Beijing
- Headquarters

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 Sunking Power Electronic Capacitor Co., Ltd.

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

Wuhan, Hubei
- Wuhan LandPower Co., Ltd.

Ningbo, Zhejiang
- Ningbo Hailong Electric Co., Ltd.

Switzerland
- Astrol Electronic AG
- SwissSEM Technologies AG

Germany
- morEnergy GmbH

The Netherlands
- Astrolkwx B.V.

賽晶科技 SUN.KING TECH

Stock code: 0580.HK

Power capacitors

Wuxi Sun.King Power Capacitor Co., Ltd.






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

Wuxi Sun.King Power Capacitor Co., Ltd.
- **Address** No.18, Chunhui Road, Huishan Economic and Technological Development Zone, Wuxi City, Jiangsu Province
- **Tel** 0510-83762888

Sun.king Tech WeChat Official Account

drive green energy development
with scientific innovation

Contents

GROUP INTRODUCTION

Sun.King Technology Group Limited ("Sun. King Technology" for short below) is a top supplier of power electronics devices and system integrator renowned for our leading technologies and significant influence in the industry. Incorporated in 2002, Sun.King Technology was listed on the main board of Hong Kong Stock Exchange in 2010 (stock code: 0580.HK). Up to now, Sun.King Technology has evolved into a group company with a total of nearly 800 employees and annual sales surpassing CNY 1 billion. The company now operates more than 10 subsidiaries in Beijing, Jiashan, Zhejiang, Wuxi, Jiangsu, Wuhan, Hubei, and Switzerland and Germany in Europe.

Adhering to the business philosophy of "driving corporate development primarily by technological innovation", we focus on two major high-end technical fields. Our first focus falls on power semiconductors and their supporting device technologies.

In this field, we have developed China's first self-developed anode saturable reactors, China's first DC support capacitors for Flexible DC transmission and also domestically leading laminated busbars, etc.

Among our cutting-edge power electronics technologies, the distinctive ones include the world's most advanced solid-state switches and pulse power supply, impedance measurement technology granted with international invention patents, and domestically leading online monitoring systems.

Now, we run with the support of our three domestic R&D centers in Jiashan, Wuxi and Wuhan respectively, and also three overseas R&D teams in Switzerland and Germany. Our ten dedicated R&D teams are staffed with 200-plus technical research and development personnel, accounting for over one third of all our employees. We have passed nine national energy technology achievement certifications, and been granted 20-plus provincial and municipal technology innovation honors, and 200-plus patent certificates.

Our innovative technological achievements have been extensively applied in various links of power systems of new energy generation, DC transmission, smart grids, electric vehicles, rail transportation, ships, communication, scientific research, and industrial control, etc.

Sun.King Technology has always practiced the business philosophy of "pursuing excellence for win-win future" and upheld the corporate mission of "fueling green energy development through scientific and technological innovations".

With this ethos in mind, we, leveraging future-oriented innovative technologies, make every endeavor to make contributions to the development of the whole industrial chain of green energy and the construction of a new power system.

Our Vision: A world-class supplier of power semiconductor devices and system solutions

Our Mission: Fueling green energy development through scientific and technological innovations

Our Values: Respect, innovate, and surpass.

Our Business Philosophy: Pursuing excellence for win-win future.

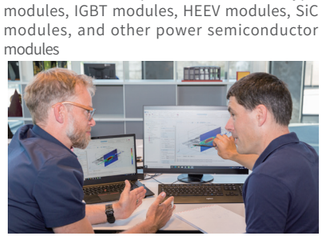
GROUP DISTRIBUTION

Lenzburg, 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

- SwissSEMTechnologies 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 ㎡

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

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.

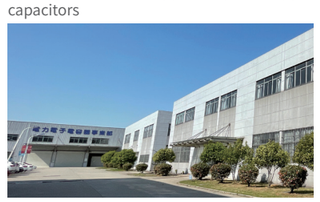
Incorporated in 2020, this subsidiary specializes in researching, developing and manufacturing power semiconductor devices. As the parent company of SwissSEM, it is staffed with a world-class technical specialist team and experienced management team in the industry, and runs with world-class fully automatic 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

- 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 Sunking 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.

ncorporated 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.

COMPANY PROFILE

Wuxi Sun.King Power Capacitor Co., Ltd.

USD 58 million

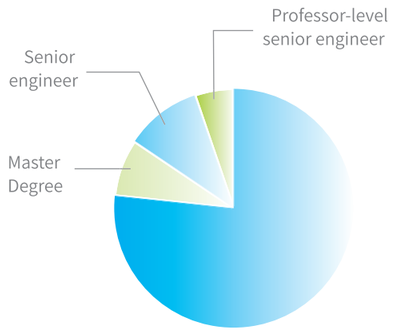
60 + mu

140 + employees

18 million kvar
Designed total annual production capacity

Wuxi Sun.King Power Capacitor Co., Ltd., a wholly-owned subsidiary of Sun.King Technology Group, was founded in May 2008 with a registered capital of USD 58 million. Located at No.18, Chunhui Road, Huishan Economic and Technological Development Zone, Wuxi City, the company has a factory area of over 60 mu and more than 140 employees. The company specializes in technical research, product development, manufacturing, sales, and related engineering services of high-voltage power capacitors and their complete sets, and boasts a total designed production capacity of 18 million kvar per year.

Supported by a professional technical and management team, the company delivers aesthetically pleasing and high-performance products to customers through secure international sourcing of raw materials, comprehensive product design, top-notch manufacturing processes, and rigorous quality control. In 2013, the company established Wuxi VAR Compensation Engineering Technology Research Center staffed with a team of over 30 research and development personnel. Two members of the team are professor-level senior engineers (one of whom enjoys special government allowances of the State Council), four senior engineers, and three individuals hold a master’ s degree. The team members' expertise spans electrical automation, high-voltage insulation technology, insulation materials, and mechatronics, equipped with extensive research and development experience. In recent years, the company has successfully developed dozens of specifications of capacitors and VAR compensators. Nine types of products, including shunt capacitors, shunt capacitors, AC filter capacitors, and DC filter capacitors, have received the certificate of "national accreditation of energy science & technology", rapidly elevating the company’ s research and development capabilities, product performance, quality, variety, and specifications to domestic advanced levels. Presently, the company is poised to be a world-class manufacturer in its field.



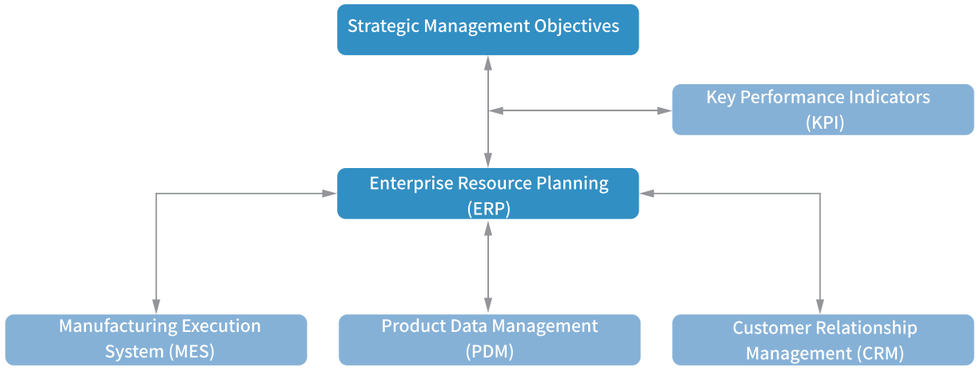
Research personnel

The company's products have been widely applied by leading enterprises such as State Grid, and China Southern Power Grid, and many industries such as new energy, railways, non-ferrous metallurgy, and chemical industries. The products have also been exported to countries such as India, Cuba, Malaysia, Cambodia, and Indonesia. By now, the company has developed and manufactured capacitors and their devices for two works of the ±500kV Three Gorges Shanghai Project Yidu Converter Station Renovation Project, more than ten works of the ±800kV Lingzhou Shaoxing Project Lingzhou Converter Station Project, the 1,100kV Changji-Guquan Project Changji Converter Station, Zhangbei Flexible DC Grid Test Demonstration Project, and Fujian-Guangdong Interconnection Project, etc. Among them, the ±1,100kV Changji-Guquan UHV DC Transmission Project boasts the highest voltage, the longest transmission distance, the largest transmission capacity and the most advanced technical level of the same kind around the globe, making Wuxi Sun.King Power Capacitor Co., Ltd. a world-class company.

Business philosophy: Pursuing excellence for win-win future
Our Core values: Respect, innovate, and surpass.
Our Vision: To be a top integrator of power system solutions in the industry
Our Mission: To make power systems run more efficiently with Sun.king
Our Corporate Purpose: Sun.king strives to satisfy customers' demands and create value for them.

Excellent enterprise management platform

Sun.king employs an advanced Enterprise Resource Planning (ERP) system integrating Manufacturing Execution System (MES), Product Data Management System (PDM), and Customer Relationship Management System (CRM). This comprehensive integration enables the company to achieve full IT-based management and implement strategic enterprise management through Key Performance Indicators (KPI).



A Highly Recognized Service System

Our Service Tenet

Provide whole-hearted full-process services with the efforts of all employees

Our Service Slogan

Any product-related service falls within our responsibility.

Our Service Commitment

Sun.king fully practices the ISO quality management system, and provides aesthetically pleasing products with excellent performance in accordance with national standards, industry standards, and customers' technical requirements. Our commitment includes a three-guarantee service during the warranty period and lifelong maintenance for products beyond the warranty period.

