

Beijing

- Headquarters

Wuxi, Jiangsu

- Wuxi Sun.King Power Capacitor Co., Ltd.
- Wuxi Astrol Power Electronics Limited

Switzerland

- Astrol Electronic AG
- SwissSEM Technologies AG

Jiashan, Zhejiang

- Jiashan Sun.King Electrical Equipment & Technology Co., Ltd.
- Sun.King Pacific Semiconductor Technology (Zhejiang) Co., Ltd.
- Zhejiang Jiashan Keneng Power Equipment Co., Ltd.
- Zhejiang Sine Power Technology Co., Ltd.
- Jiashan Sinking Power Electronic Capacitor Co., Ltd.

Wuhan, Hubei

- Wuhan LandPower Co., Ltd.

Germany

- morEnergy GmbH

Ningbo, Zhejiang

- Ningbo Hailong Electric Co., Ltd.

The Netherlands

- Astrolkwx B.V.



Zhejiang Jiashan Keneng Power Equipment Co., Ltd.



Sun.King Tech
WeChat Official
Account

Sun.King Technology Group Limited

| Address Building 9-A, KongGang
RongHuiYuan, Yuhua Road, Tianzhu
Airport Industrial Zone B, Shunyi
District, Beijing, China
| Tel 010-56301111
| Fax 010-56301112
| Email info@sunking-tech.com
| Website www.sunking-tech.com

Zhejiang Jiashan Keneng Power Equipment Co., Ltd.

| Address No. 56, Jinji Road, Huimin Sub-district, Jiashan County,
Zhejiang Province, China
| Tel 010-56301111

Promote Green Energy Development through
Technology & Innovation



GROUP INTRODUCTION

Sun.King Technology Group Limited (hereinafter referred to as Sun.King Technology) is an industry-leading and influential power electronic device supplier and system integrator. Incorporated in 2002, Sun.King Technology went public on the HKEX Main Board Upholding the management philosophy of "pursuit of excellence and win-win future" and mission of "promoting green energy development through technology and innovation", Sun.King Technology is dedicated to development of new energy industry chain and construction of new electric power system, through future-oriented technology and innovation. (stock code: 0580.HK). Sun.King Technology now has developed to a total of nearly 1000 employees, with annual sales of over CNY 2 billion. We are a corporation composed of a dozen subsidiaries in Beijing, Jiashan, Ningbo, Zhejiang, Wuxi, Jiangsu, Wuhan, Hubei, as well as Switzerland, Germany, and the Netherlands in Europe.

Upholding the management philosophy "technology & innovation is primary driver to business development", we are specializing in two advanced technical fields: Power semiconductor and relevant devices: International first-class independently developed IGBT, SiC chips and modules, the first and

only self-developed anode saturable reactor (ASR) and first flexible DC-link capacitor and most advanced laminated busbar in China; Cutting-edge power electronics: state-of-the-art solid-state switch and pulsed power supply, impedance measurement granted with international invention patent, and tech-leading online monitoring in China.

We have established three domestic R&D centers in Jiashan, Wuxi and Wuhan, and three overseas R&D teams in Switzerland and Germany. We boast 10 R&D teams of over 300 R&D professionals who represent more than 1/3 of the staff. We have obtained five state-level energy tech achievement certifications, over twenty provincial or municipal tech & innovation accolades, and more than two hundred patents. Our outcomes of tech & innovation are in extensive use in new energy power generation, DC power transmission, smart grid, electric vehicle, rail transit, shipping, communication, scientific research, as well as industrial control and other facets of electric power systems.

Vision: To be a globally leading supplier of power semiconductor devices and system solutions.

Mission: Drive green energy development through technological innovation.

Core Values: Respect, Innovation, Excellence.

Business Philosophy: Pursue excellence, create win-win outcomes.

Group Distribution

GROUP DISTRIBUTION

Othmarsingen, Switzerland

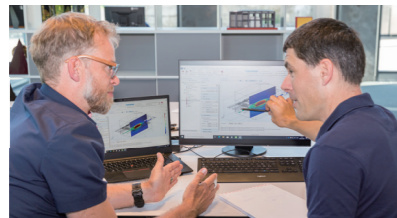
Incorporated in 1996, Astrol is a renowned European power electronics technology research and development company with 20 years of technology accumulation and the world class solid-state switch and pulsed power technology. Main products: all-solid-state DC breakers, solid-state AC switches, pulsed power supply devices, digital IGBT drivers



• SwissSEM Technologies AG

Incorporated in 2019, SwissSEM has become a power semiconductor device technology research and development center with a world-class team of power semiconductor technology experts, specializing in the research and development of power semiconductor chips and modules.

Main products: IGBT, FRD, SiC and other power semiconductor chips, ED, ST and EVD-type modules, IGBT modules, HEEV modules, SiC modules, and other power semiconductor modules



• Hamburg, Germany

Incorporated in 2019, morEnergy specializes in the research and development of power grid and new energy impedance measurement technology, has one professor-level and two doctoral-level experts, has published more than 40 academic papers, and obtained international invention patents.

Main products: online impedance real-time measurement devices



• Rotterdam, the Netherlands

Astrolkwx has extensive technical and market experience in the field of power electronics, and provides technical consultancy services and solutions to clients in multiple fields such as ship DC electrical systems and rail transportation traction converter systems.

Main products: power electronics devices and equipment of different specifications, power electronics technology solutions



Wuxi, Jiangsu

Covering an area of 60 mu

• Wuxi Sun.King Power Capacitor Co., Ltd.

Incorporated in 2008, Wuxi Sun.King specializes in researching, developing and manufacturing high-voltage power capacitors and their complete equipment, and attains recognition as a National High-tech Enterprise. Wuxi Sun.King has obtained national energy technology achievement certifications and owns an industry-leading fully automatic intelligent production assembly line with a designed production capacity of 18 million kvar/year.

Main products: Power capacitors



• Wuxi Astrol Power Electronics Limited

Incorporated in 2016, Wuxi Astrol specializes in introducing frontier technologies from Astrol, morEnergy and other foreign subsidiaries of Sun.King Group into China and conducts production and manufacturing, market promotion, sales and services, etc. in China. Main products: all-solid-state DC breakers, solid-state AC switches, pulsed power supply devices, digital IGBT drivers, online impedance real-time measurement devices



Ningbo

• Ningbo Harong Electric Co., Ltd

Foundation: 2008

Location: Binwan Road No.50, Binhai New Area, Fenghua Economic Development Zone, Ningbo, Zhejiang Province, China

Product Scope: capacitors

Area: 1,3000 m²



Wuhan, Hubei

• Wuhan LandPower Co., Ltd.

Incorporated in 2007, this subsidiary specializes in researching, developing and manufacturing in the field of smart grid state perception and assessment, and has been recognized as a National High-tech Enterprise. Main products: online smart grid monitoring systems



• Sun.King NE Technology Co., Ltd

Which is a high-tech company integrating new energy development, investment, construction, operation and maintenance. As a one-stop provider of clean energy system solutions, its main business includes new energy project design and optimization, EPC engineering management, and AI operation and maintenance service system solutions, etc.

• Jiashan Sun.King Power Electronic Capacitor Co., Ltd.

Incorporated in 2017, this subsidiary specializes in researching, developing and manufacturing metallized polypropylene film DC support capacitors and pulse capacitors, and has successfully developed the first flexible DC support capacitors for Flexible DC transmission in China.

Main products: DC support capacitors, pulse capacitors



• Zhejiang Sine Power Technology Co., Ltd.

Incorporated in 2011, this subsidiary specializes in researching, developing and manufacturing laminated busbars with industry-leading design strength and manufacturing process, and automatic production assembly lines and testing lines.



• Zhejiang Jiashan Keneng Power Equipment Co., Ltd.

Incorporated in 2011, this subsidiary specializes in providing comprehensive solutions for power quality issues in various industries, and the research and development and engineering application of flexible AC transmission technologies (FACTS).

Main products: SVC, SVG and other power.



Beijing

• Sun.King Technology Group Limited Headquarters

Jiashan, Zhejiang

Covering an area of 151 mu

• Jiashan Sun.King Electrical Equipment & Technology Co., Ltd.

Incorporated in 2004, this subsidiary specializes in researching, developing, and manufacturing anode saturable reactors. It has earned national energy technology achievement certifications, and been recognized as a National High-tech Enterprise and the sole supplier of anode saturable reactors with proprietary technology in China. Main products: anode saturable reactors



• Sun.King Pacific Semiconductor Technology (Zhejiang) Co., Ltd.

Incorporated in 2020, this subsidiary specializes in researching, developing and manufacturing power semiconductor devices. As the parent company of SwissSEM, it is staffed with a world-class technical specialist team and experienced management team in the industry, and runs with world-class fully automatic intelligent production assembly lines. Main products: IGBT, FRD, SiC and other power semiconductor chips, ED, ST and EVD-type modules, IGBT modules, HEEV modules, SiC modules, and other power semiconductor modules



COMPANY PROFILE



Zhejiang Jiashan Keneng Power Equipment Co., Ltd. (hereinafter referred to as Keneng), a subsidiary of Sun.King Technology Group, is a high-tech enterprise with independent legal person status. It is dedicated to providing comprehensive solutions for power quality issues in various industries, and the research and development and engineering application of Flexible AC Transmission Systems (FACTS) and solid-state switch technologies. Keneng boasts robust technical capabilities and extensive experience, supported by a large team of expert technicians. It possesses domestically leading technologies and teams in the fields of integrated power quality detection, management, energy conservation, and power electronics. This enables the company to offer integrated solutions for constructing industrial parks with superior power quality, thereby enhancing the overall power supply quality within industrial parks and ensuring grid security. It provides high- and low-voltage power quality products that support energy conservation and consumption reduction in industrial power distribution systems. At the same time, it offers a whole package of solutions of power quality analysis, assessment, monitoring and regulation, with significant improvements to harmonic wave, voltage fluctuation, flicker, and negative sequence, to heavily bring down transmission loss, boost safety and reliability of power supply of devices, and extend service life. Keneng excels in providing all-solid-state DC breakers, high-voltage solid-state AC switches, and high-power pulse switch technologies that demonstrate outstanding applications in the HV high-power domains.

