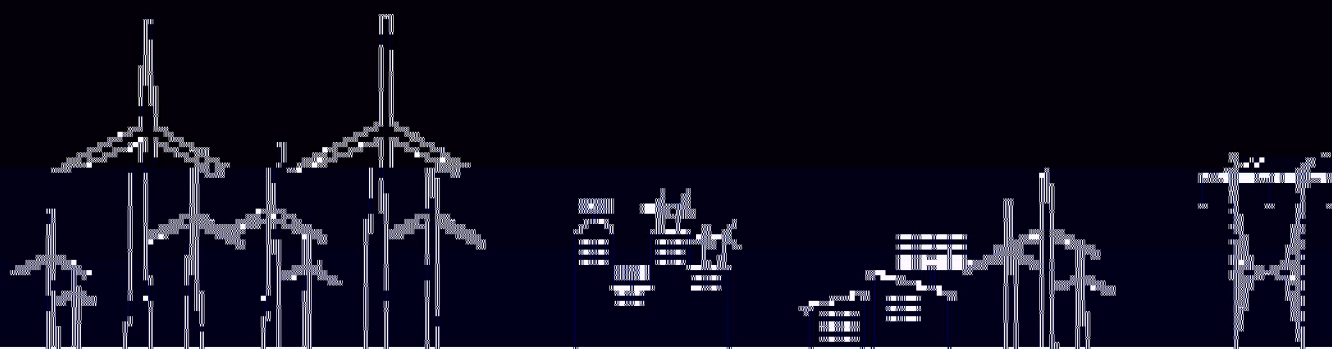


ZG-SPS智能高压岸电系统

ZG-SPS Intelligent High Voltage Shore Power System

综合能源技术与服务提供商
Integrated Energy Technology & Service Provider



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丰富的连船供电实践经验

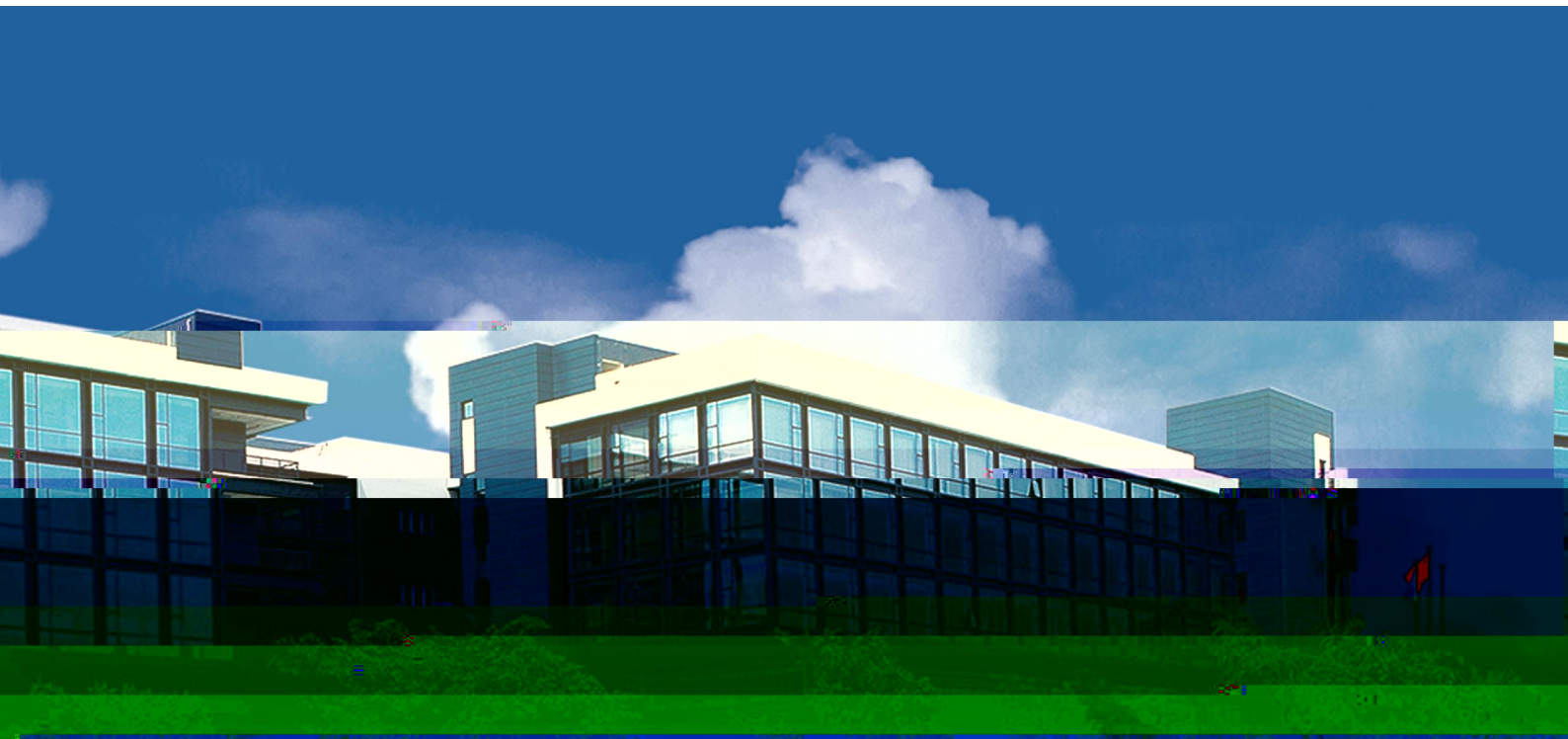


公司简介

Company Profile

广州智光电气技术有限公司成立于 2002 年，注册资金 2 亿元，是广州智光电气股份有限公司【股票代码：002169，以下简称智光】的全资子公司，是智光在综合能源技术与服务战略发展方向专业从事柔性电力技术研究的核心成员企业。