OurService

Customer Support

We guarantee an immediate response, anytime and anywhere, to address your inquiries or concerns about our products. Our professional technical team will give great support to ensure the reliable and safe operation of your equipment.

18-month quality warranty for our products

We propose to replace all defective products within 18 months upon their leaving our factory.

Quick Response to Any Malfunction for Smooth Operation

In the event of any equipment malfunction, we are committed to promptly replacing faulty products or components with the best ones, making safe and timely operation of the equipment as our top priority.

Full-cycle Tracking in P re-sales, In-sales, and After-sales

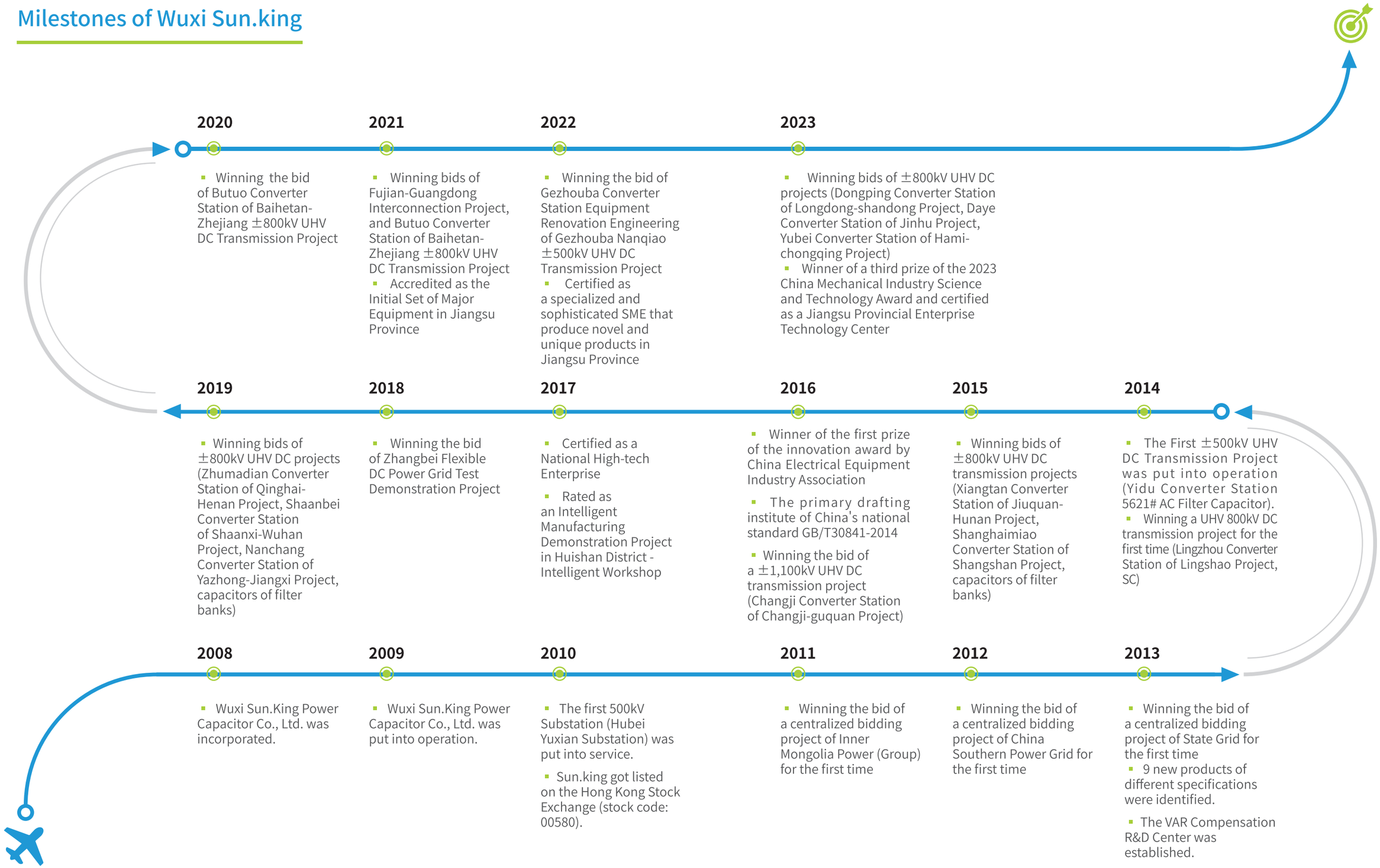
Our professional technical personnel provide full-cycle tracking in the pre-sales, in-sales, and after-sales processes. In the pre-sales phase, we offer products tailoring customers' demands. In the in-sales phase, we practice strict quality control measures to ensure excellent quality. In the after-sales phase, our comprehensive service system ensures that issues are resolved in the shortest possible time.

Free Training and Guidance

We provide free training and guidance for our customers' technical staff and frontline workers.

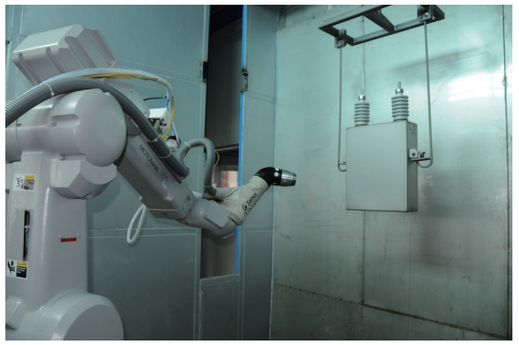
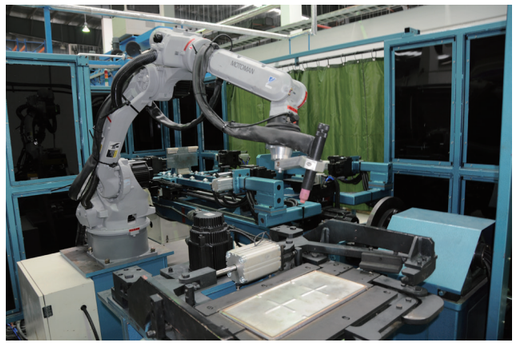
Our Qualifications

Milestones of Wuxi Sun.king



Product information



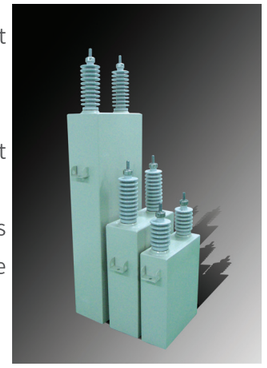




Single capacitors:

Shunt capacitor
Series capacitor
Filter capacitor
Including AC filtering capacitor
DC filter capacitor

Capacitors:

High-voltage shunt capacitors (frame type & cabinet type)
High-voltage filter capacitors
Capacitor banks for high-voltage direct current (HVDC) engineering projects
Capacitors for static var compensator (SVC) projects
Capacitor banks for series compensation device projects
Capacitors for electrified railways



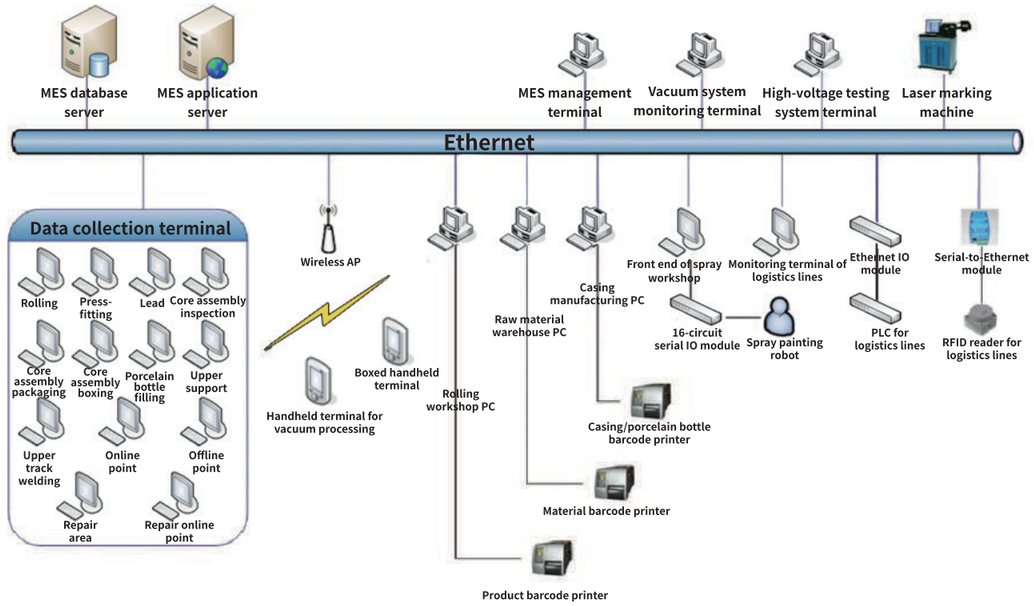
Product strengths

Advanced manufacturing systems

We have established the most advanced power capacitor production line in terms of automation and informatization following the streamlining, rhythm, flexibility, and networking-based principles to integrate personnel flow, material flow, and information flow.

1) We have put into place a Manufacturing Execution System (MES) via Ethernet by utilizing barcode and RFID technology. The MES system controls and facilitates the issuance of manufacturing orders, data transmission, information recording, and feedback of inspection results.

