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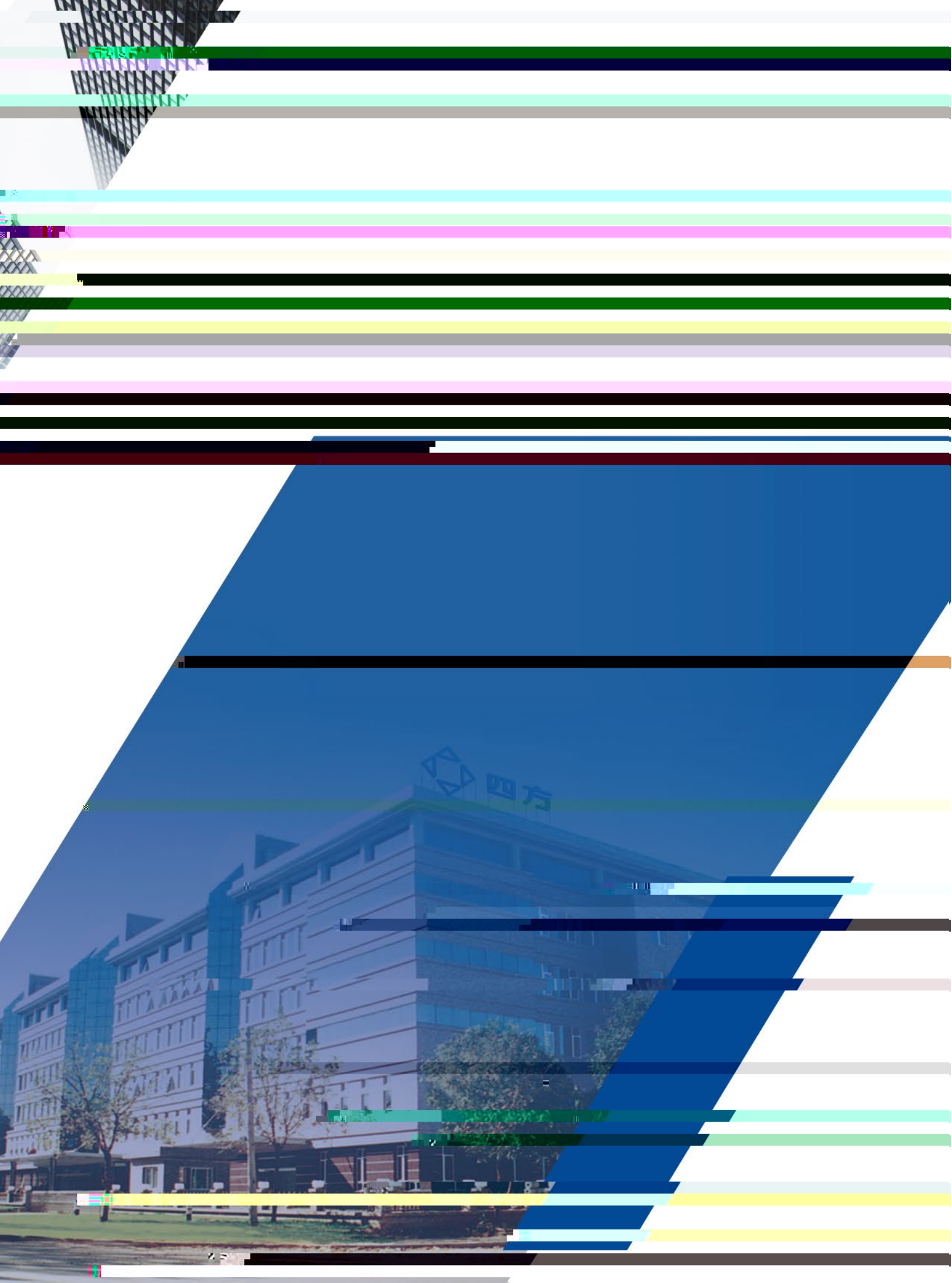
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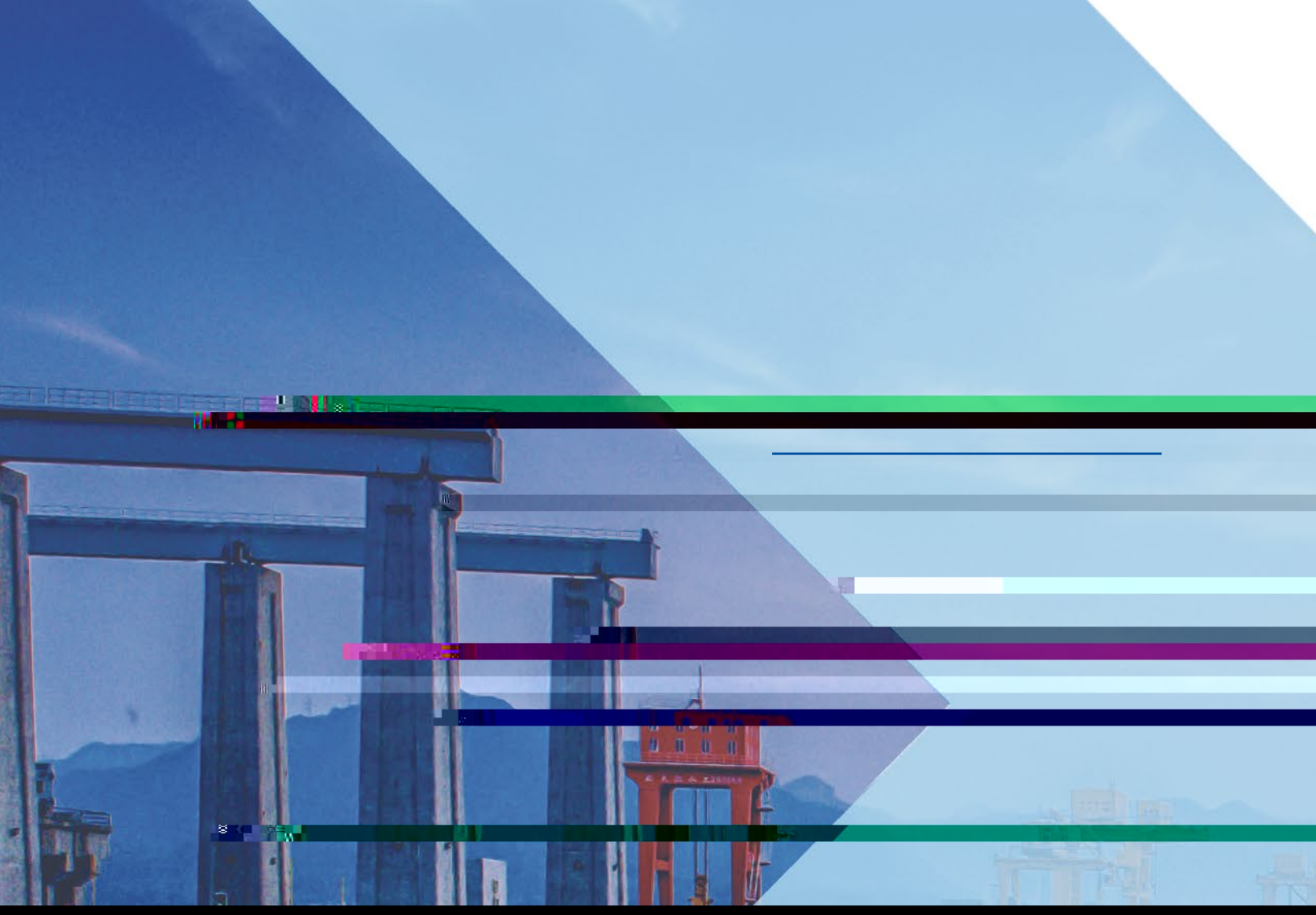
SIFANG

