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TIEON
泰昂能源



The third-generation DC power system GQH-PB parallel intelligent DC power system

- It solves the problem "single fault point determines the operation of DC power" of series battery pack, and increase the reliability
- Multibank parallel modular design, the capacity of single battery is checked automatically in energized state, which achieves free maintenance.
- The system achieves combined use of new and used batteries, the single storage battery can be replaced as required for fully using the resource.
- The distributed DC power solution perfectly matches with the constructional demands of the new generation of intelligent transformer substations





| Safe•Reliable •Convenient •Intelligent |

Shenzhen Tieon Energy Technology Co., Ltd., established in 2001 with the registered capital of 50,000,000 Yuan, is a leading specialized supplier of power supply and distribution solutions in China. Its headquarters is located in the High and New Tech Industrial Park of Nanshan District and serves as the R&D Center and marketing management center of the Company. The production base located in Jixi Eco-industrial Park in the south of Anhui Province, which covers a land area of over 60,000m². There are more than 400 employees in the Company presently, among which professionals account for more than 35%. The Company is a national high and new technology enterprise integrating research, development, production, sales and service.

In terms of technical innovation, the Company holds onto the concept of "Safe•Reliable •Convenient •Intelligent" and bases itself upon the independent intellectual properties, and a superexcellent R&D team capable of comprehensive software/hardware development in the Company. Correlated products, such as AC/DC integrated power system, DC power system and intelligent modular precise power distribution system had obtained 3 national patents of inventions and 35 patents of utility models, and 17 patents of inventions had entered into the phase of substantive examination. Correlated products had passed TUV, type tests, China 3C and Tai'er Certifications.

Over a decade, the Company has pursued the development vision "Make power utilization easier", always insists on its mission "to provide safe and intelligent power utilization solution and service", and intends on the research, development, production and service of the products of power supply and distribution systems.

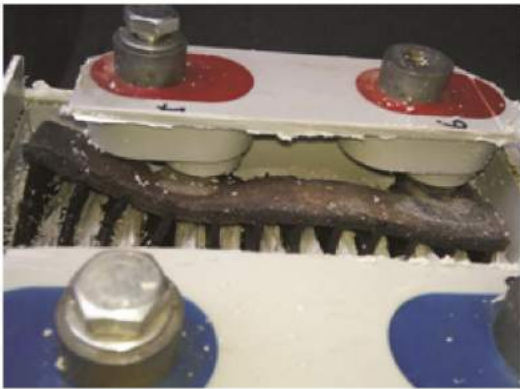
Totalling over 4000 transformer substation products, including 7 ultra-high voltage transformer substations of 1000kV each; 35 converter stations of ± 800 kV, ± 660 kV, ± 500 kV and ± 400 kV each; 4 transformer substations of 750kV each; over 150 transformer substations of 500kV each, over 1000 transformer substations of 220kV each, and over 2,360 transformer substations of 110kV each, had been put into operation by the end of 2013. The performances of integrated power solutions cover all provinces, municipalities and autonomous regions in China, also other 7 countries.

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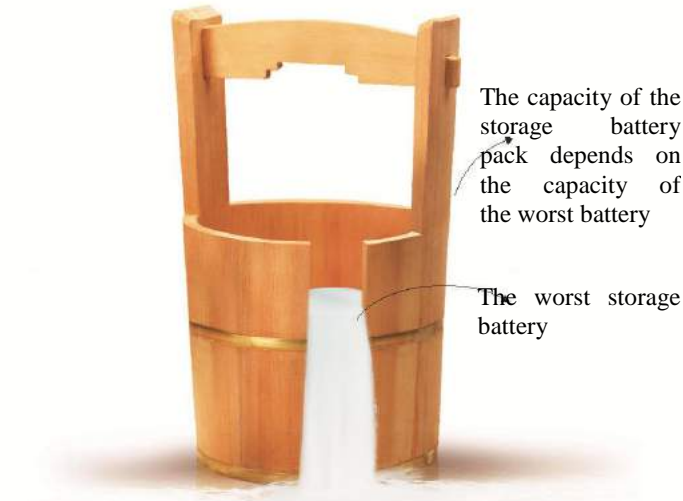
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Problems existing in traditional DC power systems

■ So long as any point in the storage battery pack is open-circuited, the entire storage battery pack will fail to power the loads, and a loose connection point is also likely to cause a fire accident.



■ The gross capacity of the storage battery pack depends on the capacity of the worst battery



■ It is hard to expand the capacity of existing substation systems
Due to insufficient direct-current system capacity resulting from quick increase in power load, modification is required to replace some equipment of the system with new one, resulting in long capacity-expansion construction period and severe wasting of resources.



■ Series application requires high consistency and rigorous matching-up of the batteries. The entire storage battery pack must be replaced even if only one single battery is damaged, and batteries kept in roughly good condition have to be discarded thereupon.