Manufacturing Execution System (MES)



2） Stacking track lines and suspension lines for production and testing, improving production efficiency and product quality and eliminating human factors.

IT-based automatic track lines

IT-based automatic suspension lines

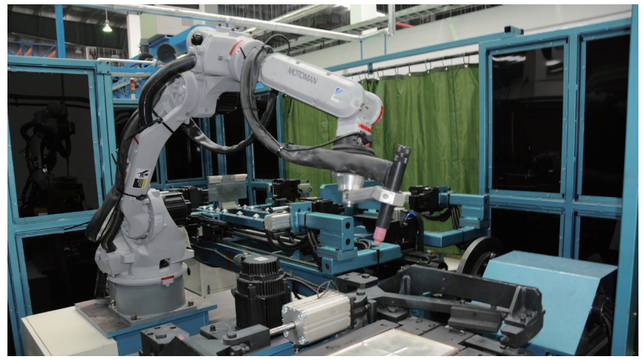
3） Top production equipment.

Equipment	Supplier	Advantages	Features
Fully automatic winding machine	HILTON	Highly parallel axles, with automatic tension adjustment	Component flatness
		Automatic folding structure	Improved field strength distortion
		Constant current source withstand voltage	Preventing component damage
Welding robot	YASKAWA	Dual station	High efficiency
		Non-melting automatic tungsten electrode DC pulse argon arc welding	Small thermal deformation, complete and beautiful welding
		Special fixtures	High welding accuracy
Vacuum system	Pump unit: LEYBOLD Valve: SPIRAX SARCO	Excellent vacuum processing	Below 1pa under the maximum vacuum and full load
		Simplified pipeline structure	No pressure difference between furnace vacuum and product vacuum
		Displacement-type oiling	No residual air
2877 fully automatic capacitor and dielectric loss measurement bridge	HAEFELY	High precision and good stability	Precision reaching 0.1 ‰
		Intelligent design	Permanent testing data
Spray painting robot	YASKAWA	High-speed centrifuge structure	Uniform and beautiful surface
		High-voltage electrostatic spraying	Strong adhesion
Oil treatment system	Pump unit: LEYBOLD Valve: KITZ	Argil filter, equipped with two-stage degassing technology	Pressure resistance: 75Kv/2.5mm; Trace moisture ⩽ 5ppm; Loss ⩽ 0.1%
CNC core pressing machine	PLC technology: SIMENS	Screw drive, PLC	Highly accurate pressing height
		Horizontal press-fitting	Uniform force distribution of components
Noise testing room	Harmonic controller: United States	Simultaneous 24-channel harmonic loading, simulating actual on-site working conditions	Low background noise Loading actual DC transmission harmonic data

Imported fully automatic winding machine

Core flipping table

CNC core pressing machine



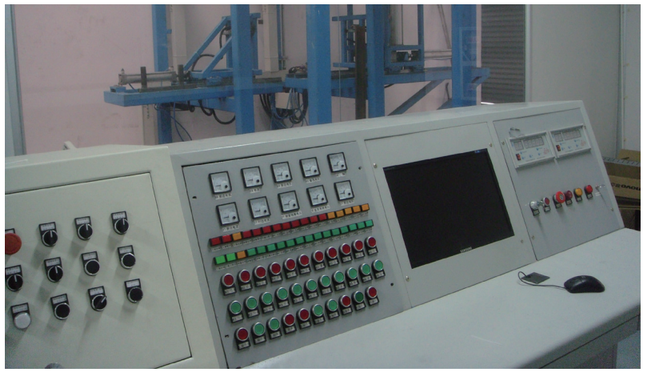
Imported welding robot workstation

Imported spray painting robot workstation

Vacuum pump units from LEYBOLD

Top-class vacuum treatment

Hot drying leak testing furnace



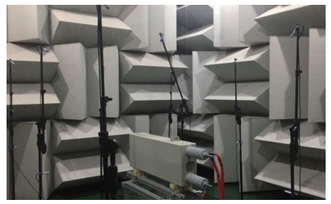
Automatic test station high-voltage electrode for automatic high-voltage laboratory

Advanced oil treatment system

High-voltage electrode for automatic testing stations

High-precision current comparator

2877 全自动电容及介损测量电桥



Capacitor noise test room

High-quality raw materials

Main raw materials	Performance of raw materials
Film	9-15μm-thick double-sided roughened polypropylene film, enabling stable electrical performance, good uniformity, and low loss
Aluminum foil	4.5μm-5μm thick, with good uniformity
Insulating oil	High aromaticity, with the gas evolution not less than -130 μl/min, and excellent partial discharge performance Low content of small molecule compounds with a slow aging rate Low viscosity at low temperatures, with the freezing point less than -67°C , and a applicable temperature range of -50°C -+55°C Non-toxic, environmentally friendly, and biodegradable
Stainless steel plate	High-quality stainless steel plate with wall thickness above 1.5mm, boasting excellent mechanical properties, and good anti-corrosion performance
Sleeve	Mechanical rolling type, with a TIG welding structure between the sealing flange and the box, free from oil leakage

Film

Aluminum foil

Insulating oil

Sleeve

Distinctive product features

Single product

S/N	Parameters		GB	DL	Sun.king
1	Operating temperature		-40°C ~+45°C	-50°C ~+55°C	-50°C ~+55°C
2	Unit capacitance		-5%~+5%	-3%~+5%	-2%~+3%
3	Loss	Products with internal fuses	⩽ 0.05%		⩽ 0.02%
		Products without internal fuses			⩽ 0.015%
4	Explosion-			15kW.s	⩾ 15kW.s
5	Partial discharge	Initial voltage			⩾ 1.5U_N
		Quenching voltage			⩾ 1.35U_N
	Note: The resolution of the partial discharge instrument reaches below 10pc.				
6	Short-circuit discharge		2.5UN, no damage after five short-circuit discharges		2.8UN, no damage after five short-circuit discharges
7	Fuse isolation		Lower voltage limit ⩽ 0.9$\sqrt{2}$ U_N	Lower voltage limit ⩽ 0.9$\sqrt{2}$ U_N	Lower voltage limit ⩽ 0.8 $\sqrt{2}$ U_N
			Upper voltage limit ⩾ 2.5$\sqrt{2}$ U_N	Upper voltage limit ⩾ 2.2$\sqrt{2}$ U_N	Upper voltage limit ⩾ 2.5 $\sqrt{2}$ U_N

1) Internal fuse protection is adopted for component protection. The internal fuse is disposed between two components, and separated from adjacent elements by an insulating liner, preventing damage to adjacent components when the fuse operates, and thereby enhancing the operational reliability of the product.

2) Each series segment of the capacitor core is equipped with discharge resistors, which, in addition to their discharge function, also eliminate overvoltage caused by the operation of the internal fuse.

3) The casing base and cover are produced through the embossed ribbing, resulting in excellent flatness and high mechanical strength after forming;

4) Pressure-embedded sleeves exhibit high mechanical strength, strong impact resistance, and low leakage rates;

5) The standardized design ensures uniform unit length, facilitating interchangeability.

Complete equipment

1) Provide the most rational comprehensive design solutions with the aid of professional simulation software such as Matlab and PSCAD, combined with actual operating conditions of the power supply system;

2) Conduct seismic, wind resistance, and various stress analyses on the installation based on the finite element simulation platform Ansys to ensure its suitability for diverse installation environments;

3) Design the installation with GIM format three-dimensional drawings, ensuring perfect integration with system layouts;

4) Offer diverse compensation, layout, and switching methods for the installation, catering to a wide range of applications;

5) The modular design, compact structure, and complete assembly and transport facilitate on-site installation;

6) A comprehensive supplier evaluation system effectively controls the quality of supporting components.

High-voltage shunt power capacitors

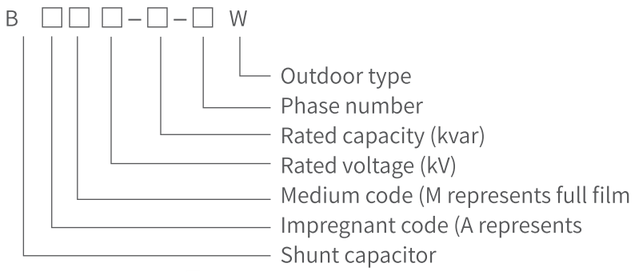
I. Purpose

High-voltage power capacitors, designed for 50Hz/60Hz AC power systems, are primarily applied to enhance power factor and grid voltage quality, reduce line losses and effectively optimize the efficiency of power generation and supply equipment.

II. Execution standards

GB/T11024.1-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 1: General
GB/T11024.2-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 2: Aging Testing
GB/T11024.3-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 3" Protection of Shunt Capacitors and Shunt Capacitor Banks
GB/T11024.4-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 4 Internal Fuses
DL/T840-2016	Specification of High-voltage Shunt Capacitors for Service
GB/T311.2-2012	Insulation Co-ordination Part 1: Definitions, Principles and Rules
IEC 60871-1	《 Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 1： General》
IEC 60871-2	《Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 2： Endurance testing》
IEC 60871-3	《 Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 3：Protection of shunt capacitors and shunt capacitorbanks》
IEC 60871-4	《 Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 4： internal fuses》

III. Model description of high-voltage shunt capacitors



Example: BAM11/$\sqrt{3}$-334-1W

Representing: Full film dielectric shunt capacitor impregnated with benzyltoluene; rated voltage: 11/$\sqrt{3}$ kV; rated capacity: 334kvar; single phase; outdoor type.