Guided by a philosophy of continuous innovation, Keneng adheres to the principle of "implementing brand strategies and pursuing sustainable development" and is sincerely committed to delivering high-quality services to its customers.



Business Philosophy

Quality and Mutual Benefit



Core Values

Professionalism, Focus,
Innovation, and Win-win
Outcomes



Corporate Vision

To be a leading
enterprise with a
positive brand image
in the industry



CONTENTS

01 Passive Power Filter (PPF) 07

02 Static Var Compensator (SVC) 13

03 Static Var Generator (SVG) 17

04 Pulsed Power Switch 21

05 Solid-State DC Circuit Breaker 25

06 Solid-State AC Switch 27

07 Low Voltage Ride Through Test (LVRT) Device 29

08 Fixed DC Deicing and SVC Device 31

09 DC Deicer 33

10 Thyristor Switched Capacitor (TSC) 35

11 Active Power Filter (APF) 37

01 | Passive Power Filter (PPF)

Device Introduction ▶

With the increasing prevalence of non-linear loads in power supply systems, harmonic pollution has emerged as a significant threat to the safety of power systems and electrical equipment, while also being a major contributor to energy losses. Certain non-linear loads can simultaneously cause issues such as negative sequence, voltage fluctuations, and flicker. Addressing the power quality challenges posed by non-linear loads in power supply systems has become a focal point for both power consumers and supply authorities. Passive power filters (PPFs), typically encompassing low-voltage thyristor-switched filter compensators (TSF for short) and high-voltage filter compensators (FC for short), represent the most mature and cost-effective technology for resolving harmonic and reactive power issues among a wide range of industrial users.

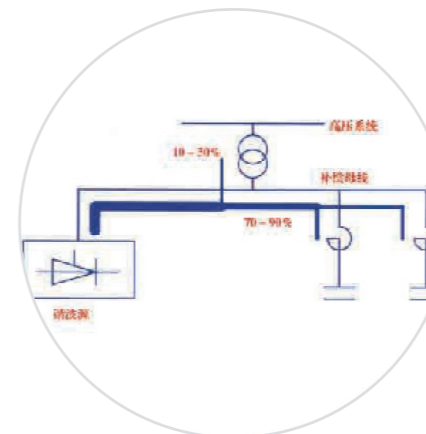
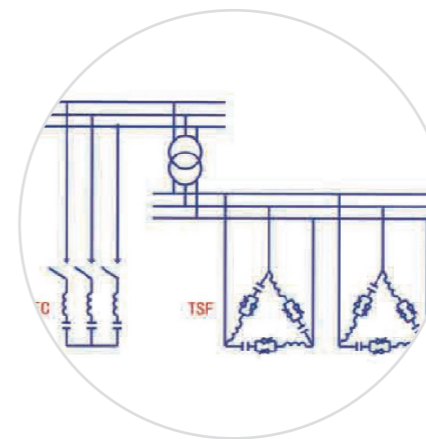
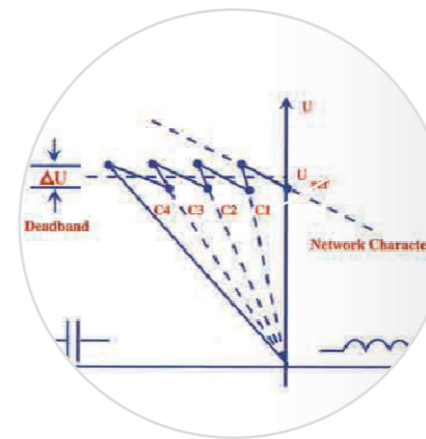
With DSP control technology, TSFs enable thyristors to rapidly switch filter banks at zero-crossing points, ensuring shock-free and arc-free operation. They dynamically track and compensate for impact loads, effectively filtering out harmonics, stabilizing voltage, suppressing flicker, and improving power factor.

FC devices are capable of implementing filtering and reactive power compensation for high-voltage power grids up to 110kV, and support automatic switching functions. The FCs provided are optimally designed to fully accommodate on-site conditions and various changes, which ensure effective filtering without amplifying harmonics and improve power factor without reverse reactive power transmission. Furthermore, the advanced CHP harmonic simulation technology allows users to predict post-commissioning performance indicators before equipment deployment, enabling informed decision-making in critical situations.

Device Function ▶

- Suppressing harmonic interference caused by non-linear loads
- Enhancing power factor
- Reducing transmission losses
- Optimizing VAR compensation
- Improving power quality
- Boosting production efficiency

Device Principle ▶



01 Output Characteristics of TSF/FC

TSF/FC are filtering and compensation equipment designed for power distribution systems, utilizing thyristors/vacuum contactors/circuit breakers to switch capacitors. These devices primarily consist of a control system, thyristors/vacuum contactors/circuit breakers, capacitors, and reactors. The capacitors can be divided into multiple groups for stepped control. TSF/FC enables step-by-step adjustment of capacitive reactive power, with the adjustment precision depending on the number of capacitor groups. The output characteristics are illustrated in Figure 1.

02 Schematic Diagram of the Primary Wiring for TSFs/FCs

Figure 2 illustrates the schematic diagram of the primary wiring for TSF/FC. The FC features a star connection configuration, whereas the TSF utilizes a delta connection setup. The capacity and branch configuration of the TSF/FC should be tailored according to the reactive power variations and harmonic levels of non-linear loads to ensure optimal compensation and filtering outcomes.

03 Schematic Diagram of the Filtering Principle for Filter Branches

Figure 3 shows the filtering schematic diagram of an FC with two filter branches (e.g., for the 5th and 7th harmonics). The FC should be installed close to the harmonic source, requiring precise tuning of the series resonance point, appropriate selection of the filter quality factor, and simulation verification to prevent resonance and harmonic amplification, thereby enhancing filtering efficiency. The FC can achieve a filtering efficiency of over 70% and a power factor compensation of above 0.9.



Technical Indicators **TSF Technical Indicators**

- Voltage level: 380V-1000V
- Maximum capacity per stage: 600kvar
- Maximum control stages: 7 stages
- Power factor: ≥ 0.9
- Overall power consumption: $\leq 1\%$
- Protection rating: IP31
- Filtering performance: GB/T14549-93 compliant
- Measurement accuracy: Voltage and current accuracy of Class 0.5; power accuracy of Class 1.5 Voltage fluctuation performance: GB/T12326-2000 compliant
- Class 1.5 Voltage fluctuation performance: GB/T12326-2000 compliant
- Bus protection: Overvoltage and undervoltage protection
- Branch protection: Multiple protection measures including overcurrent, instantaneous trip, overheating, and imbalance
- Rapid reactive power/voltage compensation achieved in $\leq 10\text{ms}$ response time
- Three-phase/single-phase control selectable

FC Technical Indicators

- Voltage level: 6kV-110kV
- Filtering performance: GB/T14549-93 compliant
- Power Factor: SD325-89 compliant
- No occurrence of resonance, overvoltage, or harmonic current amplification



Engineering Design & Services

Optimized System Design

The performance indicators of TSF/FC primarily depends on the supplier's capability in system analysis and design. Our company can deliver tailored solutions that precisely match customer-specific system requirements.

Safe and Reliable Components

The control and protection system has undergone extensive field validation. The filter capacitors employ all-film dielectric insulation, featuring low power loss and high reliability. The air-core reactors offer continuously adjustable inductance values, while the resistors utilize non-inductive designs. All components are either manufactured in-house or sourced from renowned domestic and international suppliers.

Supporting Automatic Switching

Equipped with an independently-developed automatic switching controller, it employs thyristor/vacuum contactor/circuit breaker technologies for filter bank switching, ensuring adaptability to diverse load conditions.

Comprehensive Protection Functions

The TSF/FC are equipped with micro computer-based protection capabilities, enabling automatic fault type identification and coordinated operation with the controller. It provides multiple protection functions including overvoltage/undervoltage protection, filter bank overcurrent protection, and imbalance protection.

The engineering service that integrates testing, evaluation, design, and construction aims to achieve optimal filtering effects. To this end, it is necessary to conduct on-site site selection and measurements, gather system data, present a test report along with the optimal design proposal for the user's selection, and ultimately complete the project.

Related Cases ▶

01 Geely Material Group's Coal-Electricity-Aluminum Integrated Project

Quantity: 6 sets;
Voltage level: 22 kV;
Capacity per set: 30 Mvar.



03 VAR Compensator of Guangxi Yin Hai Aluminum Industry

Quantity: 4 sets;
Voltage level: 9.5 kV;
Capacity per set: 22 Mvar.



04 VAR Compensator for Electrolytic Aluminum at Inner Mongolia Chuangyuan Metals Co., Ltd.

Quantity: 7 sets;
Voltage level: 30 kV;
Capacity per set: 36 Mvar.

02 VAR Compensator for Electrolytic Aluminum at Dongxing Aluminum Industry of JSICO

Quantity: 17 sets;
Voltage level: 30 kV;
Capacity per set: 36 Mvar.