Beijing Sifang Automation Co., LTD. (referred to as Sifang Co., stock code :601126), a leading enterprise in the field of power automation, was founded in 1994 by Professor Yang Qixun, one of the first academicians of the Chinese Academy of Engineering. Headquartered in Beijing, the company has R&D and production bases in Nanjing, Wuhan, Baoding and Huzhou, as well as overseas subsidiaries in India, the Philippines and Kenya. The company is committed to providing comprehensive power and energy solutions and services for the energy and power industry, large public utilities, industrial power-consuming enterprises, and various parks, buildings and other scenarios.

Based on complete independent intellectual property rights and an independent and controllable development system, Sifang Co., Ltd. has a series of relay protection products covering various voltage levels from 10 kV to 1000 kV, as well as product categories including primary and secondary integrated switches, power electronics, new energy storage, smart Internet of Things, and industrial intelligent control.







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Hydroelectric/Pumped Storage Overall Solution

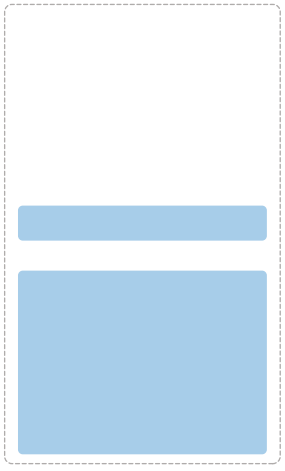
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Fully redundant system: power, controller, I/O, and bus redundancy.

Multiple protections: hot-swappable, isolated design, and self-diagnosis.

Low power consumption, lowest power

To solve the problems of scattered automation systems and low intelligence, a comprehensive power station solution has been developed. This solution integrates control, electrical, and intelligent systems, supports plant-wide information digitization and communication standardization, and enables data sharing across all systems, including core control and protection. It provides intelligent control of equipment and processes, smart maintenance, fault diagnosis, and helps optimize operations and improve efficiency.