IV. Main performance indicators

1. The dielectric between the electrodes of the capacitor can withstand one of the following two test voltages for 10 seconds:
a. Power frequency AC voltage: U_t（～）＝2.0U_N b . DC voltage:U_t（—）＝4.0U_N

2. The difference between the measured capacitance value and the rated value of the capacitor does not exceed -2%-+3%.

3. The tangent value (tanδ) of the loss angle of the capacitor at a rated power frequency voltage and a temperature of 20 °C is: Capacitors with internal fuses: tanδ ⩽ 0.02%; capacitors without internal fuses: tanδ ⩽ 0.015%.

4. Discharge resistance: The capacitor is equipped with built-in discharge resistors, ensuring that the discharge resistance drops from$\sqrt{2}U_N$ to 75V or below 50V within 10 minutes.

5. Short-circuit discharge capability: The capacitor can withstand 5 times of 2.8U_N short-circuit discharges within 10 minutes.

6. Fuse isolation: The upper and lower voltage limit is 2.5$\sqrt{2}U_N$, and 0.8$\sqrt{2}U_N$, respectively. After the fuse operates, the rupture withstands a DC test voltage of 3.5U_{NE} (U_{NE} is the component voltage) and an AC test voltage of 2.15U_{NE}.

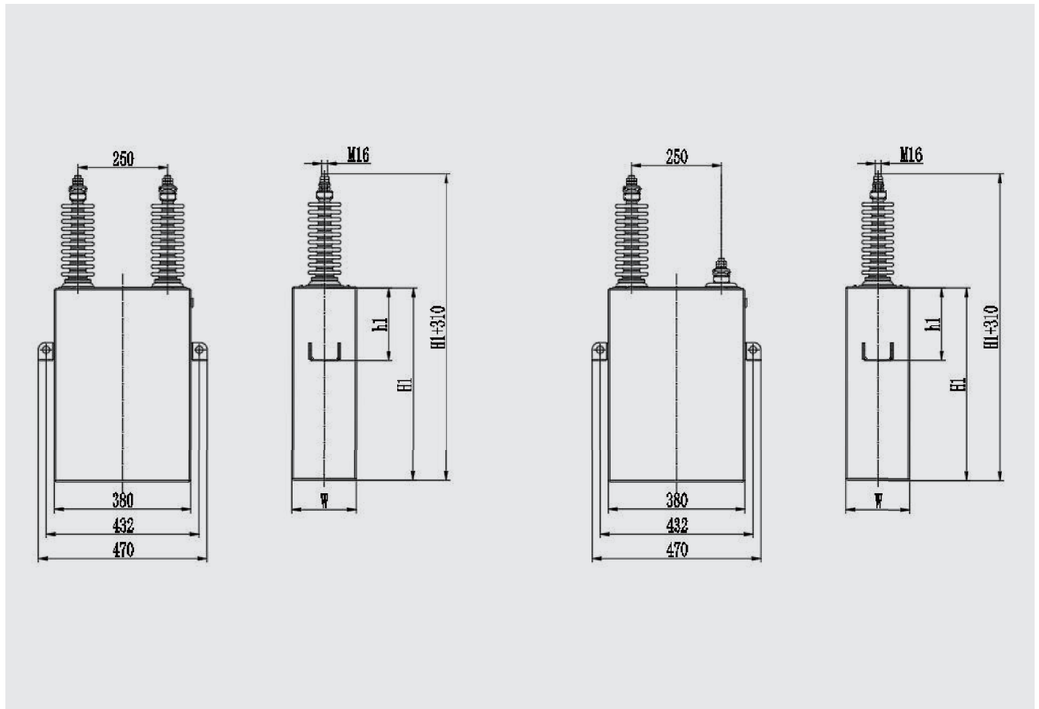
7. Partial discharge performance
1) Inter-electrode partial discharge:
After imposing voltage on the capacitor for 1 second after the partial discharge starts, then reducing the voltage to 1.35U_N for 10 minutes, and subsequently increasing the voltage to 1.6U_N and maintaining it for 10 minutes, no obvious partial discharge occurs in this process. For application in extremely cold regions, the capacitor’ s partial discharge quenching voltage is not less than 1.2U_N at the lower temperature limit.
2) Electrode-to-shell partial discharge quenching voltage:
The electrode-to-shell partial discharge quenching voltage is not less than 1.2U_{lm} (U_{lm} is the maximum operating line voltage).

8. Overload capability
1) Operating overvoltage: The capacitor can withstand the transient overvoltage of the first peak not exceeding 2$\sqrt{2}U_N$ for 1/2 cycle.
2) Maximum permissible current: The capacitor is designed to operate under a steady overcurrent with an effective value of 1.3 I_N caused by voltage rise and high harmonics. For capacitors with the maximum positive deviation, this overcurrent is permissible up to 1.43 times.
3) Long-term voltage

Voltage factor	Max duration	Description
1.00	Continuous	Highest average value during any time when the capacitor is powered on
1.10	12h/24h	Adjustment and fluctuation of system voltage
1.15	30min/24h	Adjustment and fluctuation of system voltage
1.20	5min	Voltage rises under light load
1.3	1min	

V. Dimensions of high-voltage shunt power capacitors

The standard and series-based capacitor units allow simplified wiring, convenient maintenance and replacement, supporting us to better serve our customers.



Shunt Capacitor (Internal Fuse)								
S/N	Modl TYPE	Rated voltage kV	Rated capacity kvar	Rated capacitance μF	Weight kg	W mm	H1 mm	H mm
1	BAM 11/√3-200-1W	11/√3	200	15.78	32	140	415	100
2	BAM 12/√3-200-1W	12/√3	200	13.26	34	140	435	100
3	BAM 11/√3-300-1W	11/√3	300	23.68	47	180	465	100
4	BAM 12/√3-300-1W	12/√3	300	19.89	49	180	490	100
5	BAM 11/√3-334-1W	11/√3	334	26.36	50	180	500	200
6	BAM 12/√3-334-1W	12/√3	334	22.15	54	180	535	200
7	BAM 11/√3-400-1W	11/√3	400	31.57	59	180	585	200
8	BAM 12/√3-400-1W	12/√3	400	26.53	61	180	610	200
9	BAM 11/√3-500-1W	11/√3	500	39.46	75	180	750	200
10	BAM 12/√3-500-1W	12/√3	500	33.16	75	180	750	200
11	BAM 11/√3-600-1W	11/√3	600	47.35	83	180	825	300
12	BAM 12/√3-600-1W	12/√3	600	39.79	90	180	895	300
13	BAM 11/√3-700-1W	11/√3	700	55.24	95	180	945	300
14	BAM 12/√3-700-1W	12/√3	700	46.42	100	180	1000	400
15	BAM 11/2-334-1W	11/2	334	35.15	52	180	520	200
16	BAM 12/2-334-1W	12/2	334	29.53	51	180	510	200
17	BAM 11/2-417-1W	11/2	417	43.88	63	180	625	200
18	BAM 12/2-417-1W	12/2	417	36.87	63	180	625	200
19	BAM 11/2-500-1W	11/2	500	52.61	77	180	770	200
20	BAM 12/2-500-1W	12/2	500	44.21	77	180	770	200
21	BAM 11-500-1W	11	500	13.15	76	180	760	200
22	BAM 12-500-1W	12	500	11.05	78	180	775	200
23	BAM 21/2-500-1W	21/2	500	14.44	76	180	760	200
24	BAM 23/2-500-1W	23/2	500	12.03	80	180	800	300

Shunt Capacitor (External Fuse)								
S/N	Modl TYPE	Rated voltage kV	Rated capacity kvar	Rated capacitance μF	Weight kg	W mm	H1 mm	H mm
1	BAM 11/√3-100-1W	11/√3	100	7.89	19	140	245	100
2	BAM 12/√3-100-1W	12/√3	100	6.63	18	140	235	100
3	BAM 11/√3-200-1W	11/√3	200	15.78	31	140	400	100
4	BAM 12/√3-200-1W	12/√3	200	13.25	33	140	420	100
5	BAM 11-100-1W	11	100	2.63	19	140	250	100
6	BAM 12-100-1W	12	100	2.21	19	140	250	100
7	BAM 11-200-1W	11	200	5.26	33	140	420	100
8	BAM 12-200-1W	12	200	4.42	33	140	420	100
9	BAM 11-300-1W	11	300	7.89	47	180	465	100
10	BAM 12-300-1W	12	300	6.63	47	180	470	100

Note:

(1) The dimensions indicated in this table correspond to a rated frequency of 50Hz. For products at other frequencies, please contact us for dimensional information.

(2) For capacitors with similar rated voltages and capacities, please refer to the dimensions of the standard series of products for their dimensions. For specific details, please feel free to inquire directly with our company.

(3) For capacitors with a rated capacity exceeding 700kVAR, please contact us for specific dimensions.

(4) For any other special products or specific requirements, please contact us directly.

High-voltage series power capacitors

I. Purpose

The capacitor is designed for 50Hz/60Hz AC power systems primarily to increase power transmission capacity, enhance system stability, improve voltage regulation, and balance reactive power (the reactive power generated by series-connected capacitors also increases with the increase of the transmission load), and reduce system losses.