Capacitor compensation cabinet in Malaysia ▶

02 | Static Var Compensator (SVC)

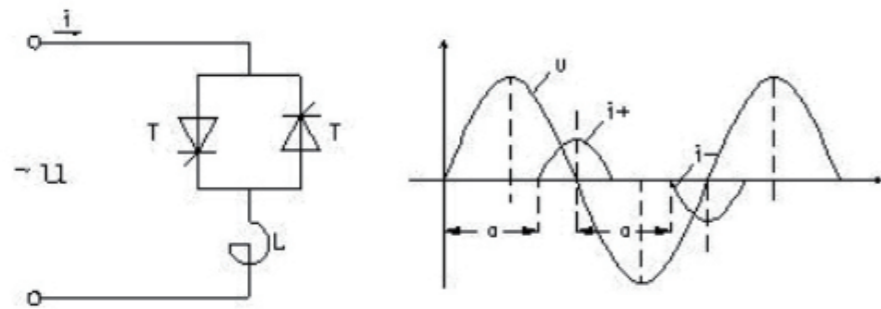
Product Introduction ▶

The Static Var Compensator (SVC) is a typical flexible AC transmission device. It evolved from mechanically switched capacitors and reactors by incorporating high-capacity thyristors as substitutes for mechanical switches. In terms of external characteristics, an SVC can be viewed as a controllable capacitive or inductive reactance connected in parallel with the power system or load. By swiftly adjusting the reactive power it generates, the SVC exhibits robust reactive power regulation capabilities, providing dynamic reactive power support to the power system, enhancing the power factor, and stabilizing system voltage.

The SVC primarily comprises three typical configurations: the Thyristor Controlled Reactor (TCR) type, the Thyristor Switched Capacitor (TSC) type, and the Magnetically Controlled Reactor (MCR) type. Among these, the TCR-type SVC stands out for its ability to swiftly and smoothly adjust reactive power in a controlled and dynamic manner. It is extensively utilized to mitigate bus voltage fluctuations and flicker caused by impact loads, facilitating transient voltage recovery and enhancing the overall voltage stability of the system. This makes it a popular choice in various fields, including power transmission and distribution systems, electrified railways, and the iron and steel metallurgy industry.

Working Principle ▶

The TCR-type SVC is composed of two main parts: a TCR (Thyristor Controlled Reactor) and an FC (Fixed Capacitor). The FC filter provides a fixed amount of capacitive reactive power while also filtering out some harmonics. Meanwhile, the TCR offers variable inductive reactive power. By adjusting the triggering delay angle of the thyristors within the TCR, the SVC can modify the conduction time and current of the phase-controlled reactor. This effectively changes the equivalent reactance value of the reactor, enabling the SVC to either generate or absorb reactive power. As a result, it can continuously and rapidly regulate the reactive power of the system.



Schematic Diagram of the Working Principle of a TCR

The device determines the control delay angle α by comprehensively considering the voltage (u) and current (i) at the point of common coupling (PCC) of the system. By adjusting the conduction angle α of the thyristors, it alters the current flowing through the phase-controlled reactor, which is essentially the current in the inductor, thereby achieving smooth regulation of reactive power. The variations in load reactive power (Q_L) are precisely balanced by the variable reactive power (Q_{TCR}) generated by the TCR, ensuring that their sum remains constant. This constant inductive reactive power is then offset by the capacitive reactive power (Q_F) provided by the FC, following the equation $Q_F = Q_L + Q_{TCR}$. Ultimately, this maintains the power factor of the power grid system at a preset value, typically around 0.95-0.99, while keeping the voltage within the required range.

Product Features ▶

- The thyristor valve bank employs photoelectric triggering technology, featuring high-voltage energy extraction from the high-potential plate, robust system immunity to interference, excellent dynamic and static voltage-sharing performance, high heat dissipation efficiency, and reliable BOD protection.
- The control system utilizes a fully digital DSP control platform, characterized by high control precision, rapid response speed, excellent output linearity, and superior compensation effects. It effectively suppresses voltage fluctuations and flicker while improving three-phase imbalance.
- The monitoring and protection system features an integrated workstation, with a user-friendly human-machine interface. It offers a wealth of monitoring and display information, along with comprehensive protection functions, enabling unmanned operation.
- It operates quietly with minimal losses and is completely pollution-free
- It boasts high reliability and is easy to maintain.

Technical Parameters ▶

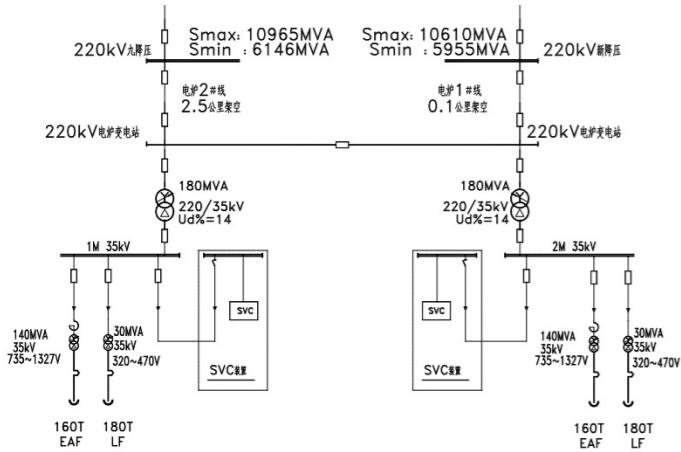
Key Technical Indicators of Kenng SVC					
	Specifications				
Voltage level	6kV	10kV	27.5kV	35kV	66kV
Rated capacity	0 ~ 30MVA	0 ~ 60MVA	0 ~ 55MVA*	0 ~ 200MVA	0 ~ 350MVA
Thyristor valve structure	Horizontal frame design for indoor installation				
Cooling method of the valve bank	For currents below 700A: Heat pipe self-cooling; for currents above 700A: water-air cooling or water-water cooling				
Triggering method of the valve bank	Photoelectric triggering				
Control system	DSP+FPGA				
Control method	Regulating reactive power, voltage, and power factor on a phase-by-phase basis				
Controller response time	<10ms				
Control panel dimension	800x800x2,200 (L x W x H); the number of control panels varies based on project configuration				
Noise level	<60dB				
Control power supply voltage	AC 220V or DC 110/220V				
Auxiliary power supply	AC 380V ± 15%				

Technical Description of Kenng SVC						
Product Mode	Voltage Level (kV)	Capacity Range (MVar)	Valve Body Installation Method	Valve Body Installation Dimensions H X W X D (mm)	Valve Body Cooling Method	
KN-SVC-6	6	0~12MVar	It can be installed indoors in a fixed manner or within a movable container.	Horizontal single-layer:1700x1300x1400	Heat pipe cooling	
		0~30MVar		Horizontal single-layer:1300x1000x1200	Water cooling	
KN-SVC-10	0~20MVar	Horizontal single-layer:1700x1600x1400		Heat pipe cooling		
	0~60MVar	Horizontal single-layer:1300x1100x1200		Water cooling		
KN-SVC-27.5	0~20MVar	Horizontal single-layer:1800x4200x1400		Heat pipe cooling		
	0~55MVar	Horizontal double-layer:2500x1200x1200		Water cooling		
KN-SVC-35	0~70MVar	Horizontal single-layer:2100x5000x1400		Heat pipe cooling		
	0~200MVar	Horizontal double-layer:2500x1400x1200		Water cooling		
KN-SVC-66	66	0~350MVar		Installed indoors in a fixed manner	Horizontal three-layer:3900x1600x1200	Water cooling

Related Cases ▶

01 Two sets of 200 MVar/35 kV SVC units of Taiyuan Iron & Steel (Group) Co., Ltd.

The load profile of Taiyuan Iron & Steel (Group) Co., Ltd. is illustrated in the diagram below, including equipment such as the 160-ton electric arc furnace (EAF) and the 180-ton ladle furnace (LF).



The AC EAF and LF represent classic examples of nonlinear impact loads. The erratic fluctuations in arc current and asymmetrical short-circuits generate harmonics and negative-sequence components, leading to voltage fluctuations and flicker. These issues severely degrade the power quality of the electrical grid and reduce steel-making output. By installing Keneng's Static Var Compensator (SVC), these problems have been economically and effectively resolved, providing robust support for ensuring both the quality and quantity of steel production.

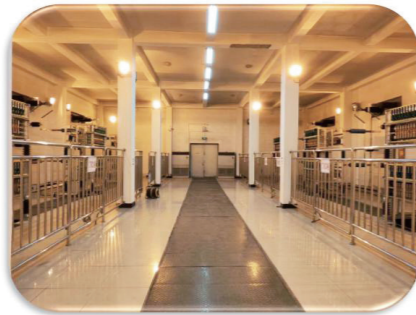


Diagram of the 200 MVar/35 kV SVC Unit of Taiyuan Iron & Steel (Group) Co., Ltd. in Shanxi

02 One set of 125 MVar/33 kV SVC unit of Tianjin Pipe Co., Ltd

Keneng has supplied a 125 MVar/33 kV SVC unit tailored for the steel-making electric arc furnace of Tianjin Steel Pipe Co., Ltd.

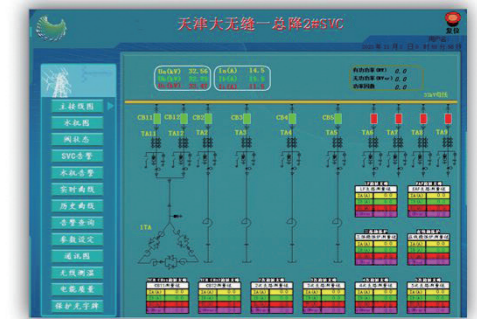


Diagram of the 125 MVar/33 kV SVC Unit of Tianjin Steel Pipe Co., Ltd.