Open access capabilities include but are not limited to the following:

- Supports Ethernet protocols such as OPC and Modbus TCP for system communication.
- Supports fieldbus protocols (ProfiBus, Modbus, HART, CAN) for connection with speed regulation, excitation, and smart instruments.
- Supports IEC61850 and IEC60870-5-101/104 for protection and telecontrol communication.
- Supports deep customization of electrical control integration.

Smart Monitoring

Digital-based intelligence runs through all scenarios of business operations and is a driver of management innovation and productivity improvement. Intelligent joint inspection and smart operation and maintenance with human intervention can help reduce the workload of operation and maintenance, highlight the abnormal conditions of key equipment, achieve precise and timely positioning and real-time push of scene image recognition, equipment status perception, etc., and enable operation and maintenance personnel to receive alarms quickly.



The integrated architecture provides an interface for the development of intelligent monitoring and intelligent early warning, supported by comprehensive data integration and three-dimensional scenario display, using intelligent algorithms and data-driven computing to gather operational information of various equipment for panoramic status monitoring of major power station equipment, early warning of equipment health status, and automatic alarm of hidden dangers. It helps to predict the condition of the equipment and display key indicators of the power station operation.

The participation of artificial intelligence in intelligent control is to combine data with intelligence, output the results of intelligent computing to the LCU controller, participate in logical control operations, achieve image condition control, safety lock control, optimization adjustment control, etc., thereby unearth hidden trends to optimize control decisions and improve system reliability.

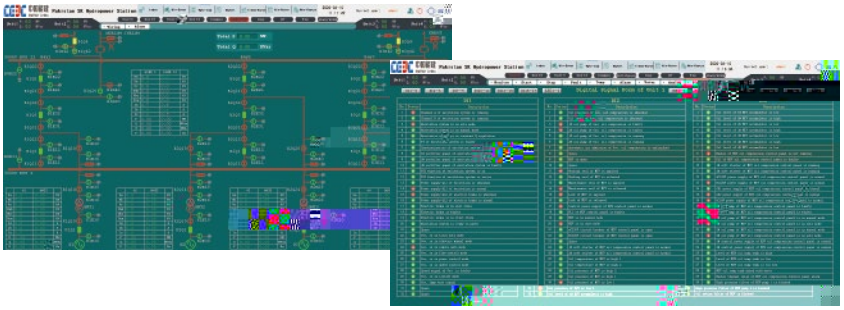
Through the intelligent sensing devices deployed on the main equipment within the station (such as water turbines, generators, main transformers, etc.), data on voltage, current, temperature, pressure, liquid level, etc. are comprehensively obtained, and past fault conditions and operation data are continuously recorded and analyzed to achieve fault early warning and fault location, and to clearly present the past, present and future status of m ɒ ɹ ҽM
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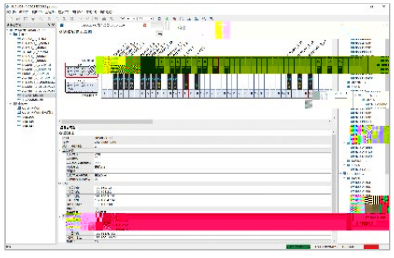
Product Introduction

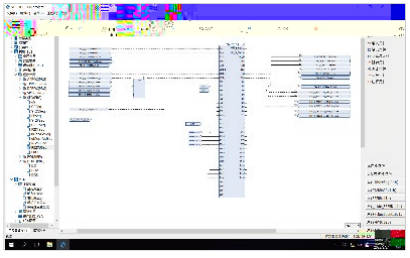
CSPA-2000 is a new generation of large-scale automated intelligent control system, mainly including CyberControl general configuration software, Nuclide logical configuration software, and CSC-800 serie

The vertical architecture of the monitoring system consists of the industrial Internet layer, the intelligent control layer and the industrial automation layer. Among them, the monitoring system layer adopts the i

CyberControl is an automation and intelligent integrated monitoring software with full independent intellectual property rights. It supports multiple platforms and systems, adopts a distributed database, and is compatible with operating systems and databases. This software can meet the monitoring requirements of single stations, centralized control, and ultra-large-scale intelligent monitoring. It supports industrial automation and power automation standard protocols, third-party equipment access/output, and cloud-edge integration deployment capabilities.









The intelligent programmable logic controller (PLC) mainly includes multiple control products such as CSC-800, CSC-850, and CSC-870. It adopts advanced fieldbus and industrial Ethernet, high-performance multi-core embedded processor technology, and a fully redundant system architecture design. The products feature high reliability designs such as high protection, low power consumption, wide temperature operation, and full PCB coating.g.

The CSC-800 distributed control system adopts an integrated structure design for the module and screen cabinet, is vertically installed, and has direct external connection lines. It supports two wiring methods: screw and direct plug. The overall installation and wiring of the screen cabinet are simple, the heat dissipation is uniform, it is easy to expand and maintain, and it is suitable for large-scale hydropower/pumped storage and other industrial applications.

