81.00±0.50  |
| 电芯尺寸（mm）<br>Dimension of cell (mm) | D 26.40±0.10<br>H 71.00±0.10                                    |
| 能量密度<br>Energy density             | 135Wh/Kg  |
| 循环寿命<br>Cycle life                 | 3000 次<br>3000 times  |
| 工作温度<br>Operating temperature      | 充电：0~55℃<br>Charge: 0 ~ 55℃<br>放电：-40~80℃<br>Discharge: -40~80℃ |



钠离子电池模组示例 Example of sodium-ion battery module

110V 230AH的电力机车电池模组和110V 180AH的轨道交通电池模组示例：模组规格为1P35S，其基本组成包括：模组控制器（BMS板）、单体电芯、导电连接件、塑料框架、冷板、冷却管道、两端的压板以及一套将这些构件组合到一起的紧固件。模组在设计时充分考虑了使用工况、机械强度、电性能、散热性能等因素，具有良好的固定和保护电芯的作用，并能满足对载流性能和温度控制的要求。

Examples of 110V 230AH electric locomotive battery module and 110V 180AH rail transit battery module: The specification of the module is 1P35S. It is composed of module controller (BMS board), single cell, conductive connector, plastic frame, cooling plate, cooling duct, pressing plates on both ends, and a set of fasteners to combine these components. In the design of the module, sufficient consideration is given to factors such as use conditions, mechanical strength, electrical performance, and heat dissipation performance. It can fix and protect the battery cell and meet the requirements for current carrying performance and temperature control.



钠电示例模组主要参数 Main parameters of example model of sodium-ion battery

|  |   |                      |
|--|---|----------------------|
| 钠电模组示例<br>Example of sodium-ion battery  | 110V 230Ah  | 110V 180Ah           |
| 应用领域<br>Field of application             | 电力机车<br>Electric locomotive                                   | 轨道交通<br>Rail transit |
| 单体电芯规格<br>Specification of a single cell | 3.2V 220Ah，数量：35 个<br>3.2V 220Ah, quantity: 35                |                      |
| 排布方式<br>Arrangement mode                 | 1P35S   |                      |
| 标称电压<br>Nominal voltage                  | 110V  |                      |
| 工作电压范围<br>Range of operating voltage     | 90V~120V  |                      |
| 能量(KWh)<br>Energy (KWh)                  | 25.3  | 19.8                 |
| 工作温度<br>Operating temperature            | 充电：0~55℃<br>Charge: 0~55℃<br>放电：-30~60℃<br>Discharge: -30~60℃ |                      |
| 重量(kg)<br>Weight (kg)                    | 172.5   |                      |
| 尺寸 (mm)<br>Dimension(mm)                 | W   | 688 ± 0.50           |
|  | D   | 258 ± 0.50           |
|  | H   | 234 ± 0.50           |

产品介绍 Product introduction

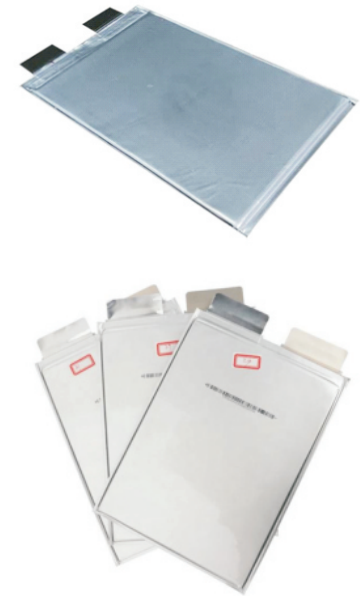
固态锂电池电芯型号为11161210-30AH。固态锂电池不同于常规锂电池，其电解质采用凝胶态混合固液电解质，具有体积小、重量轻、循环性能好、安全可靠等优点，可广泛应用于轨道交通、电动汽车和以电源为中心的智能家居产品等领域，同时也可以应用于航空、军用等高要求的场合，具有广阔的发展前景。

The model of solid-state lithium battery cell is 11161210-30AH. Solid-state lithium battery is different from conventional lithium battery. Its electrolyte is gel-state mixed solid-liquid electrolyte. It is characterized by a small volume and weight, good cycle performance, safety, reliability, etc. It can be widely used in fields such as rail transit, electric vehicles and smart household products centered on power. It can be also used in occasions with high demands such as aviation and military use. It has wide prospect for future development.