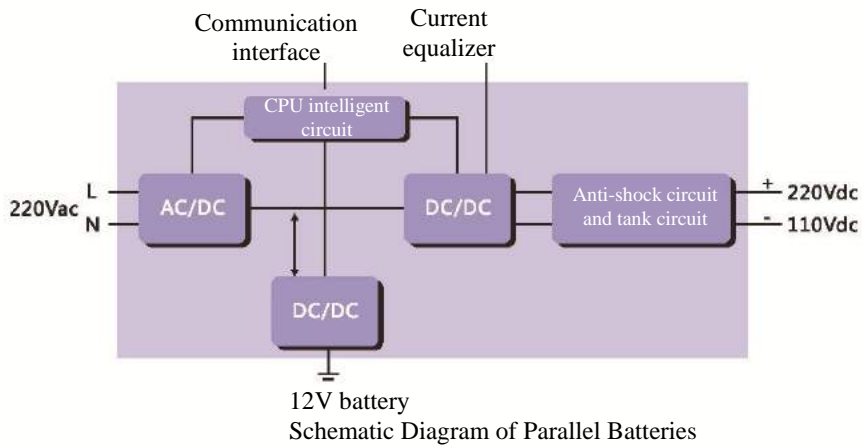


■ Storage batteries of the existing direct-current systems of transformer substations do not allow to check and measure the full-capacity in energized state, and the storage batteries can hardly be replaced in energized state. Storage battery packs require regular discharge tests intended for capacity checking, resulting in a high capacity-checking workload and long period !



Solutions of Tieon Energy

■ Parallel intelligent storage battery pack



Picture of parallel battery

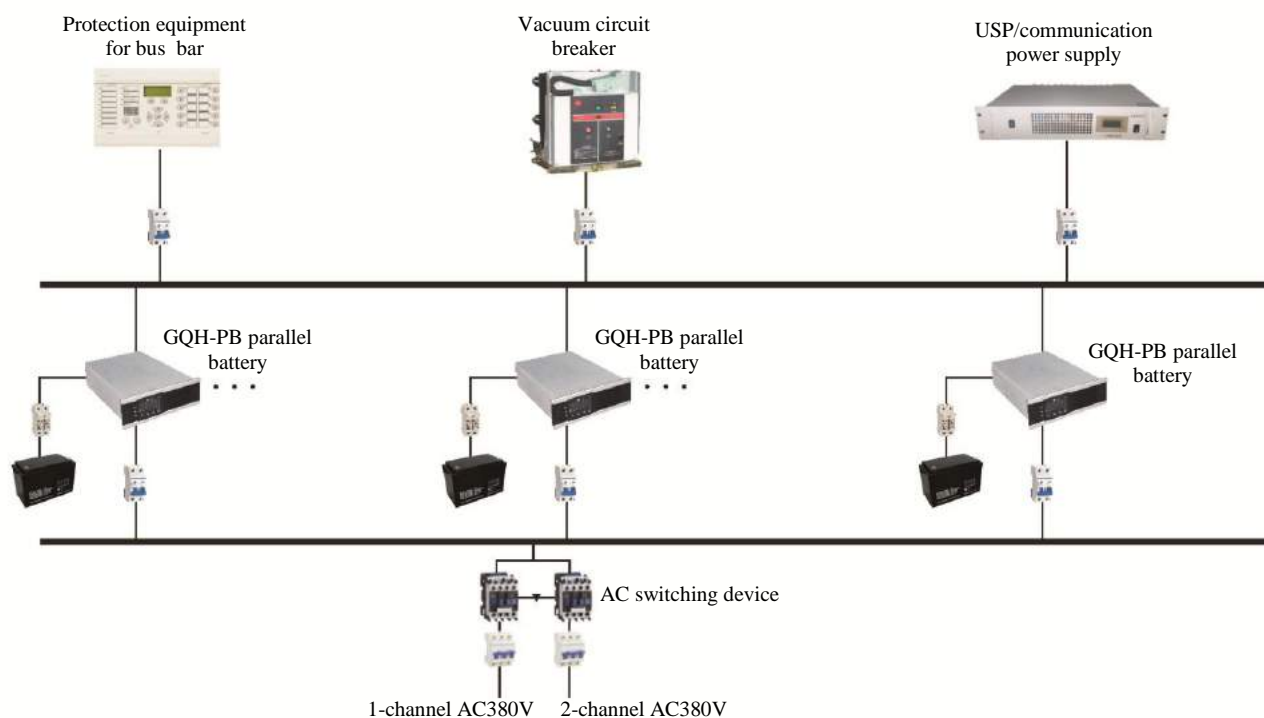
■Technology indices of parallel intelligent storage battery packs