CSC-850 control product, metal chassis structure, high protection, high density design, 19" standard rack mounting, front indicator light, rear terminal output, suitable for dedicated PLC in rack scenarios such as hydropower/water conservancy.

- Full redundancy: CPU hot standby redundancy, power redundancy, support for local bus expansion, remote Ethernet ring I/O expansion.
  High protection metal chassis, up to level 4 protection against strong energy electromagnetic interference.
  High integration design, up to 544 points for a single cage and 16,384 points for a single controller.
  High performance 4-core CPU, 1GB memory, minimum control cycle 1ms, minimum data scan

CSC-870 control product, universal PLC form, module + base plate structure, base plate supports slots such as 4/6/8/10/12/15, supports rail or screw mounting, front output line, compact size (height 112mm), suitable for various large/medium/small process control fields.

- The controller supports 5 Ethernet ports (2* optical/electrical ports +2* electrical ports +1* backplane redundant electrical ports), 4 RS485 communication interfaces, and 4 CAN network communication interfaces.
- Supports single-rack, dual-rack redundancy, local bus expansion, and remote Ethernet ring I/O expansion.
- With single-rack redundancy, up to 4 I/O racks can be expanded locally, supporting dual DP
- With dual-rack redundancy, remote I/O can be extended via Ethernet ring network, with a maximum expansion of 32 nodes.
- DN35 rail mounting, compact size, front panel lead-out, flexible layout.
- High performance 4-core CPU, 1GB memory, minimum control cycle 1ms, minimum data scan time 0.5ms Networking supports protocols such as Onet, Modbus, IEC61850, IEC104, ProfiBus, HART, CAN, OPC, etc.
- The controller supports up to 512 I/O boards, and there is distributed expansion between controllers, supporting up to 64 pairs of controllers.
- It supports time synchronization for B-code and SNTP, etc. The synchronization accuracy can be less than 1ms, and all switch input modules support SOE function.
- High reliability intelligent I/O, line-isolated, analog accuracy less than 0.1%.
- Module hot-swappable, plug-and-play, multiple protections.
- All modules are three-proof, moisture-proof, salt spray-proof and mold-proof, suitable for harsh conditions.
- Operating temperature range: -40 –70 .

CSC-830 PLC, modular, scalable IO structure design, supports 35mm rail mounting, scale within



- It has the functions of di erential frequency grid connection, simultaneous frequency grid connection and no-voltage closing.
- Fast grid connection can be achieved, and reverse power connection can be realized.
- Phase Angle and amplitude compensation can be made for the voltage on both sides of the synchronization point.
- It can measure and record the action time of the closing circuit.
- It has a large capacity recording and event storage function.

	CSC-825A	CSC-825B	CSC-825X
Generator Grid-connecte	●	●	–
Lines Concurrent	●	●	–
	●	●	–
	●	●	–
	●	●	–
	●	●	–
	●	●	–
	●	–	–
	–	–	●

The CSD-196 time synchronization device uses a core timing algorithm based on mutual backup timing of BDS and GPS. Each clock can be connected to up to 4 time reference signals, and the output time accuracy is better than 1 microsecond. It can provide di erent types of high-precision time signals for monitoring, protection, excitation, PMU, fault recording, etc.



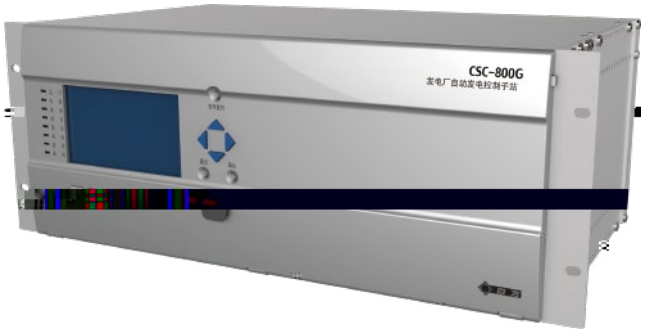
- It can output time synchronization pulses, IRIG-B code, serial port time message, Network Time message (SNTP), IEEE-1588 (PTP) time synchronization signals.
- It can receive external time reference signals in IRIG-B(DC) code.
- Supports fiber, open contact, TTL, RS-422/485, RS-232, and Ethernet signal interfaces.
- Support 104 protocol upload device status information, and support dual-network synchronization upload.
- Dual power supply is supported and power-o alerts are available.

The CSD-1321 series of intelligent communication control units, with a wide range of AC and DC power supply, can be used for access and transfer of monitoring information, protocol conversion, as well as for station-level intelligent telecontrol and data communication network shutdown. It can shut down unwanted device ports as needed, with high security.