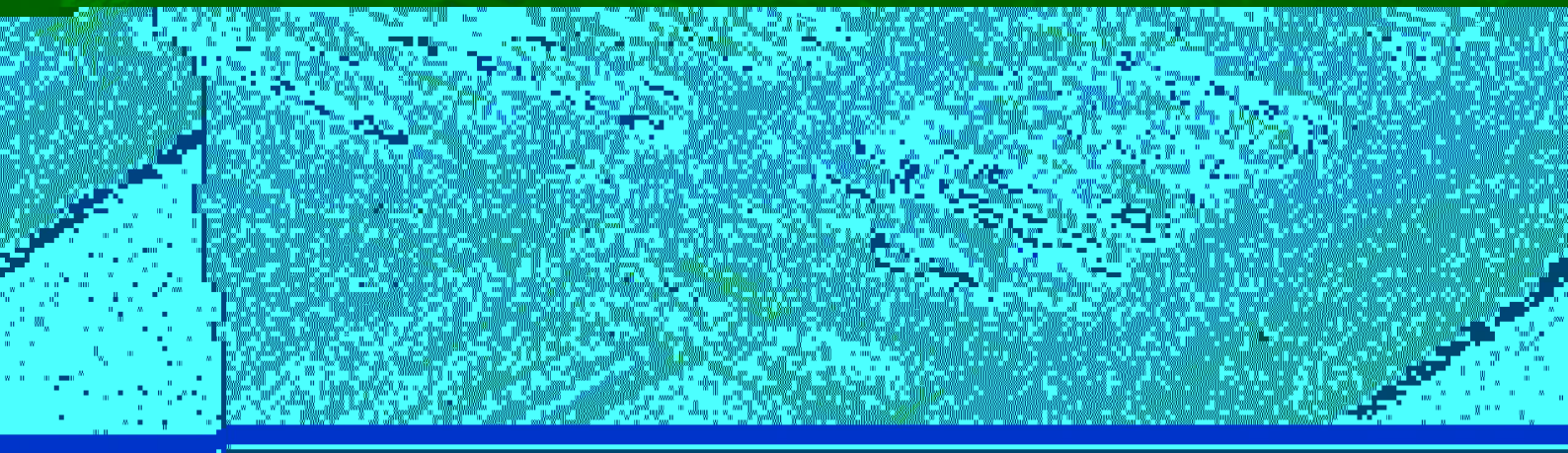
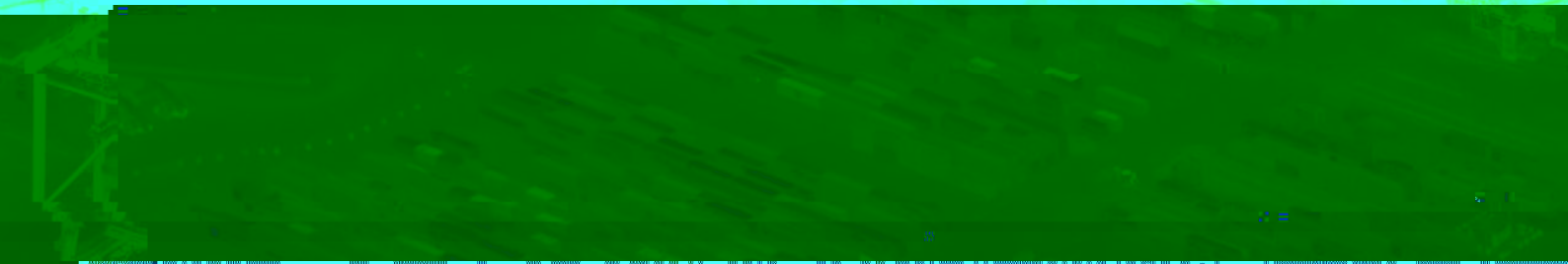
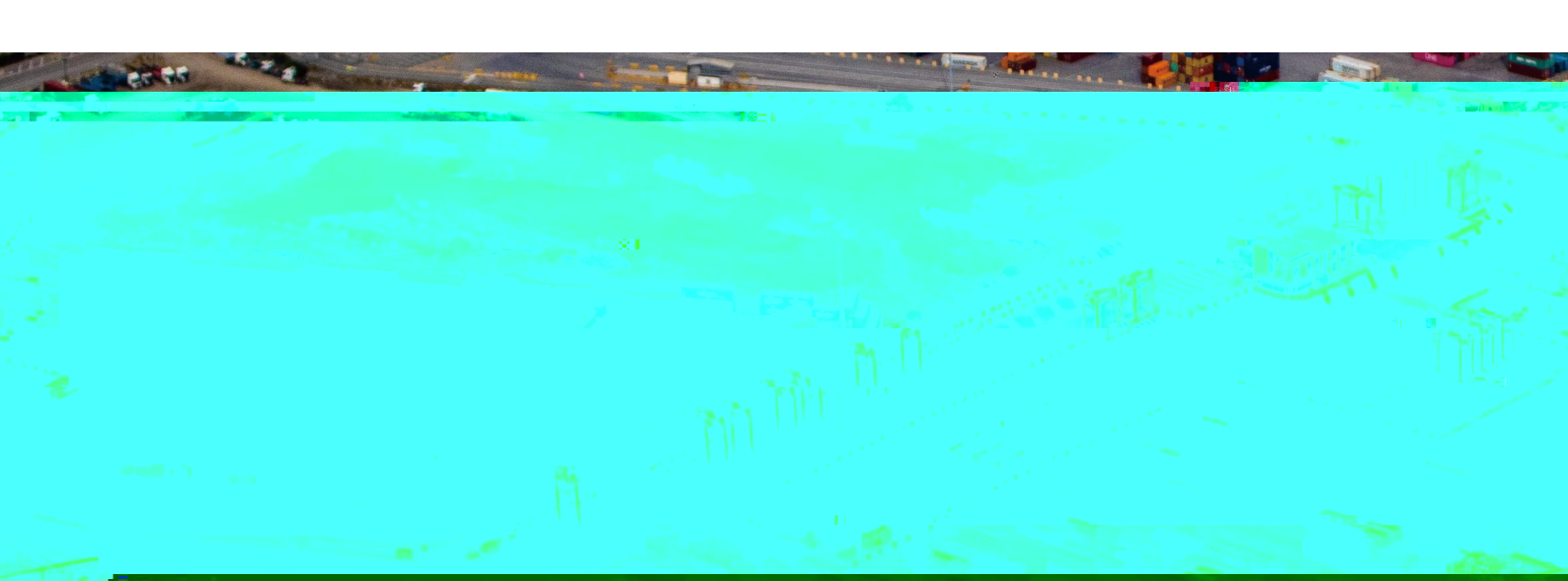
公司自成立以来一直专注于以大功率电力电子为核心技术的电力控制装备技术研究，在智能电网、分布式微网、储