II. Execution standards

GB/T 6115.1-2008	Series Capacitors for Power Systems - Part 1: General
GB/T 6115.2-2002	Series Capacitors for Power Systems - Part 2: Protective Equipment for Series Capacitor Banks
GB/T 6115.3-2002	Series Capacitors for Power Systems - Part 3: Internal Fuse
GB/T 311.1-2012	Insulation Co-ordination Part 1: Definitions, Principles and Rules
JB/T 7114-2005	Rules for Determination of the Types of Power Capacitor Products
IEC 60143-1	《Series capacitor for power systems-Part1:General》
IEC 60143-2	《Series capacitor for power systems-Par2:Protective equipment for series capacitor banks》
IEC 60143-3	《Series capacitor for power systems-Part 3:Internal fuses》

III. Model description of high-voltage series capacitors

C □□ □–□–□ W

- W — Outdoor type
- □ — Phase number
- □ — Rated capacity (kvar)
- □ — Rated voltage (kV)
- □ — Solid medium code (M represents full film medium)
- □ — Impregnant code (A represents benzyltoluene)
- C — Series capacitor

Example: CAM5.42-519-1W

Representing: Full film dielectric series capacitor impregnated with benzyltoluene; rated voltage: 5.42kV; rated capacity: 519kvar; single phase; outdoor type.

IV. Performance requirements of high-voltage series capacitors

Item	Performance requirements
Inter-electrode withstand voltage	The DC test voltage values comply with the requirements of GB/T6115.1, withstanding a DC voltage of 1.7Ulim but not less than 4.3UN for a duration of 10 seconds.
Insulation level	⩾ UlpfXn/s or 2.5×UN×n
Capacitance deviation	-2%-+3%
Tangent value of dielectric loss (tanδ)	⩽ 0.02%

V. Product dimensions

For the length and width of capacitors with similar rated voltages and capacities, please refer to the dimensions of the standard series of shunt capacitors. For specific details, please feel free to inquire directly with our company.

High-voltage filter

I. Purpose

High-voltage filter capacitors include high-voltage AC filter capacitors and high-voltage DC filter capacitors.

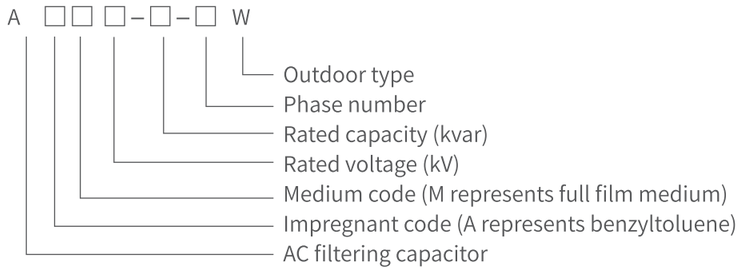
High-voltage AC filter capacitors include AC filter capacitors and shunt capacitors for high-voltage DC transmission systems, and high-voltage AC filter capacitors for general high-voltage power systems. This type of capacitors is primarily used in 50Hz/60Hz AC power systems to provide a low-impedance path for higher harmonic current in the grid, improve power factor, compensate for inductive reactive power, reduce energy losses, ensure voltage quality, enhance system stability, and increase the system's performance to transmit power.

High-voltage DC filter capacitor are mainly used to filter out harmonics in the DC circuit or provide a low-impedance path for higher harmonic current in the DC field of high-voltage DC transmission converter stations, thus preventing harmonic current from flowing into the DC lines.

II. Execution standards

GB/T11024.1-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 1: General
GB/T11024.2-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 2: Aging Testing
GB/T11024.4-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 4 Internal Fuses
GB/T20993-2012	DC Filter Capacitors and Neutral Bus Surge Capacitors for HVDC Transmission System
GB/T20994-2007	Shunt Capacitors and AC Filter Capacitors for HVDC Transmission Systems
DL/T840-2016	Specification of High-voltage Shunt Capacitors for Service
GB/T311.2-2012)	Insulation Co-ordination Part 1: Definitions, Principles and Rules
IEC60871-1	《 Shunt capacitor for a.c. power systems having arated voltage above 1000V-Part 1：General》
IEC60871-2	《Shunt capacitorfor a.c.power systems havinga rated voltage above 1000V-Part 2：Endurancetesting 》
IEC60871-3	《Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 3：Protection of shunt capacitors and shunt capacitor banks》
IEC60871-4	《 Shunt capacitor for a.c. power systems having arated voltage above 1000V-Part 4：internal fuses》

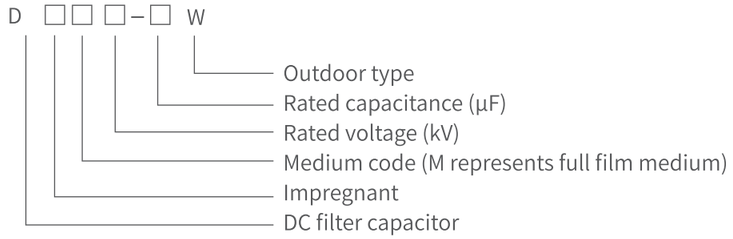
III. Model description of high-voltage AC filter capacitors



Example: AAM7.2-300-1W

Representing: Full film dielectric AC filter capacitor impregnated with benzyltoluene; rated voltage: 7.2kV; rated capacity: 300kvar; single phase; outdoor type.

IV. Model description of high-voltage DC filter capacitors



Example: DAM10.45-36W

Representing: Oil immersed full film dielectric DC filter capacitor; rated voltage: (DC) 10.45kV; rated capacitance: 36μF; outdoor type.

V. Product dimensions

Please contact us directly.

High-voltage power capacitors and their complete equipment

Overviewequipment

The capacitor installation mainly consists of high-voltage power capacitors, series reactors, discharge coils, zinc oxide lightning arresters, grounding isolators, post insulators, busbar connections, capacitor frames, and specialized capacitor fuses (if applicable), etc. For configurations utilizing double star-connected capacitor banks with neutral point unbalance current protection or single star-connected capacitor banks with bridge differential current protection, current transformers are required.

Typically, capacitor installations are wired in a star configuration. These installations commonly feature internal fault protection, delayed current fast-break protection, overcurrent protection, overvoltage protection, undervoltage protection, and other essential fault protections as needed. Internal fault protection is achieved by internal fuse, fuse protector, and relay. Relay protection encompasses open delta voltage protection, phase voltage differential protection, bridge differential current protection, and neutral point unbalance current protection, among others.

Service environment

Installation site: Indoors or outdoors;

- Installation and operation altitude: ⩽ 1,000m (otherwise, please specify in the order)
- Ambient temperature in the installation and operation area: -40°C -+45°C (otherwise, please specify
- in the order)

The installation site should have a maximum slope of 5° from the vertical plane. The installation

- and operation area should be free of conductive or explosive dust, harmful gases, vapors, and intense mechanical vibrations.
- Seismic requirements: 0.25g (horizontal acceleration), 0.125g (vertical acceleration), where g is the gravitational acceleration; both the horizontal and vertical acceleration acts. (Otherwise, please specify the horizontal acceleration in the order.)

Structure

By layout, there are frame (table) type, cabinet type, pole-mounted type, and outdoor box type, etc.

Frame (table) type

A capacitor installation consisting of several capacitor units installed on an open frame (table) and electrically connected to auxiliary electrical components.

The frame (table) structure boasts high seismic resistance, excellent heat dissipation for capacitor units, high cost-effectiveness, and compact design. It also allows preassembly of capacitor units for transportation as a whole, easy installation, convenient operation, inspection and maintenance, and easy replacement of capacitor units. This design provides conducive conditions for serialization and standardization, making it the prevailing mainstream structural form in the industry today.

Indoor cabinet type

It is a capacitor installation with capacitors (banks) and auxiliary electrical components assembled in one or several electrical cabinets for electric connection. The electrical cabinet body meets the design requirements for casing protection grade. It is featured with a well-organized and beautiful appearance. This structure is designed for 6kV, 10kV and 20 kV indoor devices, etc.

Pole-mounted type

The capacitors (banks) and auxiliary electrical components are mounted on one or multiple concrete poles, typically disposed at least 2.5m above the ground without the need for fencing. It is connected to overhead AC high-voltage power lines to compensate for inductive reactive power in lines and loads and improve power factor, characterized by high cost-effectiveness. This structure is designed for outdoor installations at voltage levels like 6kV, 10kV, and 20kV, with capacities ranging from 100kvar to 3,000kvar.

Outdoor box type

A capacitor installation with its capacitors (banks) and auxiliary electrical components assembled in the box. It is featured with convenient installation, etc. This structure is designed for 6kV, 10kV and 20 kV outdoor devices, etc.

Installation model

□ □ □□-□/□-□□□

- Service environment (W-outdoors; default-indoors)
- Protection methods (Table 4)
- Wiring methods (Table 3)
- When the first feature number is DL, it is default. Other fixed devices represent unit capacity in kvar;
- When the first feature number is DL, it represents the capacitance value of the capacitor bank in μF; All others represent the device capacity in kvar, or the group capacity when the device is switched by groups.
- Nominal voltage (kV)
- Second feature number (Table 2)
- First feature number (Table 1)
- T: Complete equipment

- The first feature code consists of two letters, and is distinguished based on the type of installations as detailed in Table 1.
- The second feature code consists of one letter, and is distinguished based on the structural type of installations as detailed in Table 2.
- The wiring method is represented by a single letter, and distinguished based on the wiring method, with specific details in Table 3.
- The protection method is denoted by a single letter, with specific details listed in Table 4.
- To maintain uniformity in code writing, it is stipulated that a small dot be used to separate the code in front and behind the document serial number (the dot placed in the lower right corner).