Model	IPM-PB22002	IPM-PB11004
Power (VA/W)	500	
AC input characteristics		
Rated input voltage	220Vac single-phase	
Rated operating frequency	50Hz	
Input voltage range	150V~295Vac	
Input frequency range	49 HZ~55 HZ	
Max. AC input	8.5A	
Current input/output characteristics		
Battery input voltage	10.8Vdc~14.1Vdc	
Battery input current	0~50A	
Charging voltage output	8 ~ 15Vdc continuously adjustable	
Charging current-limiting output	0~20 continuously adjustable	
Charging voltage ripple	≤120mVp-p	
Output characteristic		
Rated output voltage	220Vdc	110Vdc
Rated output current	2A	4A
Max. power output	200ms: 3300W; 60s: 1100W	
Module starting time	3~8S	
Total regulation	≤±0.5%	
Dynamic regulation	Range ≤±5%, recovery time ≤100mS	
Output ripple	Effective value ≤0.5%, peak to peak value ≤1%	
Power	≥85%	
Power factor	>0.95	

■ System solution

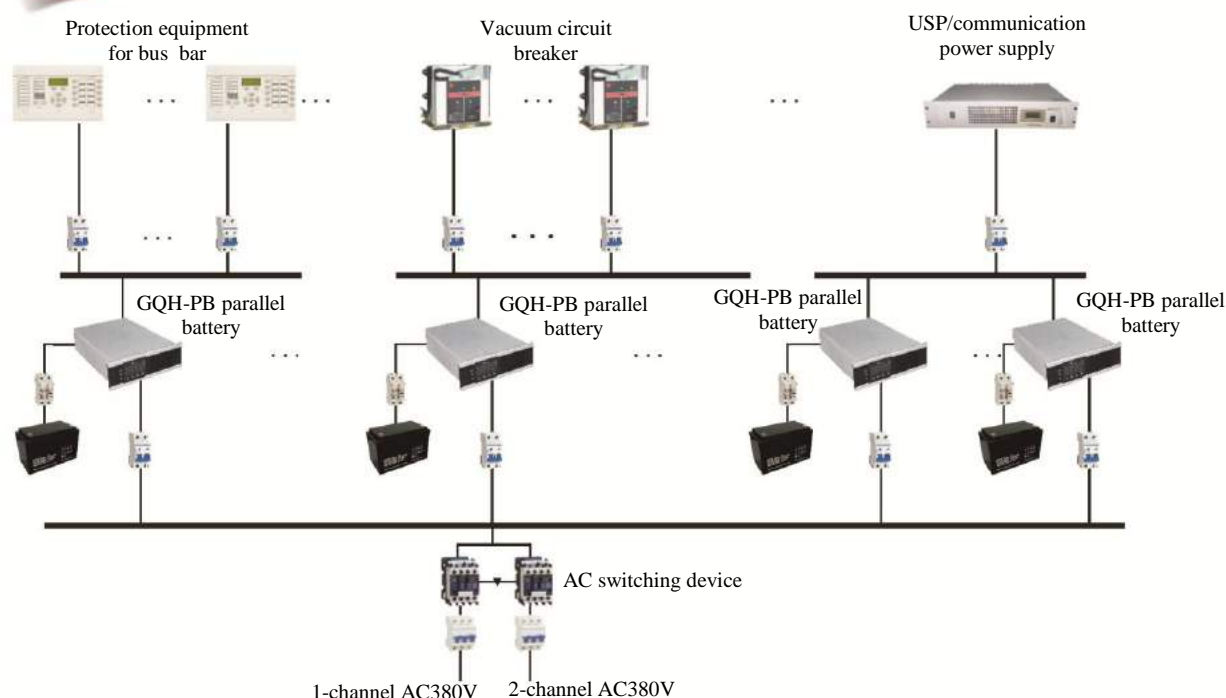
The parallel intelligent battery DC power system is extensively applicable to all classes of transformer substations of 220kV, 110kV, 66kV and 35kV each, other users using DC equipment (for example, DC system of 20kV, 10kV switch stations of distribution grid), and such applications as ON/OFF switches and the instruments, meters, relay protection and fault lighting of the secondary circuit etc.