Engineering and Architecture

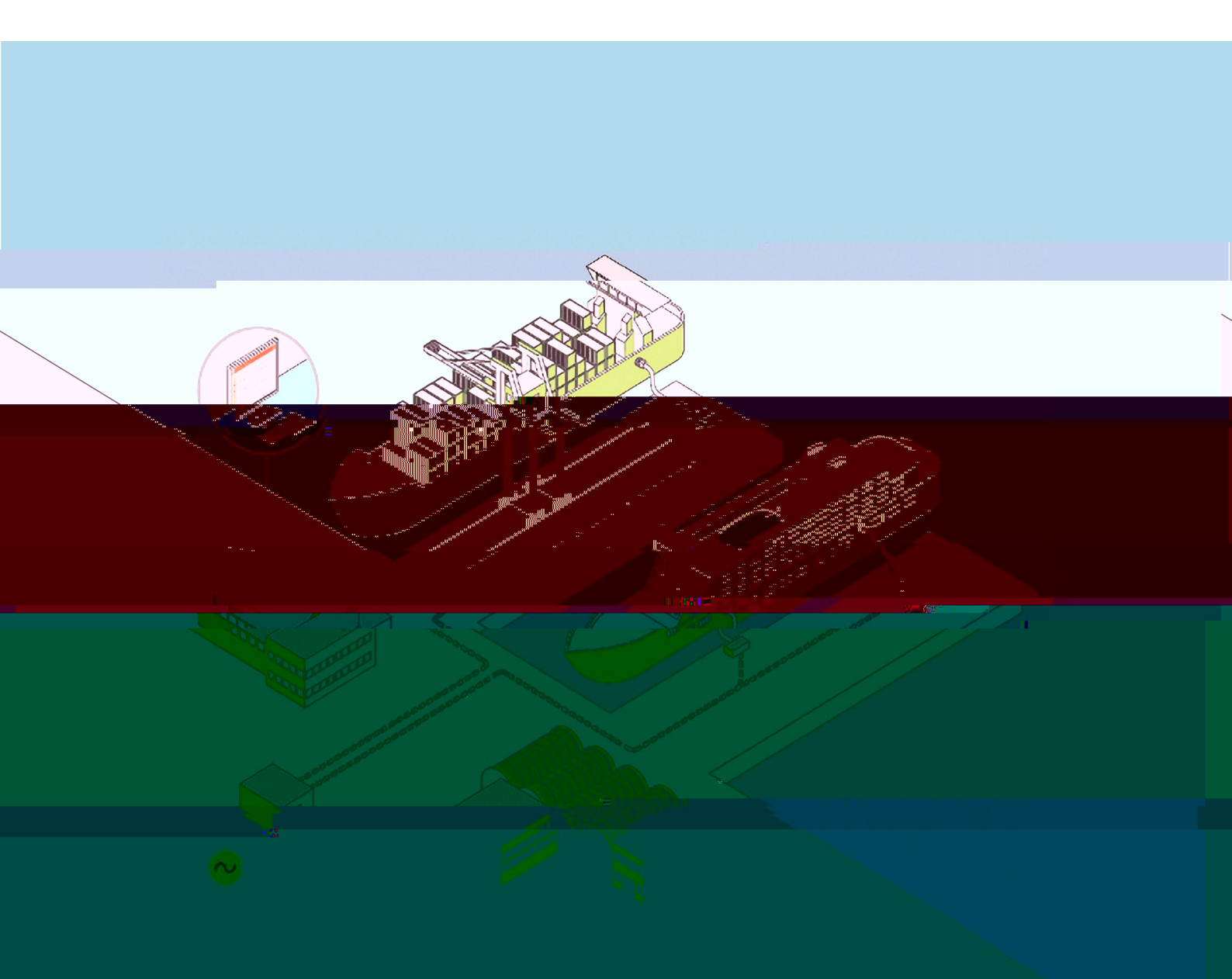
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Architectural rendering of a modern building with large glass windows and a flat roof, set against a blue sky with clouds. The building is situated on a green lawn.