产品特点 Product feature

- 能量密度高：275Wh/kg~290Wh/kg，第二代半固态电池单体能量密度可达到360Wh/kg；
- High energy density: 275Wh/kg~290Wh/kg. The energy density of the second generation of single semi-solid battery is up to 360Wh/kg;
- 使用SI材料，耐过放电压低，电芯可安全放电至2.5V；
- SI material is used. The over-discharge protection voltage is low. The battery can be safely discharge to 2.5V;
- 循环寿命长：其寿命比传统锂电池延长10-20%；
- Long cycle life: Its life is 10-20% longer than that of traditional lithium batteries;
- 电池低温性能好，相比普通电池在-20℃下放电性能提升10%以上；
- The low-temperature performance of the battery is good. The discharge performance at -20℃ is 10% higher than that of ordinary batteries;
- 结构紧凑，体积小、重量轻，可以更好地满足应用要求和定制需求；
- With a compact structure and a small size and weight, it can meet the application requirements and customization demands;
- 安全性能好，可搭配智能保护板BMS。
- With good safety performance, it can match with BMS of intelligent protection board.

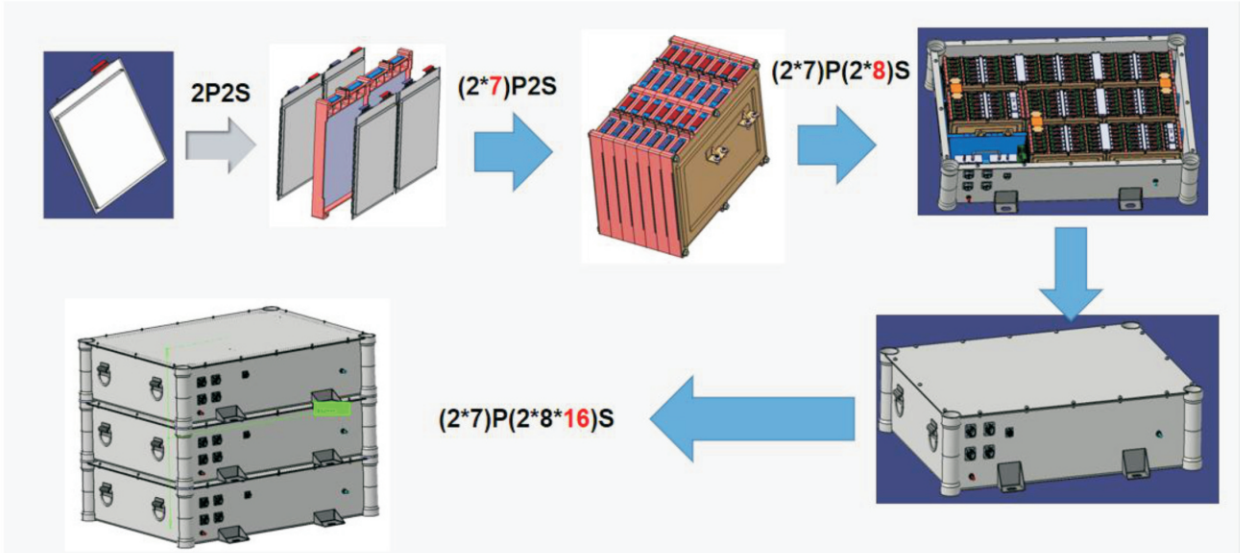
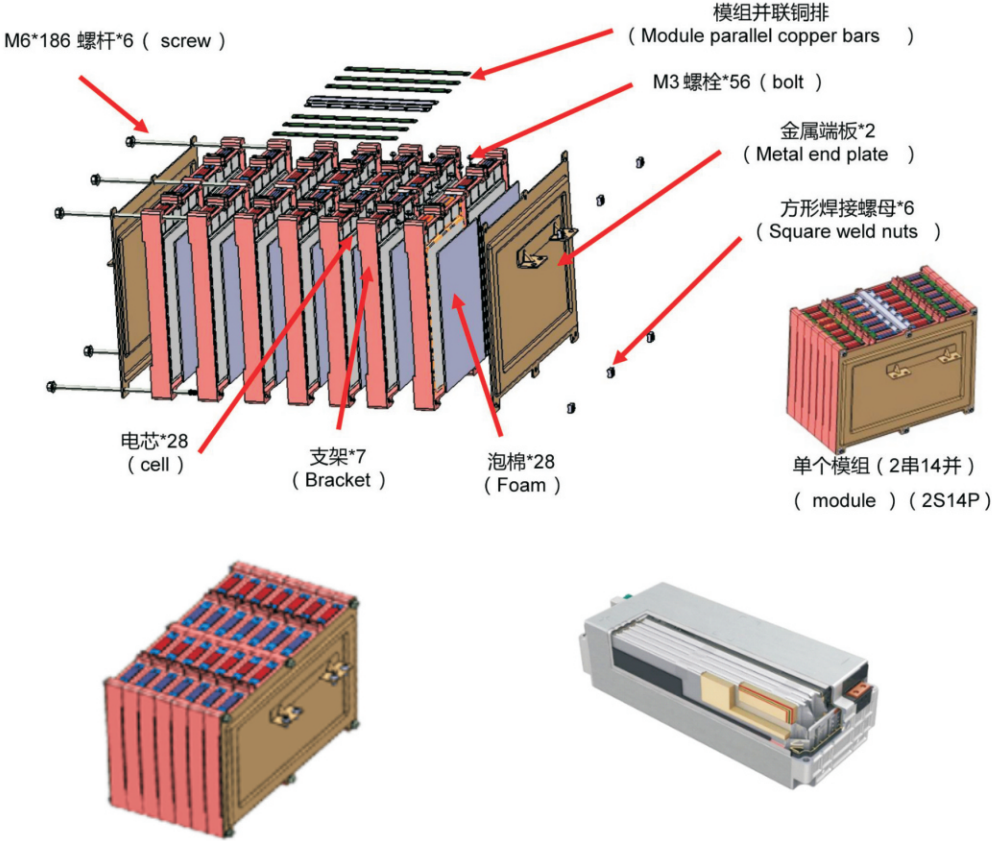
固态锂电池电芯主要参数 Main parameters of solid-state lithium battery cell