Centralized DC scheme



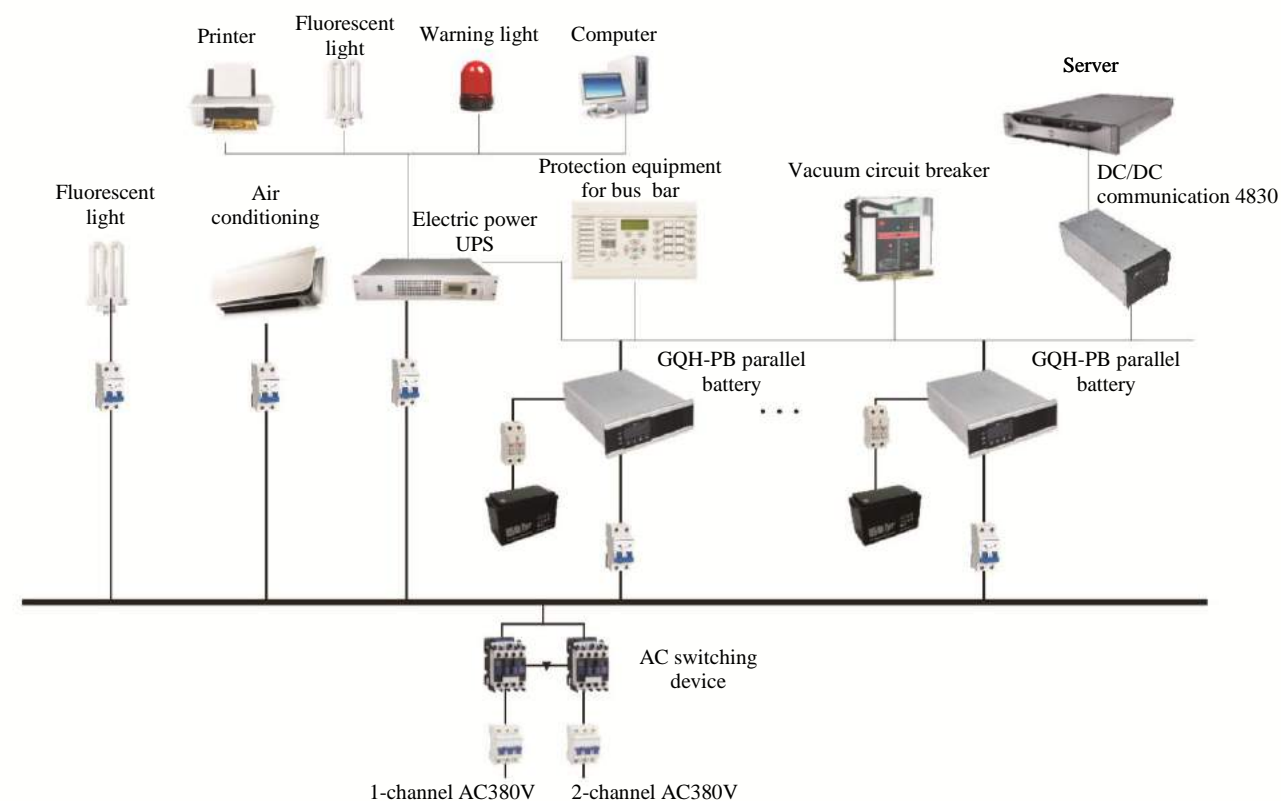
Intelligent storage battery pack + battery + monitoring system is adopted to take the place of configuration method of traditional direct-current system high frequency power source module + storage battery pack + voltage-regulating silicon chain + monitoring system. Indirect parallel application of the batteries is implemented to avoid the consistency requirements for series connection of batteries in traditional direct-current systems, and eliminate the disadvantages of problems in maintenance and low reliability

Distributed DC power scheme



Achieve in-situ installation of DC power, reduce the occurrence probability of insulation faults, minimize the workload of DC cable laying and battery room, and greatly reduce the system procurement cost and maintenance workload.

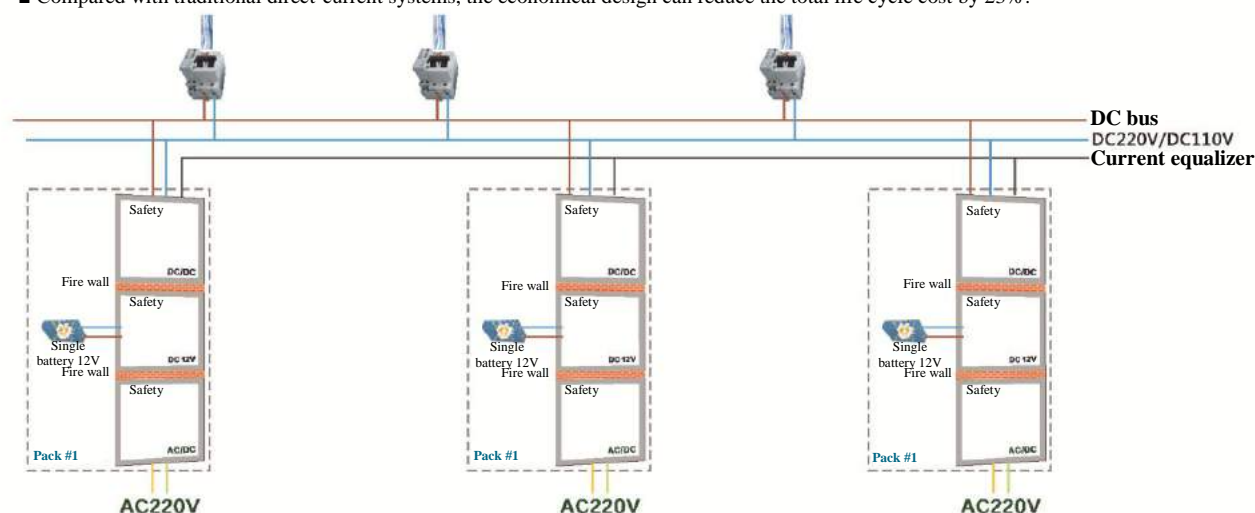
■ Distribution-grid Parallel intelligent AC/DC integrated power scheme