三、产品介绍

Product Introduction



2.1 各子系统介绍

The Introduction of Each Subsystem

高低压配电子系统

High and Low Voltage Power Distribution Subsystem

可在该子系统内设置监控、计量、通信相关的设备和接口，便于对供电情况和设备运行情况进行监控和计量。

The power distribution system at the input side of the system is designed according to the specifications of the conventional power distribution equipment, and the power distribution system at the output side is designed according to the specifications of the more power equipment. Both sections of the power distribution system can be equipped with monitoring, metering, and communications-related equipment and interfaces to facilitate monitoring and metering of power supply and equipment operation.

变频稳压子系统

Variable Frequency Voltage Regulator Subsystem

变频稳压子系统的核心设备是高压变频电源，其功能特点如下：

The core equipment is a high-voltage variable frequency power supply, and its functional characteristics are as follows:

无滤波装置谐波小

Low Harmonics without Filter Device

采用多脉冲、移相整流技术，输出电压谐波低于10%，采用多中

frequency conversion technology realized by phase shift can directly output 6.6kV and 11kV voltages close to a sine wave.

多脉冲整流技术

Multi-pulse Rectification Technology

智能高压电源系统采用多脉冲整流

rectification technology, which generates less harmonic pollution to the grid side. Under working conditions above 20% load, input power factor > 0.97. It can meet national standards without power factor compensation and harmonic suppression device.

频率电压一键切换

One-link switching of frequency and voltage

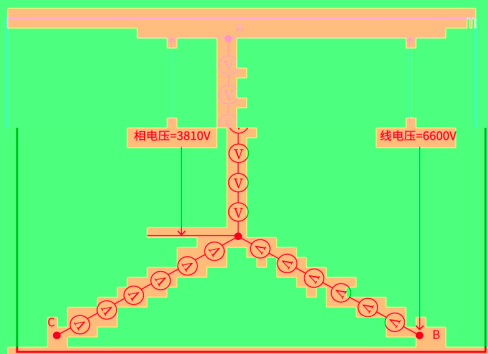
高压变频电源具备频率、输出电压微调设置功能和输出相序

switching function of output phase sequence, which can greatly improve the flexibility of the system and shorten the access time of shore power.

逆功率处理与保护

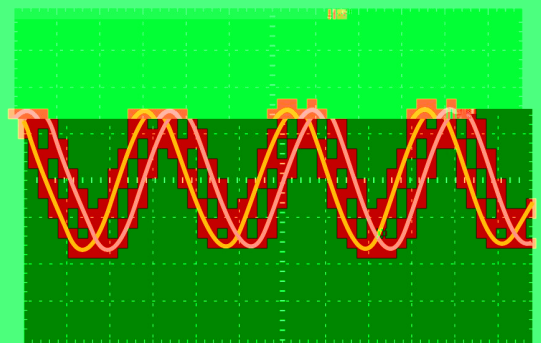
Reverse Power Processing and Protection

processing and protection functions. When reverse power is detected in the power system during grid connection and de-linking, the system output voltage is automatically adjusted to eliminate the reverse power; if the power fails, the system issues an alarm.



电压叠加形成高压输出原理结构

Voltage Superimposed to Form a High-voltage Output Principle Structure



六级串联系统输出波形

Six-stage Series System Output Waveform

变压及电网隔离子系统

Transformer and Power Grid Isolation Subsystem

隔离变压器采用Dy11接法的设计, 50/60Hz双频工作模式, 额定电压按照60Hz电制设置, 通过设置变频电源输出电压值实现不同频率下系统输出电压切换功能。

The isolation transformer adopts the Dy11 connection design, 50/60Hz dual-frequency working mode, the rated voltage is set according to the 60Hz electrical system, and the system output voltage switching function at different frequencies is achieved by setting the output voltage value of the variable frequency power supply.

数据综合监控子系统

Data Integrated Monitoring Subsystem

数据综合监控子系统不仅监控各设备, 也与码头监控系统通信, 便于操作人员掌握设备运行情况。监控系统应记录供电期间输出电压、电流数据 (含必要波形), 便于供电发生异常中断时, 追溯故障发生时的状态, 分析故障原因。

The data comprehensive monitoring subsystem not only monitors each device, but also communicates with the terminal monitoring system, which is convenient for operators to grasp the operation status of the equipment. The monitoring system should record the output voltage and current data (including the necessary waveforms) during power supply, so that when the power supply is abnormally interrupted, the state of the power supply can be traced back and the cause of the fault can be analyzed.