03 SVC Unit for Erlianhaote Wind Power Project of China Huadian in Inner Mongolia



Photo of SVC Unit for Erlianhaote Wind Power Project of China Huadian in Inner Mongolia

04 SVC Unit for the Electrified Railway of China Railway Chengdu Bureau

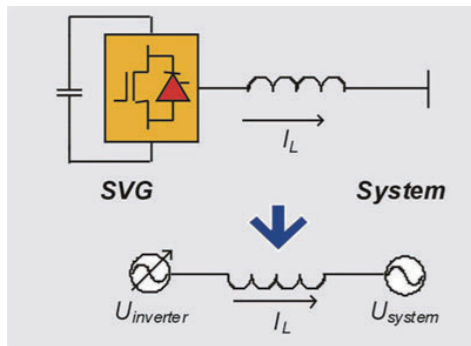


Photo of SVC Unit for the Electrified Railway of China Railway Chengdu Bureau

03 | Static Var Generator(SVG)

Product Introduction ▶ The Static Var Generator utilizes high-power, switchable power electronic devices (such as IGBTs) to form a self-commutated bridge circuit. This circuit is connected to the power grid in parallel through a reactor. By appropriately adjusting the magnitude and phase of the output voltage on the AC side of the bridge circuit, or directly controlling its AC side current, the circuit can absorb or generate reactive current as required, achieving the purpose of dynamic reactive power compensation.

Schematic Diagram of the Working Principle of SVG



Schematic Diagram of the Operational Mode of SVG

Operational Mode	Waveform and Phasor Diagram	Description
No-load operational mode		When U_i equals U_s and the I_L is 0, the SVG does not absorb or generate reactive power.
Capacitive operational mode		When U_i exceeds U_s and the I_L represents a leading current, and its magnitude can be continuously controlled by adjusting U_i , enabling continuous regulation of the reactive power generated by the SVG.
Inductive operational mode		When U_i is less than U_s and the I_L becomes a lagging current, the reactive power absorbed by the SVG can be continuously controlled.

Function Description ▶ Keneng SVG finds widespread application across various industrial sectors, including petrochemicals, metallurgy, power generation, coal mining, electrified railways, wind farms, and other fields characterized by the presence of or proximity to impact loads and high-capacity electric motors. It plays a pivotal role in energy conservation and consumption reduction, enhancing grid safety and stability, improving power factor, and optimizing power quality.

- 01** It enhances the stability of the power system by dynamically providing voltage support, curbing system overvoltages, damping power oscillations, elevating the level of transient stability, reducing the number of loads shed due to low voltage, and preventing widespread catastrophic blackouts caused by transient voltage collapse;
- 02** It boosts the capacity for long-distance AC/DC power transmission by dynamically maintaining the terminal voltage of transmission lines and increasing the steady-state power transmission limit of these lines.
- 03** It improves power quality on the load side by mitigating voltage fluctuations and flicker, compensating for load imbalances, and enhancing the power factor.

- Technical Advantage** ▶
- Utilizing VSC technology based on controllable devices, it offers flexible control
 - It incorporates a redundant design, ensuring highly reliable operation
 - It boasts excellent harmonic performance, eliminating the need for a separate TSVG capacitor cabinet.
 - It can provide bidirectional reactive power and occupies a relatively small footprint.
 - It responds rapidly (within 10 milliseconds).
 - It excels at compensating for rapid impact loads.
 - The output reactive current is independent of the system voltage, and the balance of output reactive power is adjustable
 - Through algorithmic adjustments, it achieves comprehensive management of reactive power, negative sequence components, and harmonics.

Technical Parameters ▶

AC Input	Rated voltage	380V - 35kV
	Rated capacity	100 kVar – 200MVar
	Rated frequency	50 Hz
	Target power factor	It can achieves set requirements within the capacity range..
	Full response time	5ms (10% ~ 90%)
	Active power loss	Less than 0.8% of rated power
Environmental Conditions	Operating temperature	-10°C ~ 45°C
	Storage temperature	-20°C ~ 65°C
	Relative humidity	<90%(at25° C)
Operating Mode		Optional modes: constant power factor, constant reactive power, or constant voltage
Cooling Method		Air cooled or water cooled
Load Compensation Function		Power factor compensation, flicker suppression, harmonic compensation, and imbalance control
Overload Capacity		1.1x continuous overload, 1.2x overload for 5 seconds, 1.3x overload with protection disengagement
Communication Interface		Optional remote RS485/Ethernet communication; optional host computer communication software
Operation Display		Operation parameter settings; multi-parameter display via touch buttons, operational data logging, fault recording, backup of parameters and logged data, remote control and parameter downloading, remote software updates for the controller.
Display Accuracy		±2%FS
Scalability		Capable of parallel operation to meet higher capacity requirements
Protection Functions		Protection against grid over/under voltage, phase sequence errors/missing phases, device overcurrent, DC bus over/under voltage, automatic current limiting during overload, power module overcurrent, control power supply anomalies, communication failures, and control system power outages

Model Specifications ▶

6kV Products (The following dimensions are for reference only; actual sizes may vary)

Model	Rated Capacity (MVA)	Rated Current (A)	Cabinet Dimensions(m)			Reactor Type
			L	D	H	
KN SVG-LFS-1/06	1	96	4.1	1.2	2.85	Iron-core/Air-core
KN SVG-LFS-2/06	2	192	4.7	1.2	2.85	Iron-core/Air-core
KN SVG-LFS-3/06	3	289	4.7	1.2	2.85	Air-core
KN SVG-LFS-4/06	4	385	6.9	1.3	2.85	Air-core
KN SVG-LFS-5/06	5	481	6.9	1.3	2.85	Air-core
KN SVG-LFS-6/06	6	577	6.9	1.3	2.85	Air-core
KN SVG-LFS-7/06	7	674	7.3	1.3	2.85	Air-core
KN SVG-LFS-8/06	8	770	7.3	1.3	2.85	Air-core

Related Cases ▶



Xinlong Photovoltaic SVG

10kV Products (The following dimensions are for reference only; actual sizes may vary)

Model	Rated Capacity (MVA)	Rated Current (A)	Cabinet Dimensions(m)			Reactor Type
			L	D	H	
KN SVG-LFS-1/10	1	58	5.3	1.2	2.85	Iron-core/Air-core
KN SVG-LFS-2/10	2	115	5.3	1.2	2.85	Iron-core/Air-core
KN SVG-LFS-3/10	3	173	5.3	1.2	2.85	Iron-core/Air-core
KN SVG-LFS-4/10	4	231	6.5	1.2	2.85	Iron-core/Air-core
KN SVG-LFS-5/10	5	289	6.5	1.2	2.85	Air-core
KN SVG-LFS-6/10	6	346	6.5	1.2	2.85	Air-core
KN SVG-LFS-7/10	7	404	9.5	1.3	2.85	Air-core
KN SVG-LFS-8/10	8	462	9.5	1.3	2.85	Air-core
KN SVG-LFS-9/10	9	520	9.5	1.3	2.85	Air-core
KN SVG-LFS-10/10	10	577	10.1	1.3	2.85	Air-core
KN SVG-LFS-11/10	11	635	10.1	1.3	2.85	Air-core
KN SVG-LFS-12/10	12	693	10.1	1.3	2.85	Air-core



Baosheng Photovoltaic SVG

35kV Products (The following dimensions are for reference only; actual sizes may vary)

Model	Rated Capacity (MVA)	Rated Current (A)	Cabinet Dimensions(m)			Reactor Type
			L	D	H	
KN SVG-LFS-8/35	8	132	15	6	4.2	Iron-core/Air-core
KN SVG-LFS-16/35	16	264	16	6	4.2	Air-core
KN SVG-LFS-30/35	30	495	18	7	5.0	Air-core
KN SVG-LFS-40/35	40	660	18	7	5.0	Air-core
KN SVG-LSS-50/35	50	825	18	7	5.0	Air-core
KN SVG-LSS-75/35	75	1237	20	8	5.0	Air-core
KN SVG-LSS-100/35	100	1650	20	8	5.0	Air-core



10kV/8MVA SVG of CRRC Qiqihar Co., Ltd.

04 | Pulsed Power Switch

Pulsed power technology involves storing energy over a relatively long period and releasing it rapidly through a fast switch to generate high-power electrical pulses. This technology is critical and widely applied in defense research, industrial production, and medical fields. The output power level, repetition frequency, and service life of a pulsed power source are primarily determined by its switching capability. High-power solid-state

switches based on semiconductor devices are gradually replacing gas switches due to their compact size, long lifespan, superior controllability, high reliability, and high repetition frequency, representing the future trend in pulsed power switches. Astrol's pulsed power switches from Sun.King demonstrate world-class technology and have delivered outstanding performance in numerous major global scientific projects.

Application Fields ▶

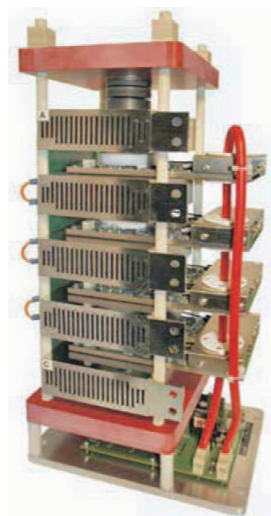
- Radar pulsed power modulators
- Pulsed power modulators for electron beam acceleration
- Tumor radiotherapy systems for medical use/Pulsed power generators for X-rays
- X-ray pulsed power generators for security screening systems
- HV pulsed generators for denitrification/desulfurization systems
- HV pulsed generators for food sterilization treatment systems
- Electromagnetic railguns and similar electromagnetic launch systems
- Laser applications (Free-electron laser generators)
- Rock blasting equipment
- Material decomposition (pulverization) equipment
- Electromagnetic force metal forming machinery
- Explosive fuses (utilizing nanoparticles)
- Electronic fences for aquaculture
- Underwater topography exploration
- Electrical overvoltage protection systems (Crowbar circuit applications)

Standard Model ▶

01 PPS-TH51 Pulsed Power Component

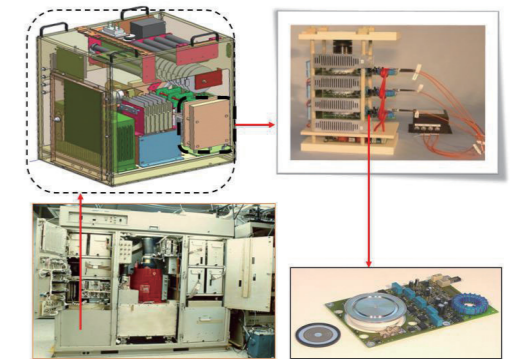
General Purpose

It can be applied in pulsed power systems across various fields, including food sterilization, medical systems, radar power supplies, security systems, high-power lasers, electron beam accelerators, seismic research, and environmental protection systems (such as desulfurization/denitrification electrical filters). It can also serve as a replacement for thyratrons.