Table 1 Type of the First Feature Number Assembly

Letters	Content	Letters	Content
BB	Shunt capacitor installations	DL	DC filter capacitor installation
AL	AC filter capacitor installation	CB	Series capacitor installation

Table 2 Structural Types of the Second Feature Code Installation

Letters	Content	Letters	Content
Z	Pole-mounted type	H	Outdoor box type
G	Indoor cabinet type	Default	Frame (table) type

Table 3 Wiring Methods of the Installation

Letters	Content	Letters	Content
A	Single-star	C	Three-star
B	Double-star	D	Single-phase

Table 4 Protection Methods of the Installation

Letters	Content	Letters	Content
K	Open delta voltage protection	Q	Bridge differential current protection
C	Phase voltage differential protection	L	Neutral point unbalance current protection

High-voltage shunt

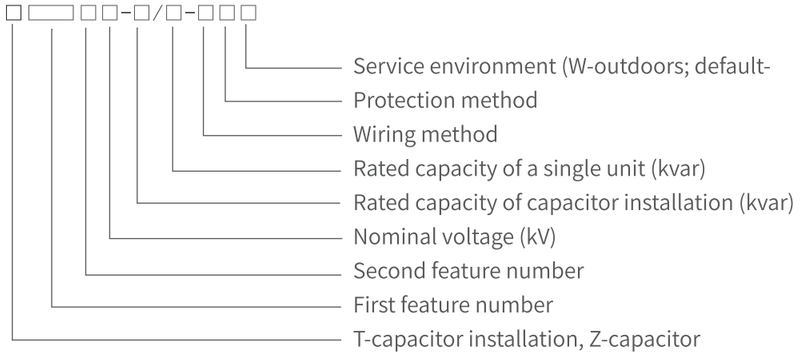
I. Purpose

High-voltage shunt capacitor installations are primarily utilized in 50Hz/60Hz three-phase AC power systems with voltage ratings of 6kV, 10kV, 20kV, 35kV, 66kV, and 110kV to compensate for inductive reactive power, enhance system power factor, improve grid voltage quality, and reduce line losses.

II. Execution standards

GB/T30841-2014	General Requirements for High-voltage Shunt Capacitor Installations
GB50227-2017	Code for Design of Installation of Shunt Capacitors
GB311.1-2012	Insulation Co-ordination - Part 1: Definitions, Principles and Rules
GB50060-2008	Code for Design of High Voltage Electrical Installation (3-110kV)
GB50260-2013	Code for Seismic Design of Electrical Installations
GB/T26218.1-2010	Selection and Dimensioning of High-voltage Insulators Intended for Use in Polluted Conditions - Part 1: Definitions, Information and General Principles
GB/T16927.1-2011	High-voltage Test Techniques Part 1: General Test Requirements
GB/T15166.4-2021	High-voltage Alternating-current Fuses - Part 4: Fuse for External Protection of Shunt Capacitors
GB/T11032-2020	Metal-oxide Surge Arresters without Gaps for A.C. Systems
GB 20840.2-2014	Instrument Transformers - Part 2: Additional Requirements for Current Transformers
GB1985-2014	High-voltage Alternating-current Disconnectors and Earthing Switches
GB/T8287.1-2008	Indoor and Outdoor Post Insulators for Systems with Nominal Voltage Greater than 1,000V - Part 1: Test on Insulators of Ceramic Material or Glass
GB/T8287.2-2008	Indoor and Outdoor Post Insulators for Systems with Nominal Voltage Greater than 1,000V - Part 2: Dimensions and Characteristics
DL/T604-2020	Technical Specification of High-voltage Shunt Capacitor Installation
DL/T442-2017	Order-specification of Fuse for the Protection of a High-voltage Shunt Capacitor
DL/T840-2016	Specification of High-voltage Shunt Capacitors for Service
DL/T653-2009	Specification of Discharge Coils for High Voltage Shunt Capacitor for Order
DL/T462-1992	Technical Specifications for Ordering Series Reactors Used for High-voltage Shunt Capacitors
DL/T620-1997	Code of Design of Overvoltage Protection and Insulation Coordination for AC Electrical Installations

Installation model



Main technical performances of the installation

Capacitance deviation of the installation: The ratio of the measured capacitance per phase of the installation to the rated capacitance does not exceed 0-+5%, the ratio of the maximum to minimum capacitance among the three phases does not exceed 1.02, and the ratio of the maximum to minimum capacity of each series segment does not exceed 1.01.

The installation can operate without interruption at 1.05 times the rated voltage.

The installation can operate without interruption at a root mean square current not exceeding 1.3 times the rated current.

Indoor frame (table): 10kV high-voltage shunt capacitor installation (open delta protection)				
S/N	**Installation model**	**Capacitor model**	**Quantity**	**Reference**
1	TBB10-600/200-AK	AM11/ √3-200-1 (corresponding to 5%reactance rate) BAM12/ √3-200-1 (corresponding to 12%reactance rate)	3	Fig. 1
2	TBB10-1200/200-AK		6	Fig. 2
3	TBB10-1800/200-AK		9	Fig. 3
4	TBB10-2400/200-AK		12	
5	TBB10-3000/200-AK		15	
6	TBB10-3600/200-AK		18	
7	TBB10-4200/200-AK		21	
8	TBB10-4800/200-AK		24	
9	TBB10-1002/334-AK	BAM11/√3-334-1 (corresponding to 5%reactance rate) BAM12/√3-334-1 (corresponding to 12%reactance rate)	3	Fig. 1
10	TBB10-2004/334-AK		6	Fig. 2
11	TBB10-3006/334-AK		9	Fig. 3
12	TBB10-4008/334-AK		12	
13	TBB10-5010/334-AK		15	
14	TBB10-1500/500-AK	BBAM11/√3-500-1 (corresponding to 5%reactance rate) BAM12/ √3-500-1 (corresponding to 12%reactance rate)	3	Fig. 1
15	TBB10-3000/500-AK		6	Fig. 2
16	TBB10-4500/500-AK		9	Fig. 3
Indoor frame (table): 10kV high-voltage shunt capacitor installation (differential pressure protection)				
17	TBB10-5004/417-AC	BAM11/√3-417-1 (corresponding to 5%reactance rate) BAM12/√3-417-1(corresponding to 12%reactance rate)	12	Fig. 4
18	TBB10-10008/417-AC		24	
19	TBB10-6012/334-AC	BAM11/√3-334-1 (corresponding to 5%reactance rate) BAM12/√3-334-1 (corresponding to 12%reactance rate)	18	
20	TBB10-8016/334-AC		24	

Outdoor frame (stand): 10kV high-voltage shunt capacitor installation (open delta protection)				
S/N	Installation model	Capacitor model	Quantity	Reference
21	TBB10-600/200-AKW	BAM11/ √ 3-200-1 (corresponding to 5%reactance rate) BAM12/ √ 3-200-1 (corresponding to 12%reactance rate)	3	Fig. 5
22	TBB10-1200/200-AKW		6	
23	TBB10-1800/200-AKW		9	Fig. 6
24	TBB10-2400/200-AKW		12	
25	TBB10-3000/200-AKW		15	
26	TBB10-3600/200-AKW		18	Fig. 7
27	TBB10-4200/200-AKW		21	
28	TBB10-4800/200-AKW		24	
29	TBB10-1002/334-AKW	BAM11/ √ 3-334-1 (corresponding to 5%reactance rate) BAM12/ √ 3-334-1 (corresponding to 12%reactance rate)	3	Fig. 5
30	TBB10-2004/334-AKW		6	
31	TBB10-3006/334-AKW		9	Fig. 6
32	TBB10-4008/334-AKW		12	
33	TBB10-5010/334-AKW		15	
34	TBB10-1500/500-AKW	BAM11/ √ 3-500-1 (corresponding to 5%reactance rate) BAM12/ √ 3-500-1 (corresponding to 12%reactance rate)	3	Fig. 5
35	TBB10-3000/500-AKW		6	
36	TBB10-4500/500-AKW		9	
Outdoor frame (stand): 10kV high-voltage shunt capacitor installation (differential pressure protection)				
37	TBB10-5004/417-ACW	BAM11/2 √ 3-417-1 (corresponding to 5%reactance rate) BAM12/2 √ 3-417-1(corresponding to 12%reactance rate)	12	Fig. 8
38	TBB10-10008/417-ACW		24	
39	TBB10-6012/334-ACW	BAM11/2 √ 3-334-1 (corresponding to 5%reactance rate) BAM12/2 √ 3-334-1 (corresponding to 12%reactance rate)	18	
40	TBB10-8016/334-ACW		24	