岸电系统监测
Shore Power Monitoring System

岸电系统监测
Shore Power Monitoring System

中性点安全接地子系统

Neutral Point Grounding Safely Subsystem

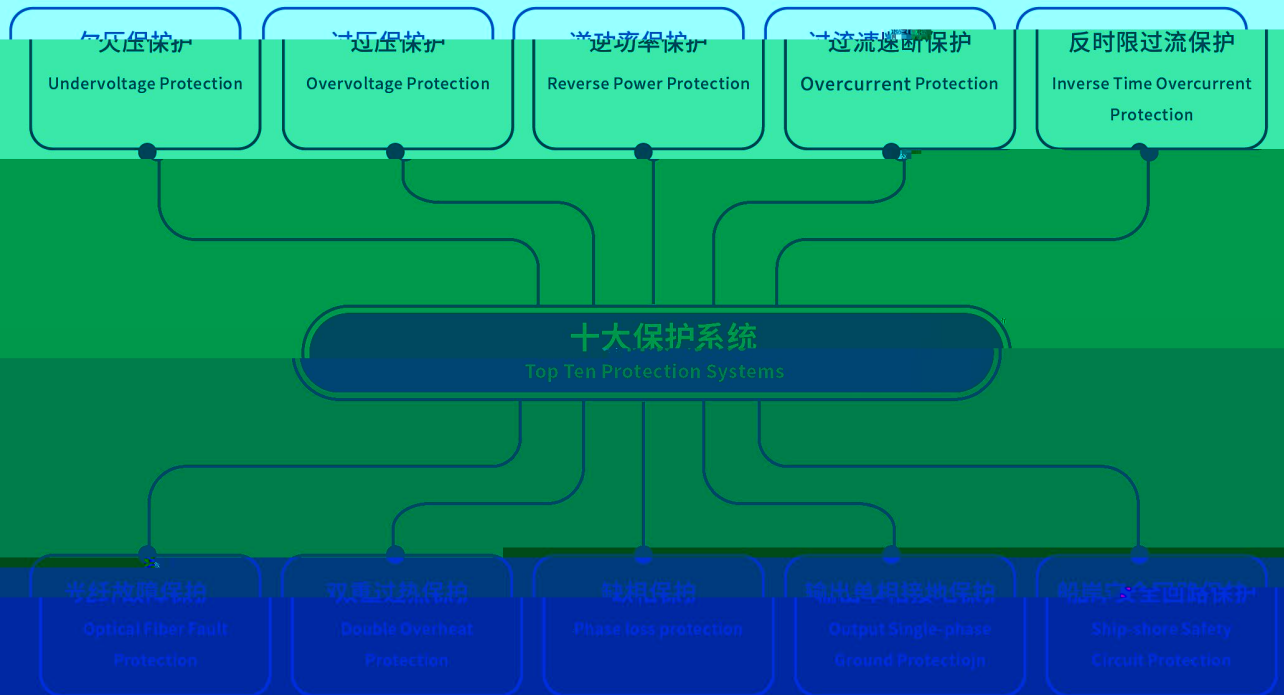
隔离变压器中性点采用电阻接地，并通过中性线与船壳连接，限制岸电供电过程中船侧接地时的故障电流，为船上设备和人员提供安全保护。

The neutral point of the isolation transformer adopts resistance grounding and is connected to the ship's hull through the neutral line to limit the fault current when the ship side is grounded during the shore power supply process and provide safety protection for the equipment and personnel on board.

电气综合保护子系统

Electrical Integrated Protection Subsystem

for the dock socket box socket key to ensure that the dock socket cable plug can only be plugged and unplugged when the energy is not output, the socket and the grounding switch of the output switch cabinet is closed.



系统温度控制子系统

Temperature Control Subsystem

系统内部大量的电力电子器件对工作温度比较敏感，因此必须对系统运行的环境温度进行实时监测和控制。在各主要设计环节均采用独特高效的散热方案。

A large number of power electronic components in the system are sensitive to the operating temperature, so the ambient temperature of the system must be monitored and controlled in real time. Unique and efficient cooling solutions are adopted in each major design link.



Cooling Design of Variable Frequency Power Cabinet



功率单元冷却设计

Cooling Design of Power Unit

功率单元采用风冷散热方式，通过风道将热量带走，同时采用风道隔离，防止热量在单元之间传递。

The power unit uses air cooling to dissipate heat, and the heat is carried away by the duct. At the same time, the duct is isolated to prevent heat from being transferred between units.

11

功率单元采用风冷散热方式，通过风道将热量带走，同时采用风道隔离，防止热量在单元之间传递。

11

The power unit uses air cooling to dissipate heat, and the heat is carried away by the duct. At the same time, the duct is isolated to prevent heat from being transferred between units.