System features: Based on the technology of parallel intelligent batteries, alternating-current distribution, UPS power and communication power supply, implement distribution-grid station-service AC/DC integrated design. The system is provided with such advantages as full-capacity measurement, compactness, high intellectualization level, safety, reliableness, capable of distribution-grid battery automatic capacity checking in energized state, and capable of battery health monitoring in energized state.

Create value for customers

- Solve the task effect that the performance of a single battery in the existing direct-current system determines the capacity of the entire storage battery pack, such that the system continues working normally in case single battery/module gets exceptional/faulty so as to improve the operational reliability of the direct-current system;
- The modules and batteries are combined in one-to-one mode, and meticulous entire life-cycle battery management and real-time battery performance monitoring in energized state can improve the battery service life and system reliability;
- The modular design of the system can facilitate the operation and maintenance, such that inspection and non-power-outage replacement of batteries and battery full-capacity measurement in energized state can be implemented in order to greatly reduce the maintenance efforts of the operating enterprise.
- The relatively independent battery room allows combined use of batteries (new and old batteries, batteries of different brands or different types), so as to improve the utilization rate of batteries, and achieve full utilization of resources, economical efficiency and environment friendliness;
- The modular design of the system allows distributed in-situ configuration of DC power, and conform to the principle for construction of a new generation of intelligent transformer substations of the state grid;
- Compared with traditional direct-current systems, the economical design can reduce the total life cycle cost by 23% !