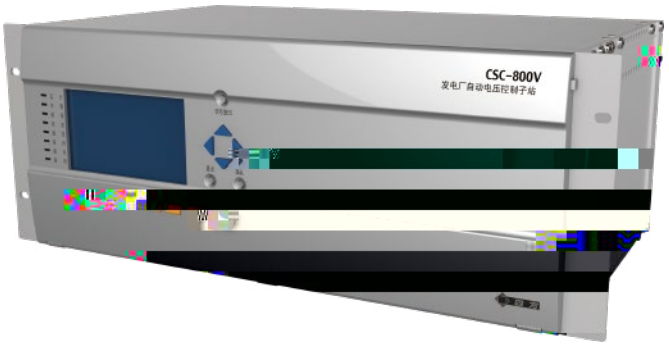
- Modular architecture for flexible configuration.
- Support advanced applications such as remote motion, fault information substations, online monitoring of primary equipment, as well as source-side maintenance and remote browsing.
- It has multiple functions such as historical data, recording files, and operation log storage.

The CSC-800G control sub-station can receive instructions issued by the AGC master station of the dispatching center in real time, allocate them to each unit of the power station according to the predetermined strategy, control the governor for automatic regulation, and realize the active power automatic control of multiple units in the entire station.



- Automatic power generation control of power stations.
- The device is flexible to expand, reliable, high measurement accuracy, strong anti-interference ability, and fast computing speed.
- It supports multiple control modes, and the adjustment dead zone can be manually set.
- Historical data holographic storage, long time recording.
- The interface is flexible, allowing for convenient information exchange with other systems.

The CSC-800V control sub-station receives instructions from the dispatching center AVC master station in real time, distributes them to each unit of the power station according to the pre-determined strategy, controls the excitation system to perform automatic regulation, realizes automatic voltage/reactive power control throughout the station, and keeps the bus voltage within a reasonable range.



- Automatic voltage control of the power station.
- The device can be expanded flexibly, is reliable, has high measurement accuracy, strong anti-interference ability and fast computing speed.
- It supports multiple control modes, and the adjustment dead zone can be manually set.
- Historical data holographic storage, long time recording.
- The interface is flexible, allowing for convenient information exchange with other systems.

In addition to controlling, scheduling and protecting the production process equipment of hydropower, it can also provide design implementation, technical consultation, system integration and other services for the information management system related to the operation of the power station, mainly including plant ventilation system, industrial television system, main equipment status monitoring system, dam safety monitoring system, water situation and water regulation, etc. By digitizing information and standardizing communication throughout the station, data sharing and integration are carried out to enhance the intercommunication capabilities among various systems/equipment, achieve the automation and intelligence of power station operation equipment, meet the information application requirements such as intelligent early warning and smart operation and maintenance, thereby improving the level and e ciency of power station operation management and improving the customer experience.

Since its establishment, Sifang Company has been actively involved in the innovative research and development of protection products, and has built an independent and controllable protection product R&D and production system. Currently, it can provide protection application solutions for numerous industries. Up to now, more than 1.5 million sets of protection and

The CSD-200 series of protection, measurement and control products, suitable for low-voltage power grids or plant power systems, have complete protection, measurement, control and monitoring functions, providing a guarantee for the safe and stable operation of plant power.

Integrate functions such as protection, measurement, control and communication.
The software and hardware can be flexibly configured and expanded to meet the requirements of di erent applications.
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The GEC-300 series of excitation control products can achieve excitation control for large/medium/small generator sets, supporting various types such as self-shunt excitation, three-unit, two-unit brushless, three-unit brushless, and DC exciter. Up to 1,200 sets of products have been put into operation so far, with a maximum capacity of 800 MW for a single hydropower unit and 660 MW for a single thermal power unit. In addition to meeting domestic market demands, the products have also been exported to Southeast Asia, South Asia and Africa.

Since its launch, the product has won the Science and Technology Progress Award of the Ministry of Electric Power Industry, the Science and Technology Progress Award of the Northeast Electric Power Administration Bureau, the Science and Technology Progress Award of the Central China Electric Power Administration Bureau, the First Prize of China Electric Power Science and Technology Progress Award, as well as four invention patents and more than ten software Copyrights.

- Hierarchical multiprocessor architecture.
  - ECU: Fully graphical Windows, user-friendly interface, easy to operate.
  - AVR: Automatic voltage regulation unit, control cycle S 0.625ms.
  - IPU: Intelligent power unit that regulates the heating components of the rectifier cabinet itself, the start and stop of the sub-unit, etc.
  - CAN: A reliable field control bus network.
- Intelligent feedback current sharing technology, current sharing coe cient greater than 0.98.
- Complete quality system/hardware/supplier management/quality inspection/product certification.

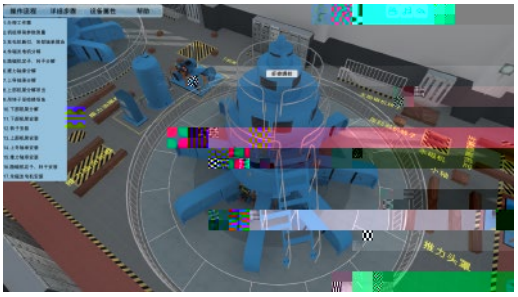
The SFC, or Static Frequency Converter, is a key device for starting a pumped storage power station in the pumping direction.