2.2 功能特点 Features



电能质量优异
Excellent Power Quality

输入电流谐波 <math>< 3\%</math>

输入功率因数 > 97%

输入电流谐波 <math>< 3\%</math>

输入功率因数 > 97%

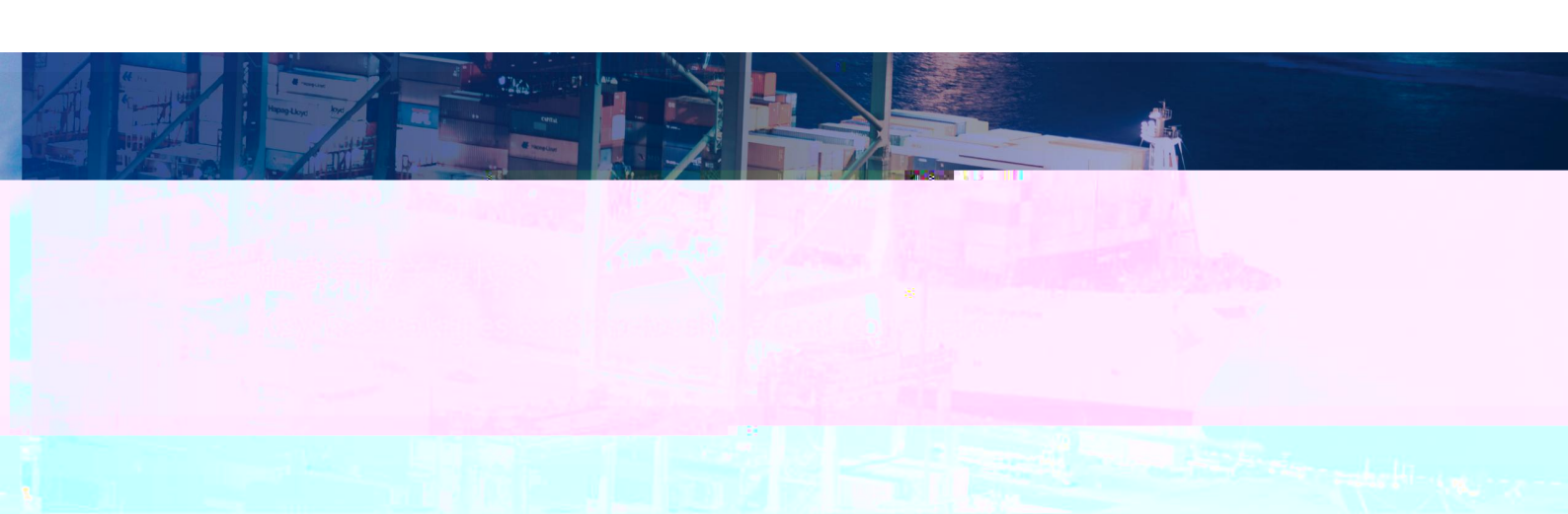
模块化设计
modular design



维护便利性
Maintenance Convenience



模块化设计，可拆卸式功率模块和断路器，易于更换，减少维护时间，降低因功率故障对客户造成的影响。



可靠的相序检测与整流技术

Reliable Phase Sequence Detection and Rectification Technology

可靠的相序检测与整流技术是船舶电力系统稳定运行的关键。该技术能够准确检测三相电源的相序，并在检测到异常时及时发出警报，防止设备损坏。同时，该技术还能实现三相电源的精确整流，提高电能转换效率，降低能耗。

低电压穿越技术

Low-voltage Ride-through Technology

低电压穿越技术是船舶电力系统在电网电压波动时保持运行的关键技术。该技术能够在电网电压暂时下降时，通过快速响应和调节，使船舶电力系统继续稳定运行，避免因电压波动导致的设备故障和系统瘫痪。该技术广泛应用于船舶电力系统、港口供电系统等领域。

高精度电压频率控制技术

High-precision Control Technology for Voltage and Frequency Regulation

高精度电压频率控制技术是船舶电力系统实现电能质量优化的核心技术。该技术能够精确控制船舶电力系统的电压和频率，确保船舶电力系统在各种工况下都能提供稳定、高质量的电能。该技术广泛应用于船舶电力系统、港口供电系统等领域。

“通过采用先进的电压频率控制技术，船舶电力系统能够实现电压和频率的精确控制，提高电能转换效率，降低能耗，确保船舶电力系统在各种工况下都能稳定运行。”

非侵入式电能计量技术

Non-invasive Energy Metering Technology

非侵入式电能计量技术是船舶电力系统实现电能精细化管理的关键技术。该技术能够在不中断船舶电力系统运行的情况下，实现对船舶电力系统电能的精确计量，提高电能计量的准确性和可靠性。

“通过采用先进的非侵入式电能计量技术，船舶电力系统能够实现电能的精确计量，提高电能计量的准确性和可靠性，为船舶电力系统的精细化管理提供有力的技术支持。”

2.4 系统安装方式

System Installation Form

7C-SPS智能高压岸电系统具有体积小、重量轻、安装方便、维护简单、使用寿命长等特点。

室内安装

Indoor Installation



室外集装箱安装

Outdoor Container Installation



occasions where the site is limited and is not suitable for the construction of permanent power distribution rooms. The system covers a relatively small area.



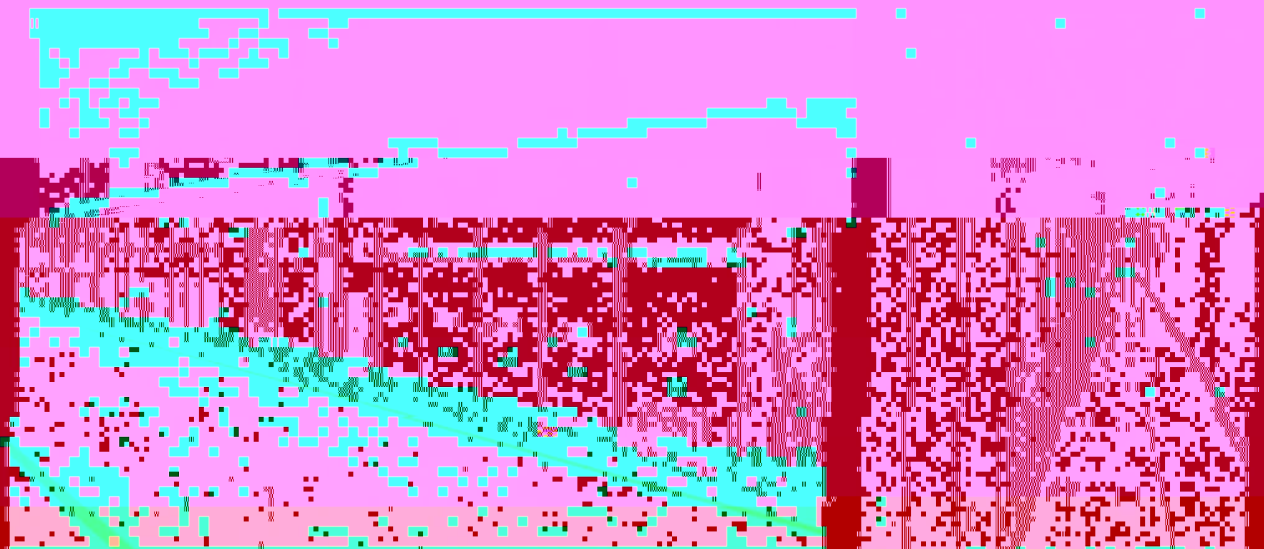
3.1 青岛邮轮母港 16000kVA/11kV 智能高压岸电系统

Qingdao Cruise Terminal 16000kVA/11kV Intelligent
High-voltage Shore Power System