Product Features

- DC voltages up to 30kV
- Non-repetitive pulse currents up to 20kA
- Maximum pulse repetition rate of 1,300Hz
- Peak di/dt capability of 10kA/μs
- Monolithic integration of a reverse-conducting freewheeling diode It is
- Immune to vibration effects compared to thyratrons
- Cooling options include air and liquid cooling
- Ready-to-use with integrated power supply, monitor, and drive system



Airport Radar Modulator of FAA

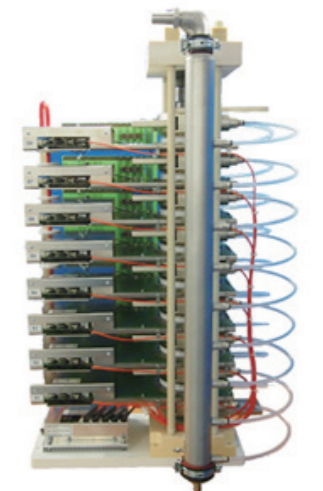
Technical Specifications for 10.5kV Switch AA-10368-004

Parameter	Symbol	Remarks	Min.Value	Typical Value	Max.Value	Unit
Operating voltage	V	100FIT	-	-	10.5	KVDC
Pulse current	I	Single pulse (10μs)	-	-	20	kA
Current riserate	di/dt		-	-	10	kA/us
Pulsere petition rate	f	Operating current:1,200A	-	-	1300	Hz
Reverse leakage current	Ileak		-	-	20	mA
Number of series stages	n		-	4	-	pcs
Cooling system	-	Forcedair cooling			4	m3/sec
Operating temperature			5	-	60	°C
Storagete mperature			-25	-	85	°C
Logic power supply	Vlogic		48	-	72	VDC
Logic power consumption	P	4-component design,operatingat1,300Hz	-	-	80	W

02 PPS-TH91 Pulsed Power Component

General Purpose

It can be applied in pulsed power systems across various fields, including environmental protection systems (such as desulfurization/denitrification electrical filters), thyatron replacement, material processing, food sterilization, magnetic forming operations, medical systems, security systems, electron beam accelerators, and seismic research.

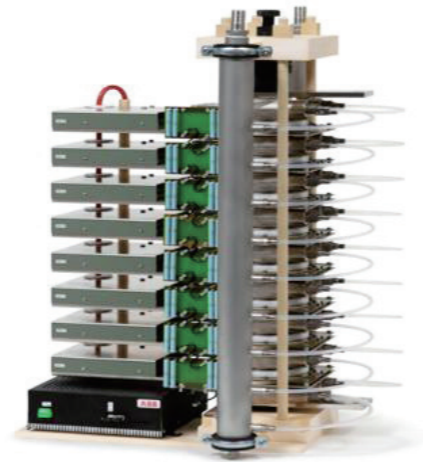


Product Features

- DC charging voltage up to 30kV
- Pulsed current capacity up to 50kA
- High pulse repetition rate
- Maximum current rise rate of 30kA/μs
- Monolithic integration of a reverse-conducting freewheeling diode
- Different from thyratrons, it can be installed in any position
- Cooling options include convection, forced air, or liquid cooling
- Liquid cooling recommended for high pulse repetition rates
- Convection or forced air cooling available upon request
- Ready-to-use with integrated power supply, monitor, and drive system
- Reverse-blocking version available upon request
- Immune to vibration effects compared to thyratrons



Desulfurization Equipment for Environmental Protection at POSCO in South Korea

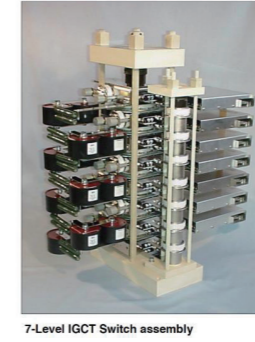
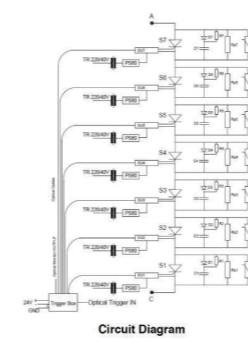


Technical Specifications for 25kV Switch AA-10375-008						
Parameter	Symbol	Remarks	Min.Value	Typical Value	Max.Value	Unit
Operating voltage	V	100FIT	-	-	25	kV _{DC}
Pulse current	I	Single pulse (10μs)	-	-	50	kA
Current rise rate	di/dt		-	-	30	kA/μs
Reverse leakage current	I _{leak}		-	-	10	mA
Number of series stages	n		-	8	-	pcs
Cooling system	-	Water cooling			50	l/min
Operating temperature			5	-	60	°C
Storage temperature			-25	-	85	°C
Logic power supply	V _{logic}		48	48	72	V _{DC}

Typical Customized Cases ▶

01 DESY (Deutsches Elektronen Synchrotron) in Hamburg, Germany

ON-OFF Switch with IGBT

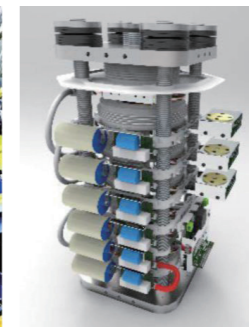
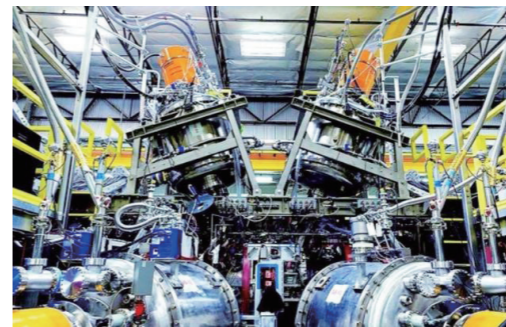


DESY Hamburg



Maximum DC charging voltage	13 kV	Maximum turn-off current	3500A
Reverse blocking voltage	13 kV	Pulse repetition frequency	10 Hz
Rated current	1800A	Quantity	14 groups
Pulse width	1700 μs	Cumulative operating hours	450,000 (fault-free)

02 Controllable Nuclear Fusion Experiment by Tri Alpha Energy in the USA



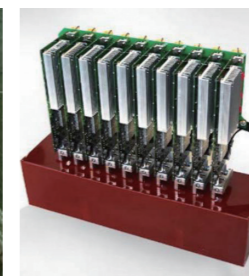
Switch 1

- Half-bridge configuration with 6 kV/6 kA
- 100 kJ capacitor discharge delivering a 20–30 ms current pulse

Switch 2

- Full-bridge configuration with dual 4.5 kV (±6 kA)
- 100 kJ capacitor discharge providing microsecond-scale current pulse

03 ESS (European Spallation Source) in Lund, Sweden



- DC voltage: 18 kV
- Peak current: 300 A (air-cooled)
- Repetition rate: ≤10 kHz

As the pulsed spallation neutron source with the highest flux in the world, it utilizes Astrol's IGBT-based pulsed power switches to safeguard tetrodes in the event of arcing.

05 | Solid-State DC Circuit Breaker

As global ship electrification and green carbon reduction and transformation efforts advance, the advantages of simple, flexible, and efficient DC grid systems have become increasingly apparent, driving rapid adoption of DC integrated power systems in marine distribution. To ensure the safety and reliability of DC distribution systems, solid-state DC circuit breakers are the preferred critical equipment for DC short-circuit protection.



Astrol, a subsidiary of Sun.King Technology, has delivered hundreds of marine solid-state DC circuit breakers to leading companies such as Siemens, ABB, Kongsberg Maritime, and China State Shipbuilding Corporation Limited. These products are widely used in Norway, Finland, Sweden, Turkey, the Netherlands, the United Kingdom, the United States, South Korea, Switzerland, and China.

Domestic Application ▶

Tugs in ports, research vessels, official patrol ships, wind turbine installation vessels, offshore wind operation and maintenance mother vessels, and shipboard power distribution laboratories.