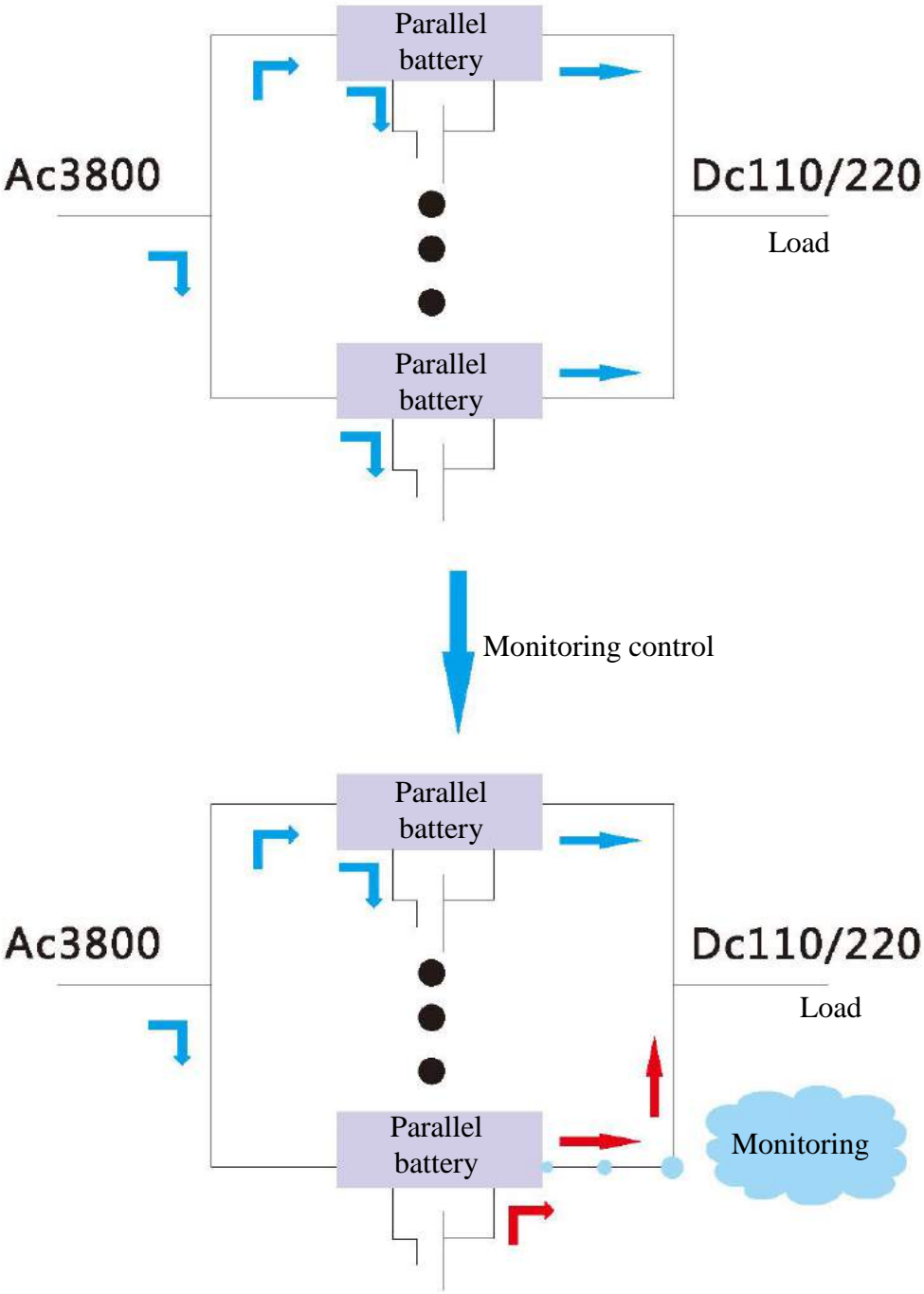


Storage battery pack #1: Panasonic lead-acid battery 12V, 1 piece, made in 2010

Storage battery pack #2: Sonnenschein lead-acid battery 12V, 1 piece, made in 2008

Storage battery pack #M: Yuasa lead-acid battery 12V, 1 piece, made in 2009