2018年

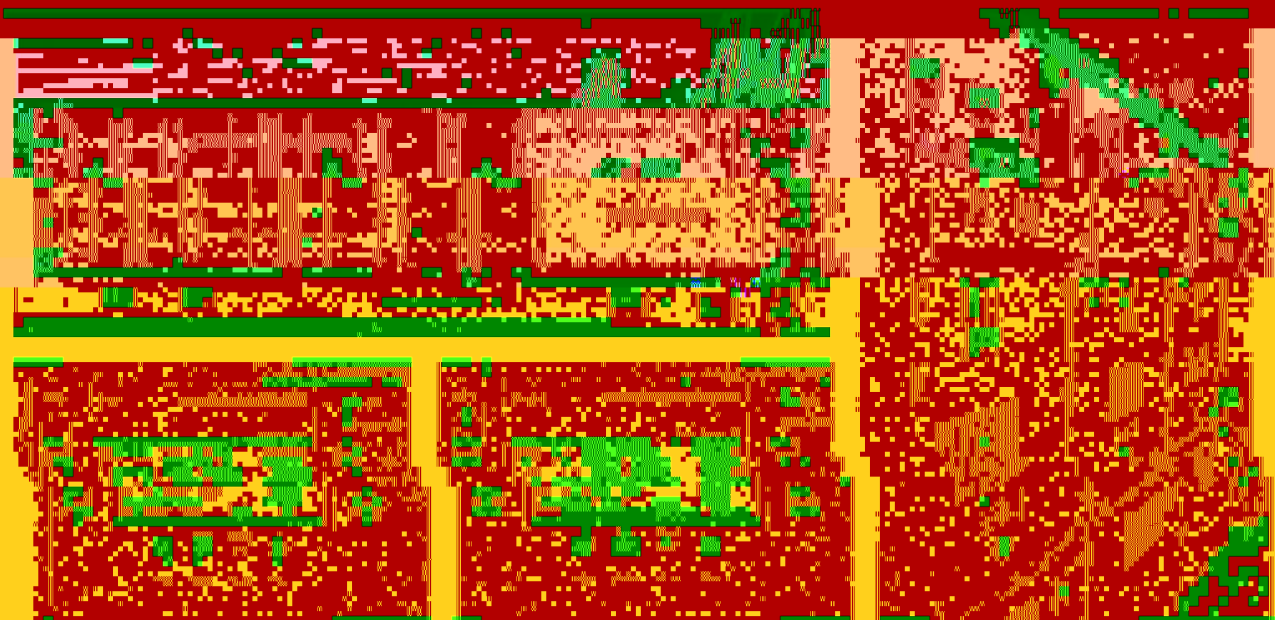
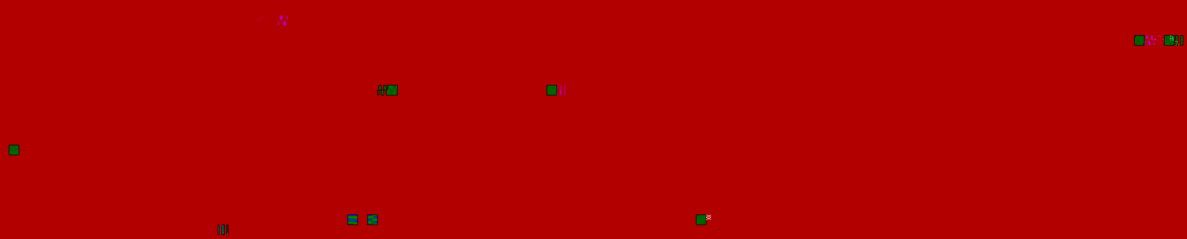
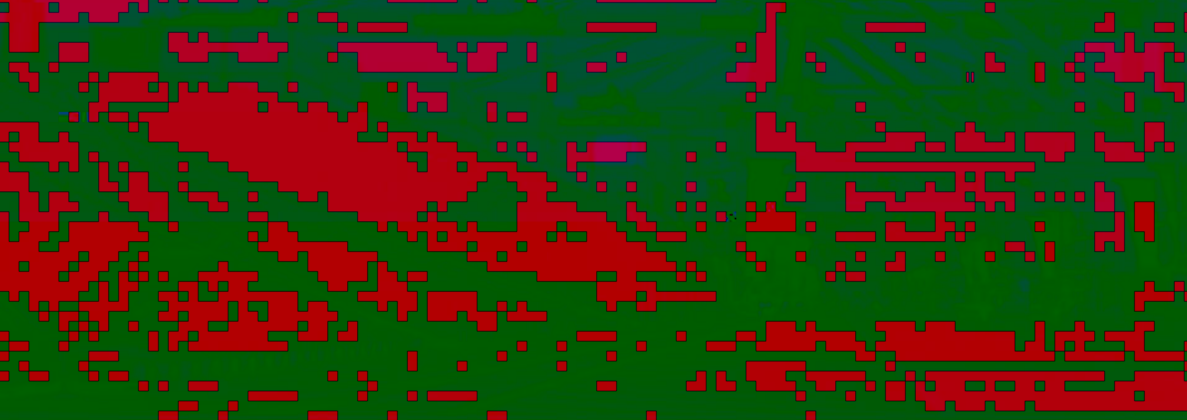
2018年青岛邮轮母港项目使用一套16000kVA/11kV智能高压岸电系统，该系统可对其泊靠的邮轮、客滚船、散货船、拖船等提供一年之内所需岸电总容量达200000kWh，相当于一年节约10000吨CO₂，在节能减排和绿色环保方面做出突出贡献。