Indoor cabinet type: 10kV high-voltage shunt capacitor installation (open delta protection)				
S/N	Installation model	Capacitor model	Quantity	Reference
41	TBBG10-600/200-AK	BAM11/ √ 3-200-1 (corresponding to 5%reactance rate) BAM12/ √ 3-200-1 (corresponding to	3	Fig. 9
42	TBBG10-1200/200-AK		6	
43	TBBG10-1800/200-AK		9	
44	TBBG10-2400/200-AK		12	
45	TBBG10-3000/200-AK		15	
46	TBBG10-3600/200-AK		18	
47	TBBG10-4200/200-AK		21	
48	TBBG10-4800/200-AK		24	
49	TBBG10-1002/334-AK	BAM11/ √ 3-334-1 (corresponding to 5%reactance rate) BAM12/ √ 3-334-1 (corresponding to 12%reactance rate)	3	
50	TBBG10-2004/334-AK		6	
51	TBBG10-3006/334-AK		9	
52	TBBG10-4008/334-AK		12	
53	TBBG10-5010/334-AK		15	
54	TBBG10-1500/500-AK	BAM11/ √ 3-500-1 (corresponding to 5%reactance rate) BAM12/ √ 3-500-1 (corresponding to 12% reactance rate)	3	
55	TBBG10-3000/500-AK		6	
56	TBBG10-4500/500-AK		9	
Indoor cabinet type: 10kV high-voltage shunt capacitor installation (differential pressure protection)				
57	TBBG10-5004/417-AC	BAM11/2 √ 3-417-1 (corresponding to 5% reactance rate) BAM12/2 √ 3-417-1(corresponding to 12%reactance rate)	12	Fig. 10
58	TBBG10-10008/417-AC		24	
59	TBBG10-6012/334-AC	BAM11/2 √ 3-334-1 (corresponding to 5%reactance rate) BAM12/2 √ 3-334-1 (corresponding to 12%reactance rate)	18	
60	TBBG10-8016/334-AC		24	

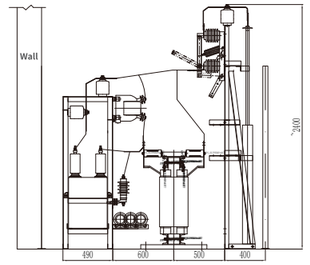
Outdoor layout: 35kV high-voltage shunt capacitor installation (differential pressure protection)				
S/N	Installation model	Capacitor model	Quantity	Reference
61	TBB35-10008/417-ACW	BAM11/2-417-1W (corresponding to 5%reactance rate)	24	Fig. 11
62	TBB35-20016/417-ACW	BAM12/2-417-1W (corresponding to 12%reactance rate)	48	
63	TBB35-12000/500-ACW	BAM11/2-500-1W(corresponding to 5%reactance rate)	24	
		BAM12/2-500-1W (corresponding to 12%reactance rate)		
Outdoor layout: 35kV high-voltage shunt capacitor installation (axle differential protection)				
64	TBB35-40080/334-AQW	BAM11/2-334-1W(corresponding to 5%reactance rate)	120	Fig. 12
		BAM12/2-334-1W (corresponding to 12%reactance rate)		
65	TBB35-40032/417-AQW	BAM11/2-417-1W(corresponding to 5%reactance rate)	96	
		BAM12/2-417-1W(corresponding to 12%reactance rate)		
66	TBB35-60000/500-AQW	BAM11/2-500-1W(corresponding to 5%reactance rate)	120	
		BAM12/2-500-1W (corresponding to 12%reactance rate)		

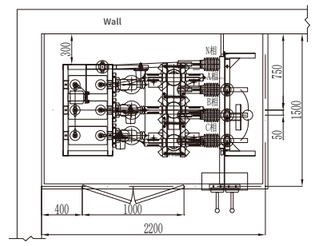
Note:

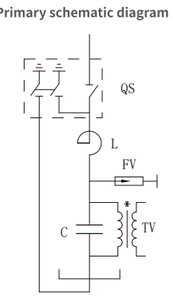
(1) For installations resembling the configuration illustrated in Fig. 1, their layout structure is similar, with adjustments made to the layout dimensions based on the dimensions illustrated in the figure. For specific details, please feel free to inquire directly with our company.

(2) Please contact us for other special products or requirements (for limited space, high altitude, etc.).

Fig. 1 shows the layout of TBB10-1002/334-AK (reactance rate: 5%).

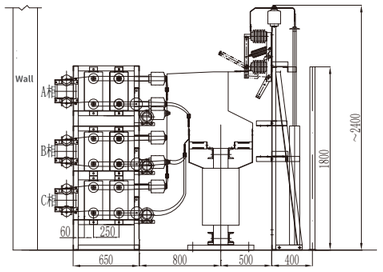


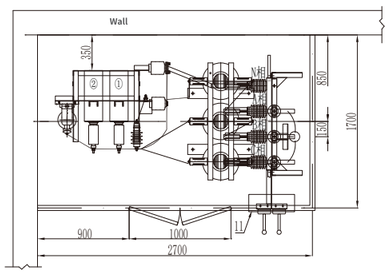


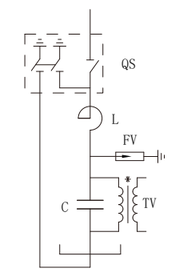


L-Series reactor
C-Shunt capacitor
FV-Zinc oxide lightning arrester
QS-Grounding isolator
TV-Discharge coil

Fig. 2 shows the layout of TBB10-2004/334-AK (reactance rate: 5%).







L-Series reactor
C-Shunt capacitor
FV-Zinc oxide lightning arrester
QS-Grounding isolator
TV-Discharge coil

Fig. 3 shows the layout of TBB10-4008/334-AK (reactance rate: 5%).

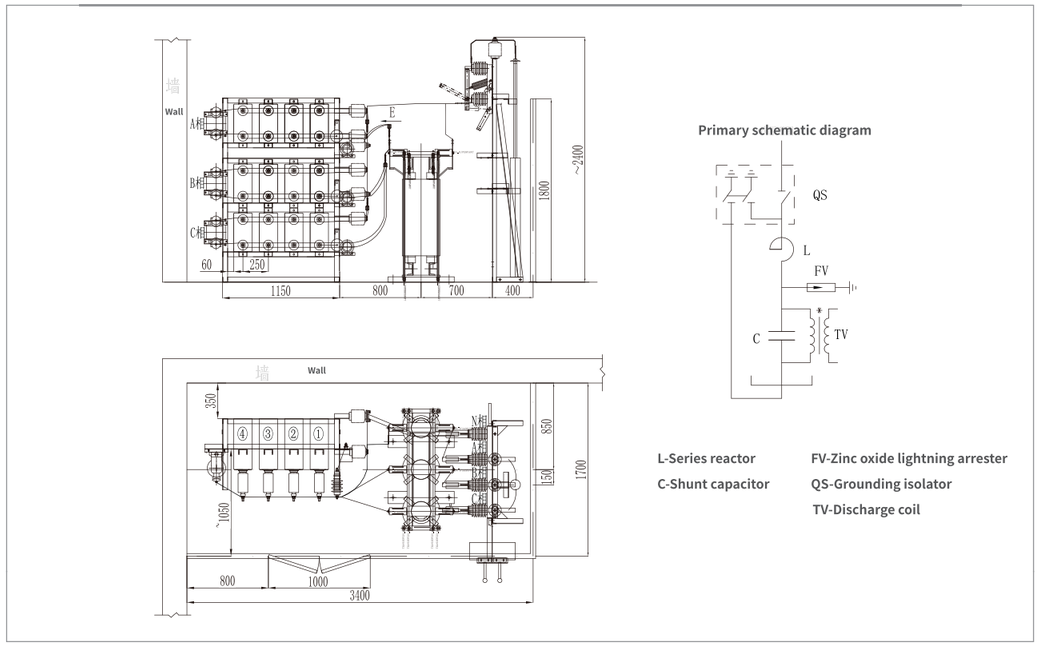


Fig. 4 shows the layout of TBB10-6012/334-AC (reactance rate: 5%).

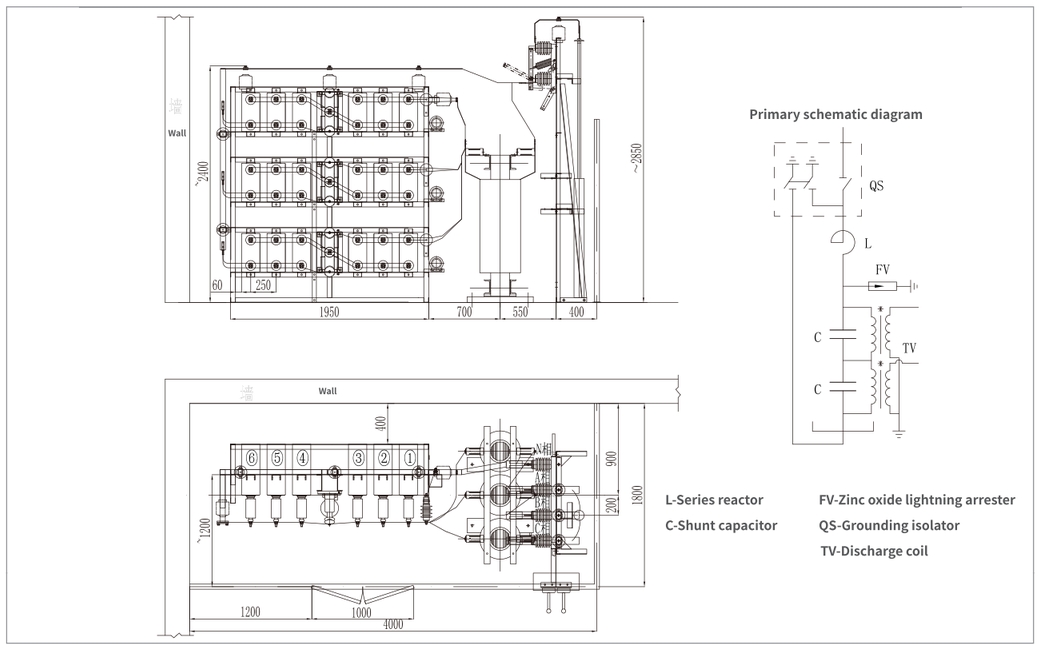


Fig. 5 shows the layout of TBB10-2004/334-AKW (reactance rate: 5%).