Features ▶

- Imported directly from Astrol in Switzerland and backed by comprehensive domestic service support
- Primarily used as a bus-tie switch in marine DC power distribution systems
- Dual certifications from DNV-GL and CCS
- Maximum applicable DC voltage of up to 1,500V
- Microsecond-level interruption time
- Bidirectional current flow capability
- Circulating water cooling system
- Built-in self-diagnostic functions for
 - Gate drivers
 - Inlet/outlet water temperatures
 - Inlet/outlet water pressures
- Various system interface types
 - Triggered by optical or electrical signals
 - Modbus-TCP
 - Other customized protocols

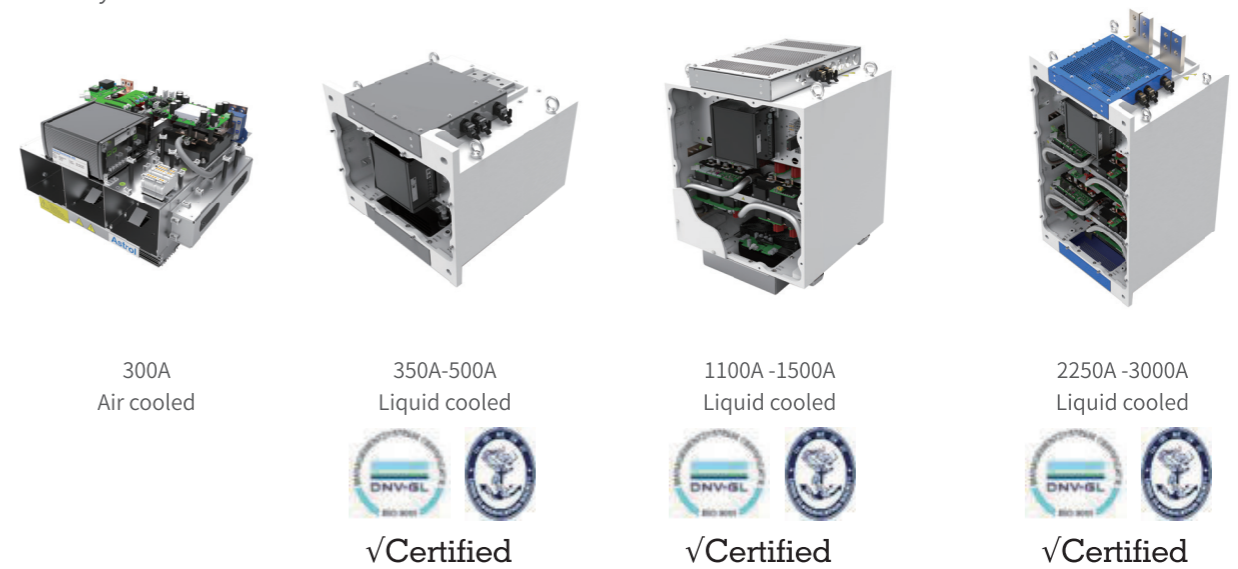


Industry-leading Technologies ▶

- Specialized circuit breaker topology and design
- Maximum interrupt current twice that of similar products
- Protection speed ten times faster than similar products
- No need for additional inductors or fuses
- Quarter the size and weight of similar products



Sun.King Technology's product lineup for solid-state DC breakers includes models spanning rated currents from 300A to 3,000A. Specifically, models rated from 350A to 3,000A have obtained both CCS and DNV certifications. The 300A version is air-cooled and primarily designed for non-marine DC power distribution systems, while the 350A-3,000A models are liquid-cooled and suitable for a wide range of DC power distribution applications, including marine systems.



Parameters ▶

Current rating	300A	350A	500A	1100A	1500A	2250A	3000A
Maximum interrupt current	2.5kA	3.5kA	4.5kA	7.5kA	10kA	15kA	20kA
Operating voltage	10~1500V						
Interruption time	8μs						
Circuit inductance	5~100μH	2.6~100μH		1.2~100μH		0.6~100μH	
W × D × H (mm)	482*386*310	506*506*430		506*506*673		506*506*912	
Weight(kg)	22	48~60		84~97		147~157	

06 | Solid-State AC Switch

Application Fields ▶

Smart grids, rail transportation, renewable energy, data centers, the semiconductor industry, and others

Product Advantages ▶

- Contactless design with no arcing, ensuring high safety
- High control accuracy and exceptional reliability
- Rapid switching capability with a high switching frequency
- Highly intelligent with a user-friendly interface
- Long service life with zero maintenance require

Product Performance ▶

Item Name	Technical Parameter Description
Rated voltage	3kV~35kV
Rated current	200A~2000A
Operating frequency	≤ 2000Hz
Response time	≤ 10μs
Number of phases	Single-phase,three-phase,six-phase or more
Cooling method	Forced air cooling and water cooling
Communication interface	RS485 and Ethernet
Communication protocol	Mod bus R T U/ TCP
Operating environment	Indoor,0° C-40° C
Altitude	Up to 2000 meters (customizable for higher elevations)
Expected lifespan	≥ 15 years

Specific Cases ▶

Thermal Energy Storage Project - Thyristor-Based Solid-State AC Switch

Project Overview:

The proportion of new energy sources, represented by wind and photovoltaic power, continues to rise within the energy system structure, posing challenges to the stable operation of power grids. Innovative energy storage technologies, such as thermal energy storage, can enhance the integration of renewable energy, elevate the safety and reliability of grid operations, and play a pivotal role in establishing a new power system centered around renewable energy.

Astrol's solid-state AC switch enables flexible and secure distribution of renewable energy across multiple heat storage modules within electrothermal energy storage systems. It dynamically absorbs and utilizes surplus renewable power that would otherwise be wasted, while smoothly adjusting heating power.



Product Overview:

Rated voltage: 4.2kV/6.3kV/11kV
 Rated current : 200A-900A
 Grid frequency: 50Hz or 60Hz
 Cooling method: Air cooled or water cooled

UK SmartGrid-IGBT Ultra-Fast Solid-State AC Switch

Project Overview:

Smart microgrids play a pivotal role in efficiently integrating renewable energy, fostering distributed energy development, and providing mutual support with the main power grid to ensure reliable electricity supply. With vast application potential, they are experiencing rapid global growth. When a short-circuit fault occurs in a microgrid, the interconnection must be disconnected within microseconds to prevent voltage dips from affecting the main grid. Astrol's ultra-fast solid-state AC switch, featuring microsecond-level switching speeds, enables rapid, disturbance-free transitions between different AC circuits. As a critical component for microgrid-main grid interconnection, it has been deployed in UK smart grid projects in multiple batches, enhancing operational efficiency, ensuring power supply security, and significantly advancing grid intelligence across the UK.



Technical Specifications for IGBT Ultra-Fast Solid-State AC Switch:

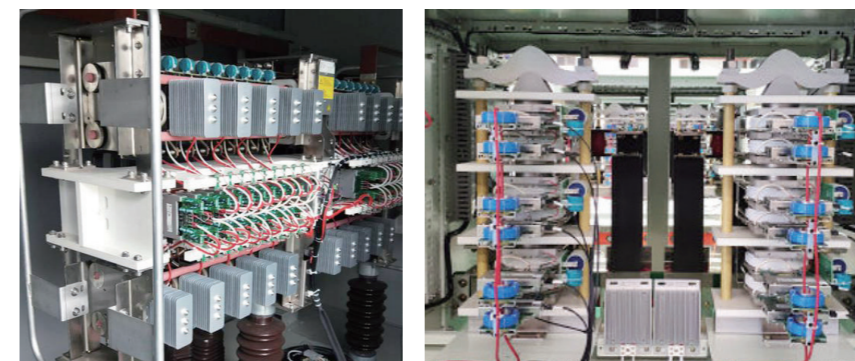
Rated voltage: 11kV or 6.6kV
 Number of phases: Three-phase configuration
 Frequency: 50Hz
 Rated current: 600A
 Disconnection time: ≤ 10 μs
 Cooling method: Water cooled

Rail Transit-Thyristor-Based Solid-State Transfer Switch

Project Overview:

Sun.King's Astrol solid-state AC switches boast several key advantages, including rapid switching, natural current zero-crossing turn-off, precisely controllable activation timing, and a long service life that requires no maintenance.

These features make them indispensable in specific applications. We have a sophisticated and well-validated technical platform for power electronics AC switches, which has been proven across numerous applications. This platform encompasses structural expertise in solid-state switch valve assemblies, HV valve group fiber-optic control technology, synchronous triggering techniques, as well as extensive experience in thermal analysis, engineering design, and reliability design. With these capabilities, we offer tailored solutions for HV high-power AC solid-state switches to meet the diverse needs of our customers across various applications.

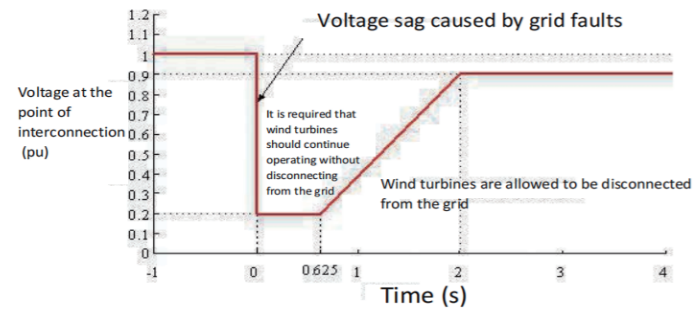


Product Overview:

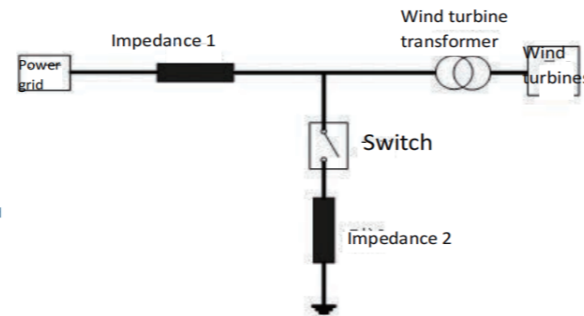
Rated voltage: 27.5kV/16.7kV
 Rated current: 500A-2,000A
 Grid frequency: 50Hz or 60Hz
 Cooling method: Forced air cooling
 Altitude: ≤ 2,000m
 Expected lifespan: 15 years