In 2018, the Qingdao Cruise Terminal project used a set of 16000kVA/11kV intelligent high-voltage shore power system, which has a largest parallel capacity within parallel connections. The shore power system is expected to reduce 10,000 tons of CO₂ emissions every year.



3.2 宁波四港 2000kVA/3000kVA 智能高压岸电系统

宁波四港 2000kVA/3000kVA 智能高压岸电系统
Ningbo Four Ports 2000kVA/3000kVA Intelligent High Voltage Shore Power System



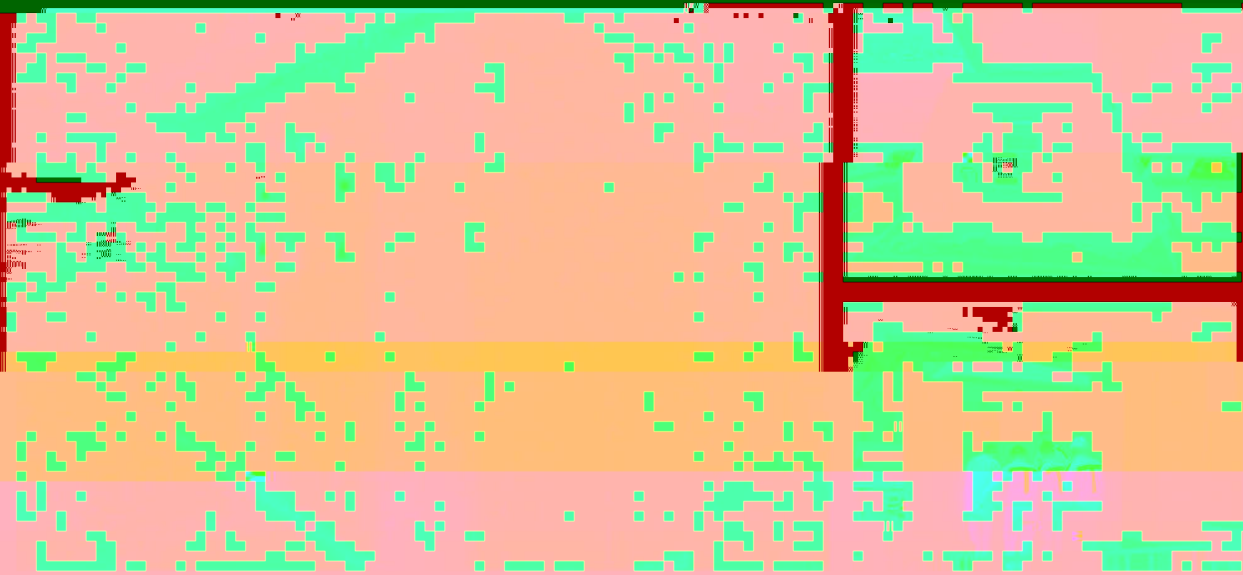
3.3 青岛港前湾港区 103 泊位 5000kVA 智能高压岸电系统

Qingdao Qianwan Port Area 103 Berth 5000kVA Intelligent High-voltage Shore Power System



2017年，由智光研发的国内容量最大的智能高压岸电系统在青岛港口一次性连船成功。该项目的岸电系统输出容量5000kVA，频率60Hz，采用模块化产品设计理念。该项目是国内第一套完整地融合电源变换技术、中性点接地及保护技术、电缆实时监控及控制技术等技术智能高压岸电系统。

In 2017, the intelligent high-voltage shore power system with the largest capacity in China, developed by ZhiGuang, was successfully connected to a COSCO container ship at the Qingdao Qianwan Port Area 103 Berth. The shore power system has an output capacity of 5000kVA, a frequency of 60Hz, and adopts a modular product design concept. This project is the first set in China to fully integrate power conversion technology, neutral point grounding and protection technology, cable real-time monitoring and control technology, and other technologies of intelligent high-voltage shore power system.



3.5 深圳蛇口集装箱码头 4000kVA 智能高压岸电系统

Shenzhen, Shekou Container Terminal, 4000kVA
Intelligent High-voltage Shore Power System



四、丰富的连船供电实践经历

Extensive Practical Experience in Power Supply with Connected Ships



营口港紫丁香号客箱船（常态连船供电）

MSC DANIELA (14000 TEU)

营口港紫丁香号客箱船（常态连船供电）
中远神华801轮

Mediterranean MSC DANIELA (14000 TEU)
Yingkou Port Lilac Passenger Ship (normal power supply with ship)
COSCO Shenhua Bound 801

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24h Service: 400-8800-233



广州智光电气技术有限公司
Guangzhou Zhiguang Electric Technology Co., Ltd.