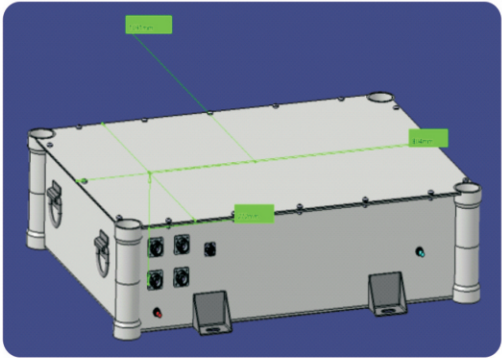
|                                     |   |
|-------------------------------------|---|
| 型号<br>Model                         | 11161210-30Ah   |
| 标准容量<br>Standard capacity           | 30Ah  |
| 标准电压<br>Standard voltage            | 3.2V  |
| 工作电压 (V)<br>Operating voltage (V)   | 1.5~4.0   |
| 电芯尺寸 (mm)<br>Dimension of cell (mm) | W 161±0.50<br>D 11 ± 0.50<br>H 210±0.50                           |
| 能量密度<br>Energy density              | 280Wh/Kg  |
| 循环寿命<br>Cycle life                  | 3000次<br>3000 times   |
| 环境温度<br>Ambient temperature         | 充电：-10~50℃<br>Charge: -10~50℃<br>放电：-40~65℃<br>Discharge: -40~65℃ |
| 标准充/放电<br>Standard charge/discharge | 1C/1C   |



固态锂电池模组主要参数 Main parameters of solid-state lithium battery module



|  |   |
|--|---|
| 固态锂电池模组示例<br>Example of solid-state lithium battery module | 6.4V 420Ah  |
| 应用领域<br>Field of application                               | 轨道交通项目<br>Rail transit project<br>机车牵引<br>Locomotive traction |
| 单体电芯规格<br>Specification of a single cell                   | 3.2V 30Ah, 数量: 28 个<br>3.2V 30Ah, quantity: 28                |
| 排布方式<br>Arrangement mode                                   | 14P2S   |
| 标称电压<br>Nominal voltage                                    | 6.4V  |
| 工作电压范围<br>Range of operating voltage                       | 5.4V~8.0V   |
| 能量(KWh)<br>Energy(KWh)                                     | 2.688   |
| 工作温度<br>Operating temperature                              | -30~55℃   |
| 重量(kg)<br>Weight(kg)                                       | 30  |
| 尺寸 (mm)<br>Dimension(mm)                                   | W 360±0.50<br>D 262±0.50<br>H 272±0.50                        |



- ▶ 产品由电池模组、电池管理系统、继电器、熔断器以及结构件等构成。每个电池模组包含若干个电池电芯，通过串并联连接成组。  
The product consists of battery module, battery management system, relay, fuse, structural components, etc. Each battery module contains several battery cells which are connected in series and in parallel.
- ▶ 具备电池温度采集、单体电压采集  
It can collect battery temperature and voltage of a single battery
- ▶ 具备均衡功能  
It has equalization function
- ▶ 具备CAN通信功能  
It has CAN communication function
- ▶ 具备液冷系统  
It has the liquid cooling system