07 | Low Voltage Ride Through (LVRT) Test Device

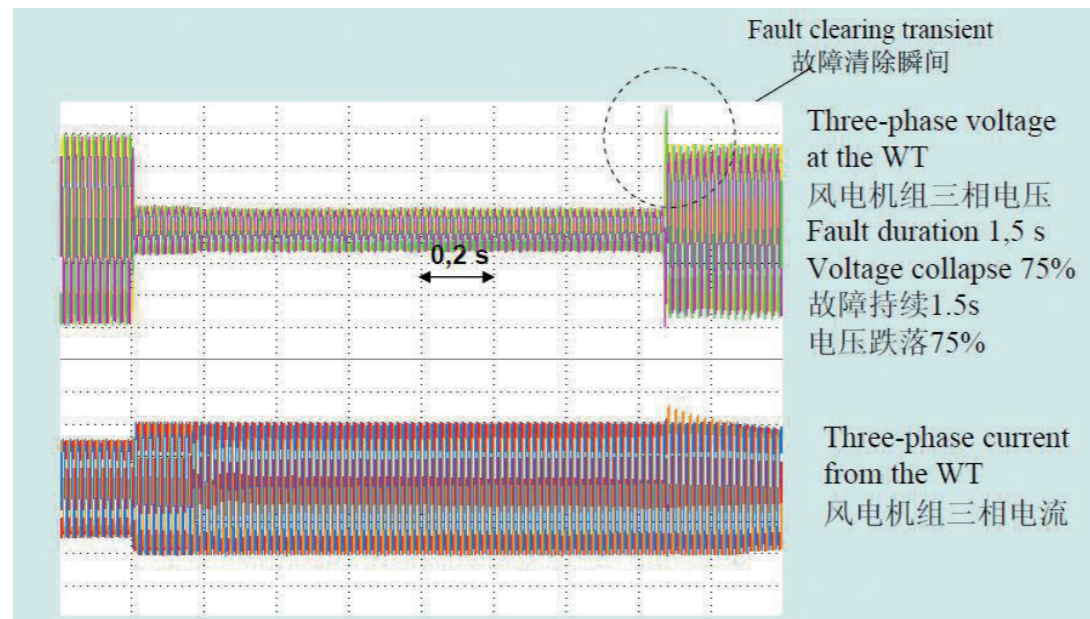
1 Technical requirements of the national standard GB/T19963-2011:



2 Principle of impedance-divider based LVRT:



3 Typical waveform for LVRT



4 Features of Keneng's LVRT Products

- 1) They can be designed and manufactured with either fixed or mobile configurations, tailored to meet the specific needs of users.
- 2) Utilizing impedance voltage division, they can simulate various fault scenarios, including three-phase, two-phase, and single-phase faults. The exact configuration can be customized according to user requirements.
- 3) They are capable of achieving voltage sag amplitudes ranging from 0%Un to 100%Un, with a deviation in sag amplitude of less than 5%Un.
- 4) They meet the LVRT test requirements for wind turbine generators with a rated capacity range of 1.5MW to 8MW.

5 Technical Parameters of Keneng LVRT:

Item	Specification		
Voltage level	0.69kV	10kV	35kV
Voltage sag method	Impedance-divider based		
Control components	Circuit breakers or thyristor valves		
Installation method	Indoor fixed or movable in the container, with maximum dimensions of 14,000×3,100×3,200mm		
Control system	DSP+FPGA fully digital controlled		
Control mode	Fully automated test execution		
Voltage sag range	0 ~ 100%		
Voltage sag time	Adjustable		
Controller size	Standard 4U chassis, mountable on switchgear		
Noise level	<60dB		
Control power supply voltage	AC 220V or DC 110/220V		
Auxiliary power supply	AC 380V±15%		

6 Related Cases of Keneng LVRT:

12 MVA/35 kV LVRT Testing Equipment of Electric Power Research Institute of Yunnan Power Grid Co., Ltd.



08 | Fixed DC Deicing and SVC Device

Device Introduction ▶ Fixed DC De-icer & SVC Device

The Fixed DC Deicing and SVC Device utilizes high-power power electronic components to generate direct current, which heats the wires to melt accumulated ice on transmission lines. This device is highly reliable, with minimal impact on the system, and is suitable for deicing large-capacity, long-distance power lines.

The Fixed DC Deicing and SVC Device can switch between two operating modes of DC deicing and SVC, as needed. When there is no demand for ice-melting, the device can be reconfigured through its main wiring to operate as a SVC. This transformation enhances the stability and transmission capacity of the power system, significantly improving the utilization efficiency of the device.

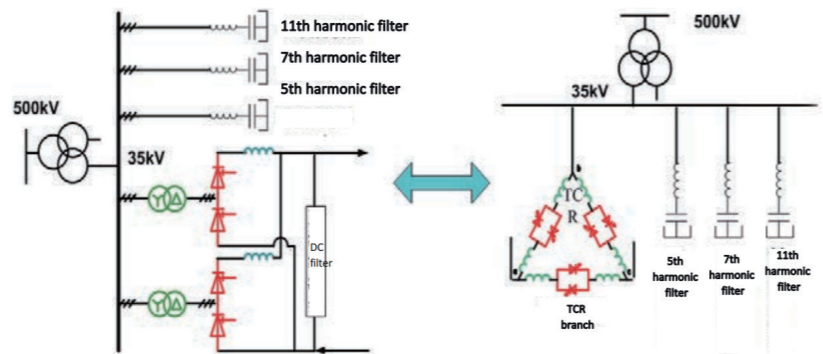
Device Principle ▶

DC Ice-Melting Mode

In this mode, 6-pulse or 12-pulse thyristor rectifiers are employed as the power conversion equipment to operate for ice-melting purposes. The DC current output is adjusted to meet the ice-melting requirements for transmission lines of varying lengths.

SVC Mode

The thyristor rectifier bridge structure is utilized as the TCR valve group of the SVC. The control system adjusts the capacity output of the SVC by SVC Mode varying the conduction angles of the thyristors, thereby meeting the requirements for voltage regulation and stability control.



Device Composition ▶

Key Components of the Fixed DC De-icer & SVC Device

Rectifier Transformer

Employed in the ice-melting mode, it primarily serves functions such as isolation, voltage reduction, and limiting short-circuit fault currents in the valves.

Thyristor Rectifier (and TCR Valve Group)

The thyristor rectifier (and TCR valve group), is composed of several valve modules connected in series. In ice-melting mode, it functions as a thyristor rectifier, supplying direct current to melt ice on the transmission lines. The control system of the thyristor valve group adjusts the triggering angle of the thyristors to regulate the line current during the ice-melting process. In SVC mode, it operates as a TCR valve group. By controlling the conduction angle of the thyristor valves, the TCR valve group can alter the current in the reactor branch, thereby adjusting the output capacity of the SVC. The thyristor valve cooling system transfers the heat generated by the valves to the surrounding air or other medium, ensuring that the thyristor components remain within the permissible temperature range.

Reactor (Smoothing and TCR Phase-Controlled Reactor)

In ice-melting mode, it serves as a smoothing reactor to maintain the continuity of the direct current and reduce current ripple. In SVC mode, it functions as a phase-controlled reactor. By controlling the conduction angle of the thyristor valves, its equivalent inductive reactance can be continuously varied, enabling the continuous output of reactive power from the device.

AC Filter

The AC filter is primarily employed to suppress the harmonics generated by the device, ensuring compliance with national standards, and to provide capacitive reactive power to the system.

DC Filter

It is used exclusively in ice-melting mode, primarily to filter out the power-frequency induced currents from parallel lines on the same tower and to suppress the DC component in the rectifier transformer.

Circuit Breakers and Disconnect Switches

They enable the switching between operational modes and the normal interruption of current flow.

Surge Arrester

The surge arrester is employed to limit switching overvoltages, with gapless metal oxide surge arresters being commonly selected.

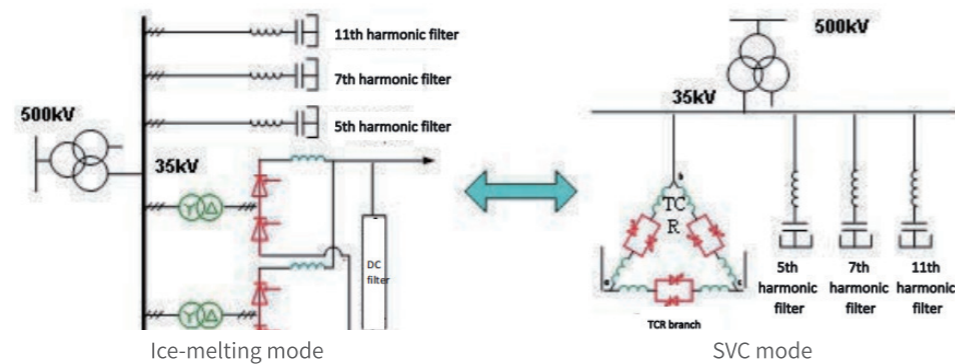


09 | DC Deicer

Product Introduction

The Fixed DC Deicing and SVC Device utilizes high-power power electronic components to generate direct current, which heats the wires to melt accumulated ice on transmission lines. This device is highly reliable, with minimal impact on the system, and is suitable for deicing large-capacity, long-distance power lines.

The Fixed DC Deicing and SVC Device can switch between two operating modes of DC deicing and SVC, as needed. When there is no demand for ice-melting, the device can be reconfigured through its main wiring to operate as a SVC. This transformation enhances the stability and transmission capacity of the power system, significantly improving the utilization efficiency of the device.