Sifang's SFC products are well-designed, such as trigger redundancy technology, which fully guarantees the reliability of the trigger board; The specially designed sampling loop ensures sampling accuracy throughout the startup process (from low-frequency small signals to power frequency rated signals). Since the development of the SFC product, it has been tested and verified on multiple sites, and the feedback has been good.



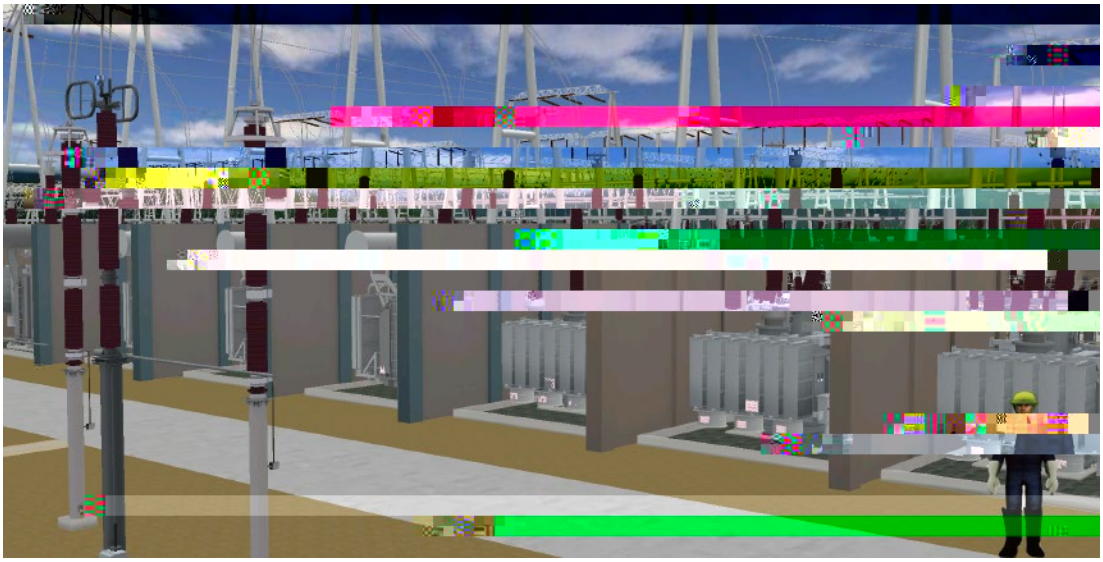
- Superior control performance: Accurate determination of the rotor position of the unit, smooth and stable start-up process, fully capable of making the pumping direction of the pumped storage unit reliable for start-up.
- Good acceleration performance: A unique patented control algorithm that provides settable acceleration curves.
- Optimized grid connection strategy: Automatically calculate the excitation regulation value when connected to the grid, using a proprietary patent algorithm, active grid tracking, shortened grid connection time, and increased grid connection success rate.
- Modular design: Integrated design of thyristors, trigger units, heat sinks, etc. Compact cabinet, saving floor space costs.
- Flexible and reliable protection: Equipped with primary and backup protection such as di erential, overcurrent, di/dt.

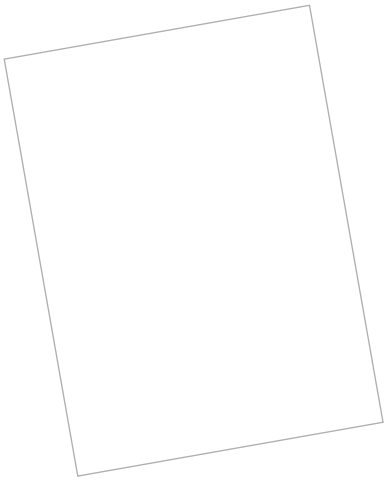
The simulation system has good controllability, no loop-breaking/safety, is not restricted by weather conditions and sites, has good economy, and can be repeated multiple times. Establishing a three-dimensional (3D) scene model centered on the generating units, primary equipment and plant equipment of the hydropower station, achieving three-dimensional data visualization, video data visualization and concealed data visualization of the equipment, with realistic e ects, can fully restore the operation process and equipment failure phenomena, and can increase the speed of talent training in the power station and reduce the di culty of operation and maintenance.