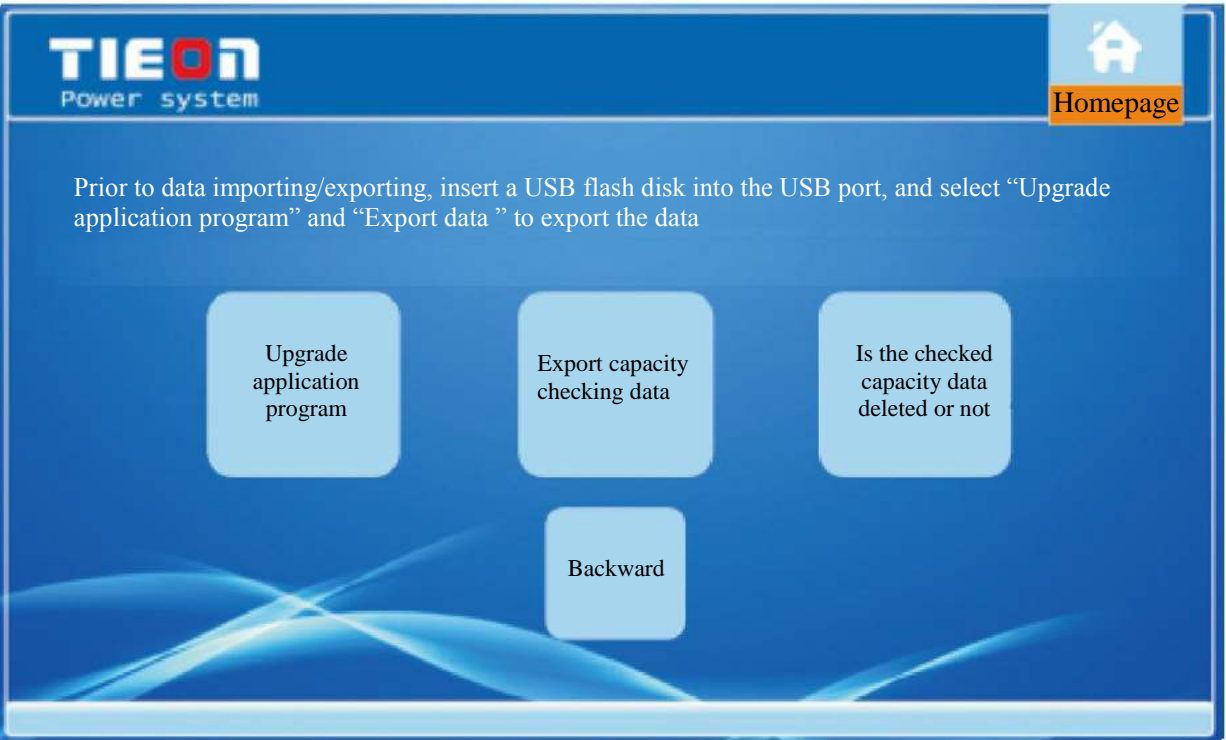
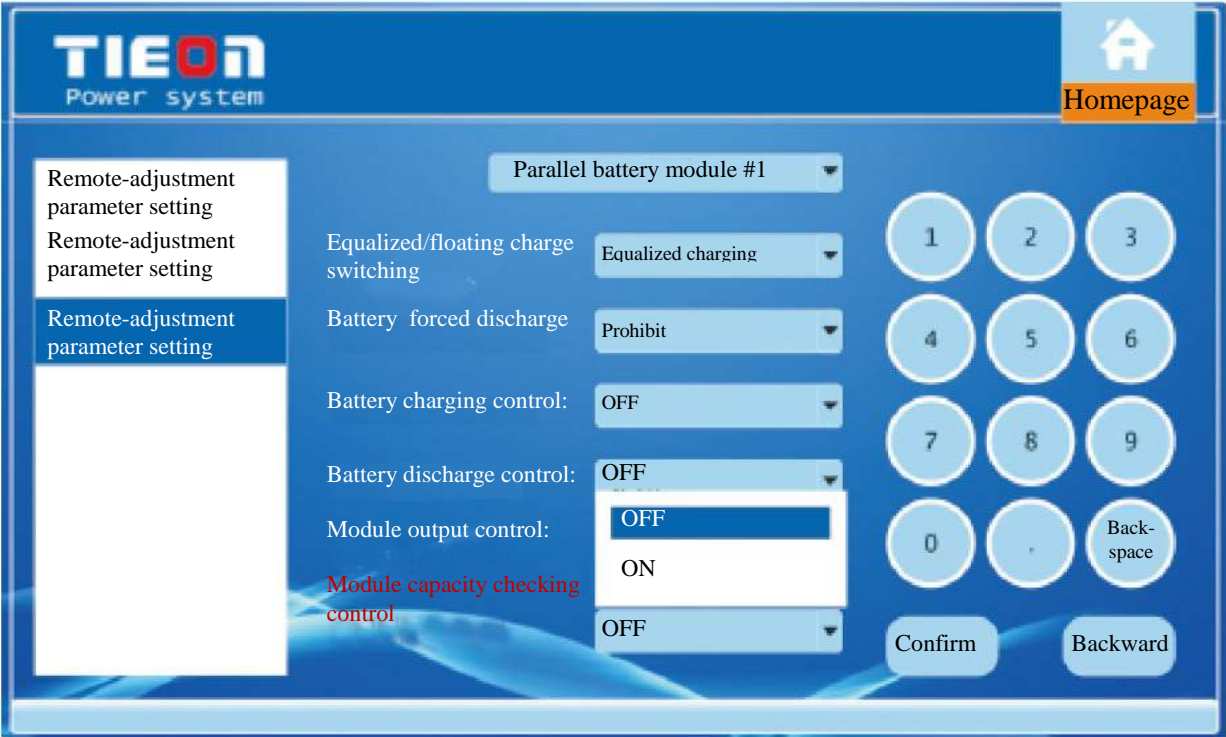
■Realize capacity measurement/checking of batteries in energized state, and reducing the workload of capacity checking and maintenance of batteries