Model Specifications

Item	Specifications	
Power supply voltage level	10kV	35kV
Maximum DC voltage	13kV	45kV
Maximum DC current	2400A	4500A
Maximum rated capacity	32MVA	200MVA
Rectifier bridge mode	6	
Thyristor valve structure	Three-phase integrated multi-layer horizontal frame structure	Phase-splitting valve body
Valve body installation form	Indoor/container installation	
Valve group cooling method	Water-air or water-water cooling	
Valve group triggering method	Optoelectronic triggering	
Control system	DSP+FPGA fully digital controlled	
Operation mode	Optional automatic and manual operation modes	
Current control mode	It offers continuously adjustable settings, with operation modes including constant DC voltage mode, constant DC current mode, zero power mode, and high-voltage no-load mode.	
Control panel/cabinet size	800X800X2200 (L x W x H). The number of control panels/cabinets varies depending on the specific engineering configuration	
Noise level	< 60dB	
Control supply voltage	AC 220V or DC 110/220V	
Auxiliary power supply	AC 380V±15%	

Technical Parameters

Model	Voltage Level (kV)	Capacity Range(MVA)	DC Current (A)	Valve Body Installation Form	Valve Body Installation Dimensions H X W X L (mm)	Cooling Method
KN-DEICER-10	10	0 ~ 32MVA	0 ~ 2400	Indoor/container installation	Horizontal three-layer 3400×1600×1200	Water-cooled for heat dissipation
KN-DEICER--35	35	0 ~ 200MVA	0 ~ 4500	Indoor fixed installation	Horizontal two-layer 3×2500×1400×1200	Water-cooled for heat dissipation

Related Cases



Mobile DC de-icer

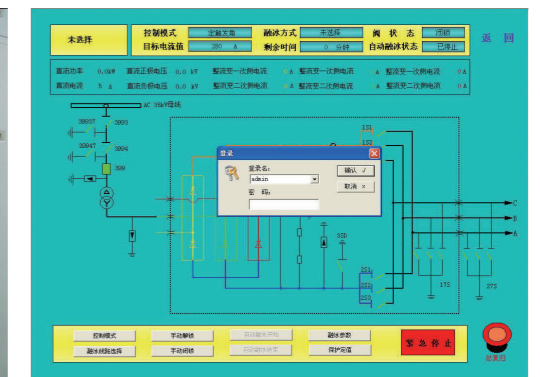
Zhejiang 220kV Substation in Qujing, Yunnan: 12.3kV/2000A DC Ice-Melting Device



Valve Group



Control and Monitoring Panel



Human-Machine Interface



DC Ice-melting for Yunnan Power Grid

10 | Thyristor Switched Capacitor (TSC)

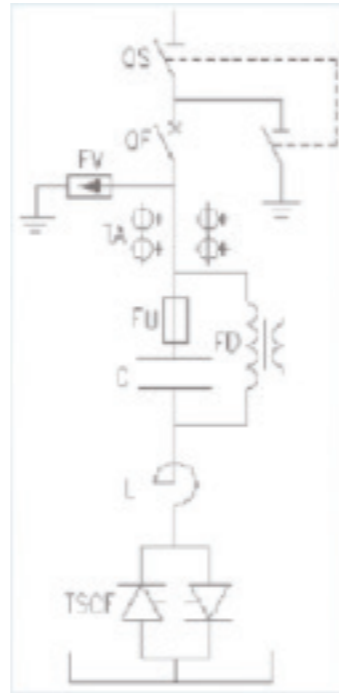
Working Principle ▶

TCS var compensator employs high-power thyristors as contactless switches to rapidly and seamlessly switch multi-stage capacitor banks. This approach overcomes the drawbacks of traditional var compensators that rely on mechanical switches, such as significant switching surges, burnt switch contacts, and substantial damage to capacitors. The TSC device ensures surge-free, inrush-free, and transition-free switching of capacitor banks.

The controller continuously monitors and measures the power factor of the load in real time, comparing it against a preset target value. It dynamically controls the switching of different numbers of capacitor banks to ensure that the power factor consistently meets the set requirements. The controller guarantees zero-crossing triggering of thyristors, enabling rapid and dynamic tracking of load variations.

The TSC device delivers excellent automatic compensation for various types of loads, boasting a fast dynamic response time (less than 15ms) and significant energy-saving and consumption-reduction effects. It offers functions such as reducing losses, stabilizing load voltage, and enhancing the load-carrying capacity of transformers, making it a cutting-edge product in the field of reactive power compensation.

The main circuit of the TSC var compensator consists of the switching device, surge arrester, current transformer, capacitor, discharge coil, reactor, valve group, and other components.



Wiring Diagram Illustrating the Working Principle of TSC

TechnicalParameters ▶

Rated voltage: 6kV-10kV

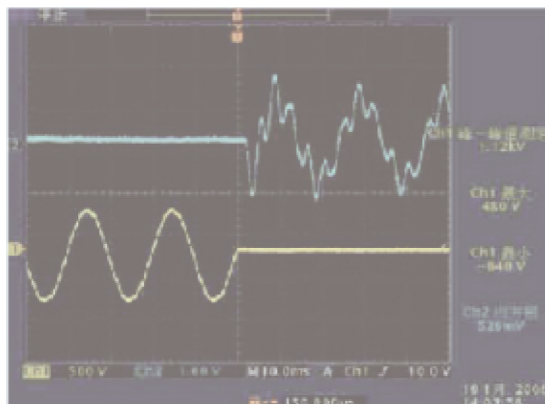
Response time: <15ms

Single unit capacity: 150-3,000kvar (6-10kV); multiple units can be used in parallel

Switching stages: 1-12 stages

Protection rating: IP30

Triggering method: Optoelectronic triggering



Ideal Operational Waveform with Zero Transition Process

Channel 1: Voltage waveform during thyristor switching-in

Channel 2: Current waveform during thyristor switching-in

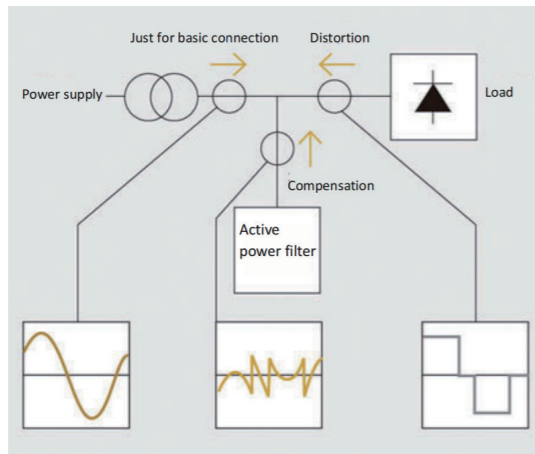
Technical Characteristics ▶

- It is capable of both local and centralized compensation, achieving a power factor greater than 0.95 after compensation
- It implements three-phase or phase-by-phase dynamic compensation, suitable for unbalanced or impact loads
- It provides real-time dynamic reactive power compensation and harmonic suppression, ensuring safe and reliable operation
- It enables switching with zero impact, zero inrush current, and zero transition process
- It achieves current zero-crossing switching and maximize the lifespan of capacitors
- It suppresses voltage flicker, reduces grid and transformer losses, and increases the load-carrying capacity of transformer
- It automatically withdraws during external faults or power outages and resumes operation upon power restoration
- It features a fully digital controller that allows setting switching delays and different target power factors for different time periods
- It intelligently optimizes switching modes and supports serial communication for unattended operation
- It utilizes optoelectronic triggering, offering strong system immunity to interference, excellent triggering synchronization, and reliable operation
- It powers the main circuit directly, ensuring a simple and reliable system
- The thyristor valve group provides real-time status feedback signals for real-time protection

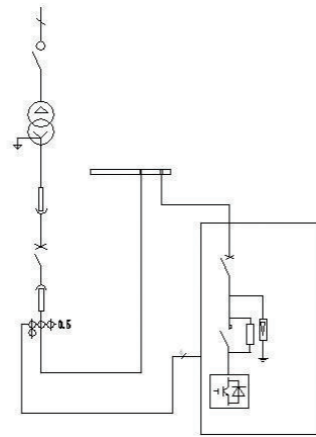


11 | Active Power Filter

Working Principle ▶ The Active Power Filter (APF) utilizes a three-phase parallel converter composed of high-capacity IGBT modules to inject a compensating current into the power system. This compensating current is precisely equal in magnitude but opposite in direction to the harmonic currents present in the load current, resulting in their mutual cancellation. By doing so, the APF effectively filters out harmonics, ensuring that the final current flowing into the system is a clean sine wave.



The specific configuration of the APF is illustrated in the diagram below:



Technical Indicators ▶ Key technical indicators for the APF:

- Rated frequency: 50Hz
- Rated voltage: 380V-10kV
- Rated current: 50A-300A
- Switching frequency: 12.8kHz (average)
- Cooling method: Forced air cooling
- Response speed: $\leq 10\text{ms}$

Technical Characteristics ▶

- The main circuit employs IGBT devices from internationally renowned brands, which can automatically adjust their output in response to changes in the power grid's operating mode and fluctuations in load, thereby offsetting harmonics within the grid.
- The filtering performance of the APF is independent of the grid impedance and system conditions, remaining unaffected by variations in grid or system impedance.
- Filtering range: It can eliminate harmonics from the 2nd to the 51st order. The harmonic orders to be filtered and the target values for harmonic elimination can be set according to specific requirements.
- It incorporates built-in reactive power compensation functionality, enabling simultaneous compensation for reactive power.

- It comes equipped with comprehensive protection features, including overload, overcurrent, and short-circuit protection, along with a self-diagnostic function upon system startup.
- It incorporates a soft-start control circuit to prevent excessive inrush current during self-startup and keeps the current within the rated range.
- The communication protocol is MODBUS, and it features a 485 communication interface, facilitating easy integration into the user's existing communication system and meeting the requirements for communication monitoring functions.
- It utilizes a Chinese-character LCD touch screen with fault alarm and recall capabilities, displaying real-time operational status and allowing for the setting of operational parameters directly on the panel
- The active power filter can be conveniently expanded in capacity through parallel connection.

Product Photos ▶