- Device Operation Simulation
- Unit Condition Training, Production Information System Access
- 3D Visualization Simulation
- Equipment History and Maintenance, Disassembly
- Fault Simulation
- VR Virtual Reality
- Evaluation and Assessment System
- Operation Ticket






华电科
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GEC300 型励磁控制系统入网
检测报告

华北电力科学研究院有限责任公司
二〇七年三月


No:JW130624

检 验 报 告

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样品名称 励磁控制器
委托单位 北京四方继保自动化股份有限公司
制 造 商 北京四方继保自动化股份有限公司
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中国广井检实验室
国家继电保护及自动化设备质量监督检验中心


检 测 报 告

CEPRI-EET006

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样品名称：静止变频器
型号规格：
检测类别：委托试验

电力工业电气设备质量检验测试中心


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Table 1: Monitoring System Performance			
No.	Project Name	Unit Capacity	Type
	Auxiliary equipment such as monitoring, protection and DC for the Nam Shen 1A hydropower station in Laos		
	ong Chao 2*22MW hydropower station project in Vietnam		
	Hydropower monitoring equipment for the restoration project of the beautiful hydropower station in Myanmar		
	SK 4*221MW hydropower station in Pakistan		
	Computer monitoring system at Long Chao Hydropower Station in Vietnam		
	Computer monitoring system, relay protection at the Bousanga hydropower station in Congo		
7	Computer monitoring system of the Baihe (Jiahe) Hydropower Station on the Han River in Hubei Province		
8	Computer monitoring system of Xinji Hydropower Station on the Han River in Hubei Province		
	The monitoring system of the unit in Eping, Hubei Province has been upgraded and connected to the centralized control center and the centralized control system		
	Hubei Three Gorges Left Bank Power Station Main Transformer Cooler Control cabinet		
	Hubei Gezhouba Power Station overhaul drainage pump control cabinet in the Da and Er Rivers		
	Computer monitoring system of Xiaoyantou Hydropower Station in Zhaotong City, Yunnan Province		
	Computer monitoring system of Wanjiakouzi Hydropower Station in Yunnan		
	Computer monitoring system of Dapingtian Hydropower Station in Baoshan City, Yunnan Province		
	The computer monitoring system and its a liated equipment of each hydropower station in Mengjiang, Guizhou		
	The computer monitoring system and its ancillary equipment of the Shangjianpo Hydropower Station on the Mengjiang River in Guizhou		
	Computer monitoring system of Jia Cha Hydropower Station in Pingtang County, Guizhou Province		
	The water and electricity monitoring and protection system of the Guizhou Duliujiang Great Integration and Congjiang Navigation and Power Hub Project		
	Computer monitoring and relay protection at the Muni Hydropower Station in Lixian County, Sichuan Province		