The system can implement local/remote control and one-by-one battery capacity checking 0.1C10 so as to reduce the operation and maintenance cost of the system.

The system can automatically release capacity checking command in accordance with time intervals. Once the module receives a command, it disconnects the current equalization system, makes fine adjustment of the output voltage, implements the automatic battery capacity checking 0.1C10, records the capacity measurement data, and guarantees that the batteries, the heart of direct-current system, are always kept safe.

Capacity- testing data (including the data such as the voltage and current of the battery measured in process of capacity checking, the physical capacity, the charging voltage and the current after capacity measurement,) can be exported through system monitoring;



■ Patents for inventions



■ Inspection reports



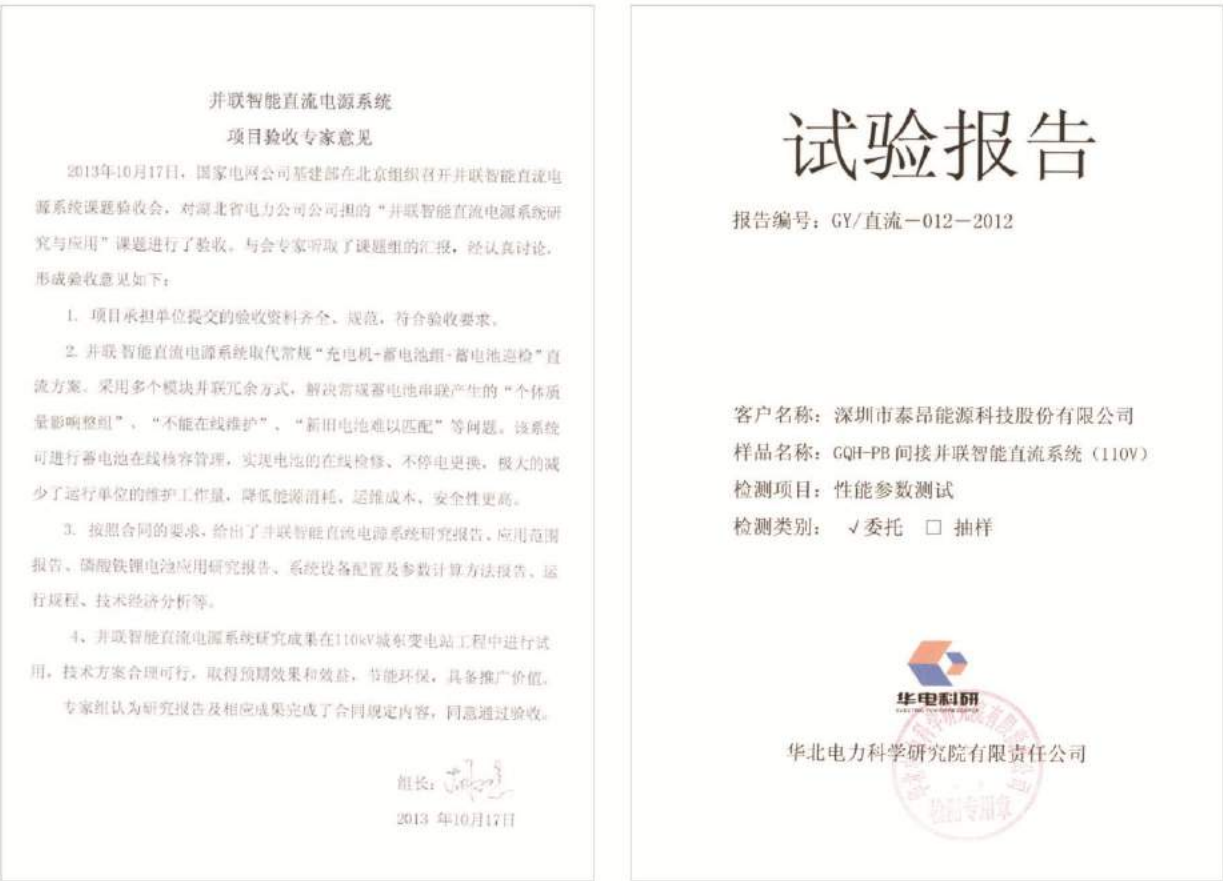
■ The parallel intelligent DC power system is listed in the implementation catalogue for popularizing and application of designs and new technologies of the State Grid Infrastructure Department
Achievement No.: SXYM2014-TB4-07

7	SXYM2014-TB4-07	Parallel intelligent DC power system	1) Parallel intelligent DC power system is established by designing the devices such as batteries 12V, compatible AC/DC charging modules and DC/DC output transducers into the parallel intelligent storage battery pack, and form output parallel by several packs so as to satisfy the actual requirements. 2) The equipment configuration principle of the parallel intelligent DC power system and the parameter-selection system capacity are determined by the number of packs, and centralized or dispersed configuration can be adopted as per the nature of loads or voltage class.	The technology allows intelligent control, and it can effectively reduce the operation and maintenance cost, and the utilization area of the secondary equipment room. As compared with integrated power schemes of traditional transformer substations, the technology can reduce total life cycle investment by approximately 23%.	The technology is applicable to transformer substations of 110kV or below, especially the prefabricated compartment-type intelligent substations.	0.6
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■ Won the second prize for technological progress in electric power construction 2014



■ Evaluation opinions from the state grid supported projects



Successful Projects for intelligent DC systems with parallel batteries

- ◆ Transformer substation 110kV of Eastern Expansion Future City in Wuhan, Hupei (first-batch new-generation intelligent transformer substation of the state grid)
- ◆ Chengdong transformer substation 110kV (state grid supported project)in Yuan'an, Yichang, Hupei
- ◆ Xinzhou Wangji transformer substation 110kV in Wuhan, Hupei
- ◆ Dongnanjiao transformer substation 110kV of Tangshan Power Supply Bureau of Jibei Power Supply Company
- ◆ Gengma transformer substation 110kV in Lincang, Yunnan
- ◆ Yongxin transformer substation 35kV in Qinan, Chongqing
- ◆ Switch station 10kV of Shinan Power Supply Company of Shanghai Municipal Power Company
- ◆ Switch room 20kV of Sino-Singapore Knowledge City by Guangzhou Power Supply Bureau Co., Ltd.
- ◆ Switch room of Guangdong Financial High-Tech
- ◆ Mazhuang transformer substation 35kV of Xuzhou Power Supply Company in Jiangsu
- ◆ Switch room 10kV for residential quarters in Wuxi, Jiangsu
- ◆ Switch room 10kV of Jiangmen City Power Supply Company in Guangdong
- ◆ Xianhu transformer substation 110kV of Nanning Power Supply Bureau in Gangxi

■ On-site photos of the integrated system of 110kV transformer substation for Eastern Expansion Future City in Wuhan