No.	Unit Capacity	Type

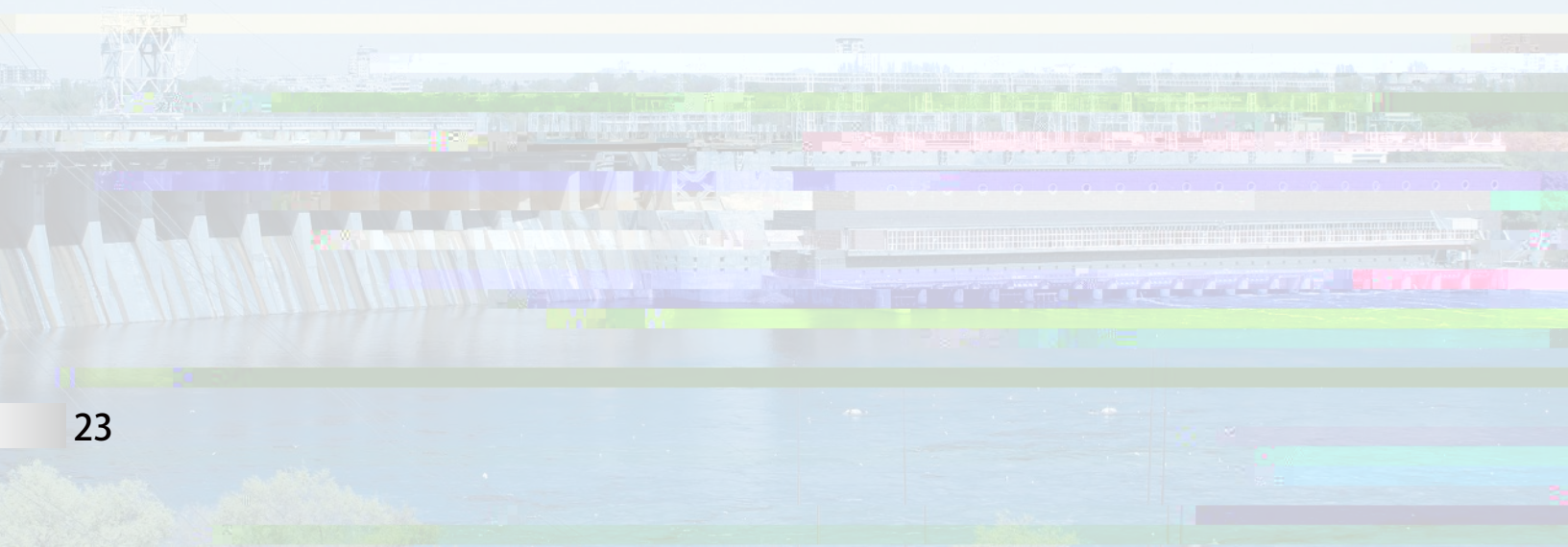


Table 2: Protection System performance			
No.	Project Name	Unit Capacity	Type
1	Research on protection technology for Large-capacity variable-speed Pumped Storage units	—	Pumped Storage
2	Dandong Pushihe Pumped Storage Power Station Generator and Transformer Group Protection Device Procurement Contract	4 × 300 MW	Pumped Storage
3	Relay protection renovation of State Grid Xinyuan Shanxi Xilongchi Pumped Storage Power Station	4 × 300 MW	Pumped Storage
4	Zhanghewan Energy Storage Power Generation Co., LTD. Unit 3 protection grid connection trial operation	1 × 250 MW	Pumped Storage
5	The protection systems for units 3 and 4 at the Huang-gou Pumped Storage Power Station in Mudanjiang are undergoing trial operation.	1 × 300 MW	Pumped Storage
6	Taishan Company's Generator Transformer Group Protection Upgrade Project (Units 1-4)	1 × 250 MW	Pumped Storage
7	Procurement of the Wuyue pumped storage relay protection system and its accessory equipment	4 × 250 MW	Pumped Storage
8	Heimifeng Company's 500kV main transformer B set protection upgrade and renovation	4 × 300 MW	Pumped Storage
9	Purchase of transformer protection equipment for Panjiakou Power Plant	3 × 90 MW	Pumped Storage
10	Huadian Hybrid Energy Storage Hydropower Company Gangnan-1 unit protection and renovation	1 × 11 MW	Pumped Storage
11	Research and application of Key technologies for independent control of Core Components of relay protection devices for Pumped Storage units	1 × 250 MW	Pumped Storage
12	Standardized design of pumped storage generator protection device and grid connection test run	1 × 300 MW	Pumped Storage
13	Relay protection renovation of State Grid Xinyuan Anhui Xin 'anjiang Hydropower Plant	8 × 95 MW + 1 × 90 MW	Hydropower
14	Ankang Hydropower Plant, Shaanxi Province	4 × 200 MW	Hydropower
15	The Menas hydropower Station in Ecuador	3 × 90 MW	Hydropower
16	SK Hydropower Station in Pakistan	4 × 221 MW	Hydropower
17	Daguo Hydropower Station in Shannan, Tibet	4 × 165 MW	Hydropower
18	Yalong River Lianghekou Hydropower Station	6 × 500 MW	Hydropower
19	Yangfanggou Hydropower Station on the Yalong River	4 × 375 MW	Hydropower
20	The Rubuge Hydropower Station	4 × 150 MW	Hydropower
21	State Grid Gansu Liujiaxia Hydropower Plant	5 × 230 MW	Hydropower
22	State Grid Xinyuan takes control of the Thirteen Tombs Power Plant	4 × 200 MW	Hydropower
23	Sanbanxi Hydropower Plant	4 × 250 MW	Hydropower
24	The Grafnaya hydropower Station in Tajikistan	240 MW	Hydropower
25	Datang Group Changheba Hydropower Station in Ganzi Prefecture, Sichuan Province	4 × 650 MW	Hydropower

No.	Unit Capacity	Type



Table 4: SFC Product Performance			
No.	Project Name	Unit Capacity	Type
1	Huayuan Power Zhitu Wind Farm Synchronous condenser (Unit 1 to Unit 2)	2 × 10 MVar	Adjust the Camera
2	Huayuan Power Derun Wind Farm Synchronous condenser (Unit 1 to Unit 2)	2 × 10 MVar	Adjust the Camera
3	Vision Energy Fengning Wind Power Project Tuner	1 × 50 MVar	Adjust the Camera
4	Mengneng Tuquan 1 million Kilowatt Wind Storage Base Project Synchronous condenser (Unit 1 - Unit 2)	2 × 50 MVar	
5	Monengkeshketeng 1 million kilowatt wind storage base Project Condenser (Unit 1 - Unit 2)	2 × 50 MVar	
6	Aerospace Hongyuan project Synchronous camera	1 × 20 MVar	
7	Qiyuan Project (Hebei) Modulator	1 × 20 MVar	

Table 5: Simulation System Performance			
No.	Project Name	Unit Capacity	Type
1	Datang Guiguan Power 3D Intelligent Simulation Training System	7 × 700 MW, 4 × 300 MW	Hydropower
2	3D visualization intelligent simulation system for the Jinping-I Hydropower Station on the Yalong River	6 × 600 MW	Hydropower
3	3D visualization intelligent simulation system of the Yalong River Guandi Hydropower Plant	4 × 600 MW	Hydropower
4	Huaneng Sichuan Taipingyi Hydropower Simulation Training Base Project	4 × 650 MW	Hydropower
5	GGG	5 × 350 MW	Hydropower
	Traine Proj ` t guan Powi a®opض		er Station