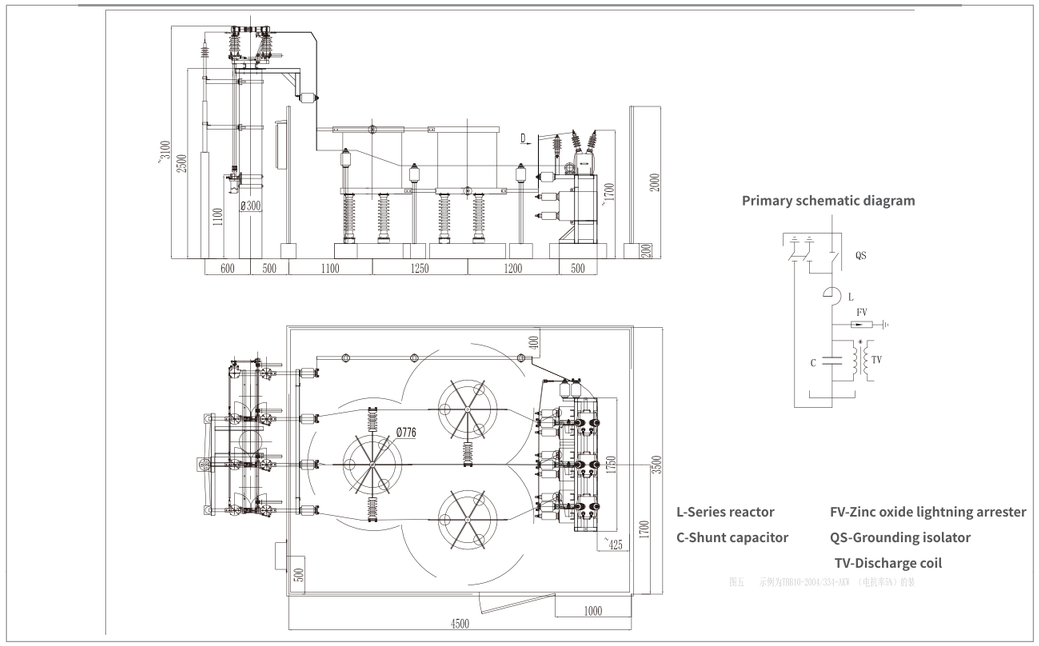


Fig. 6 shows the layout of TBB10-4008/334-AKW (reactance rate: 5%).

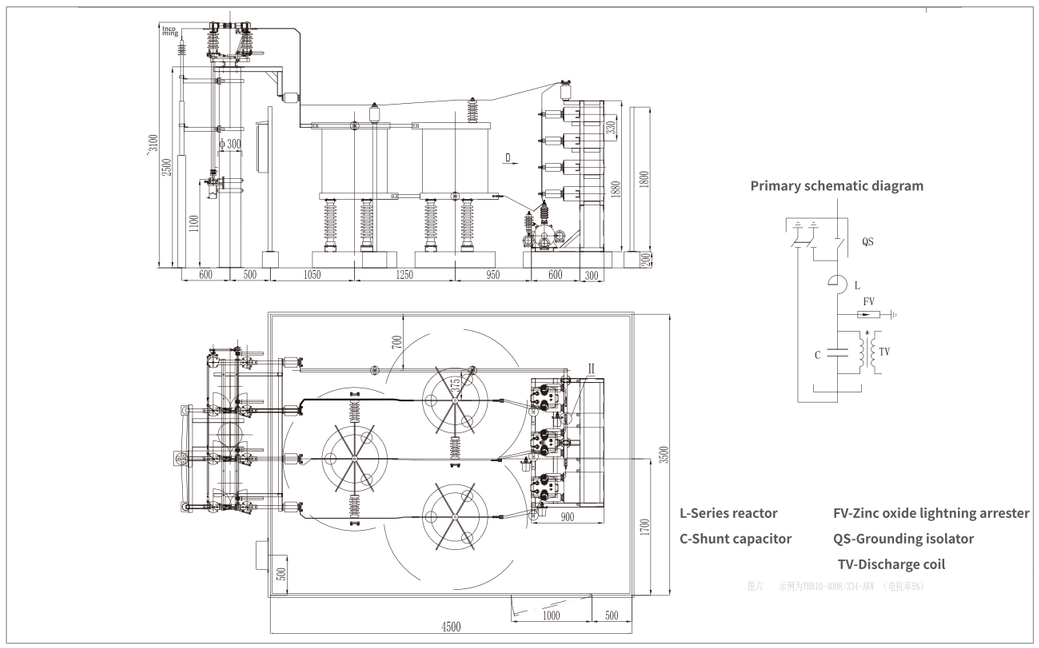


Fig. 7 shows the layout of TBB10-4800/200-AKW (reactance rate: 5%).

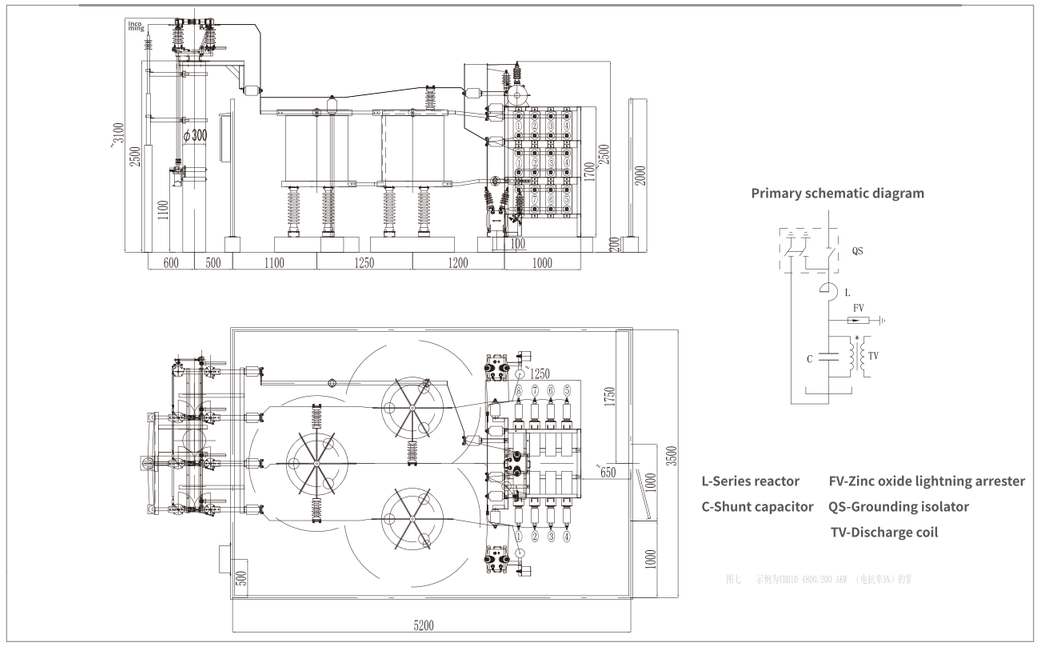


Fig. 8 shows the layout of TBB10-8016/334-ACW (reactance rate: 5%).

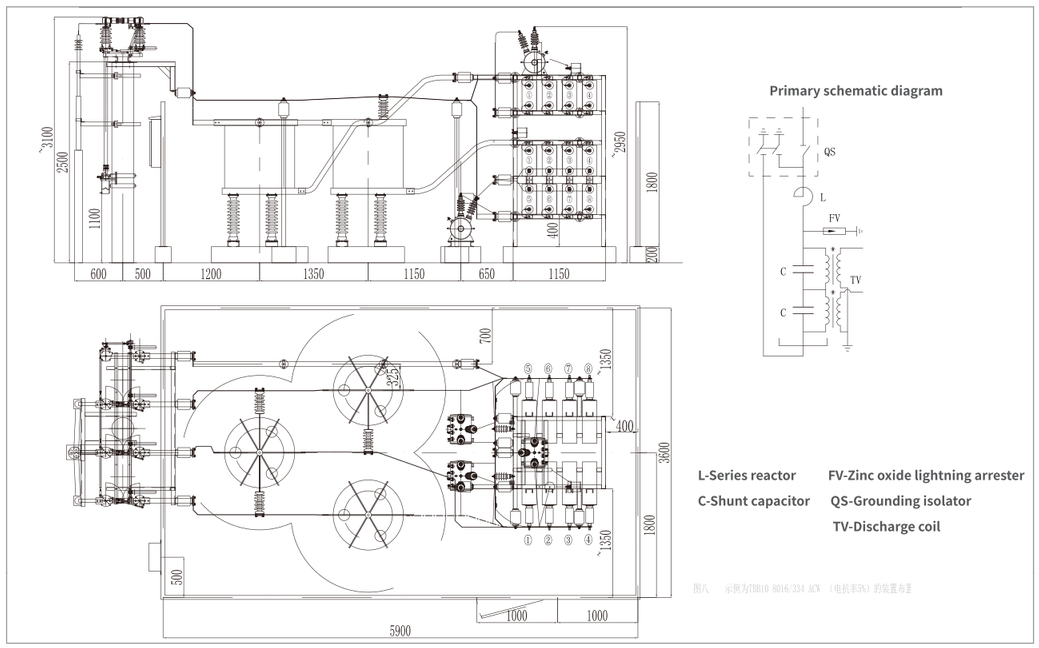


Fig. 9 shows the layout of TBBG10-3006/334-AK (reactance rate: 5%).

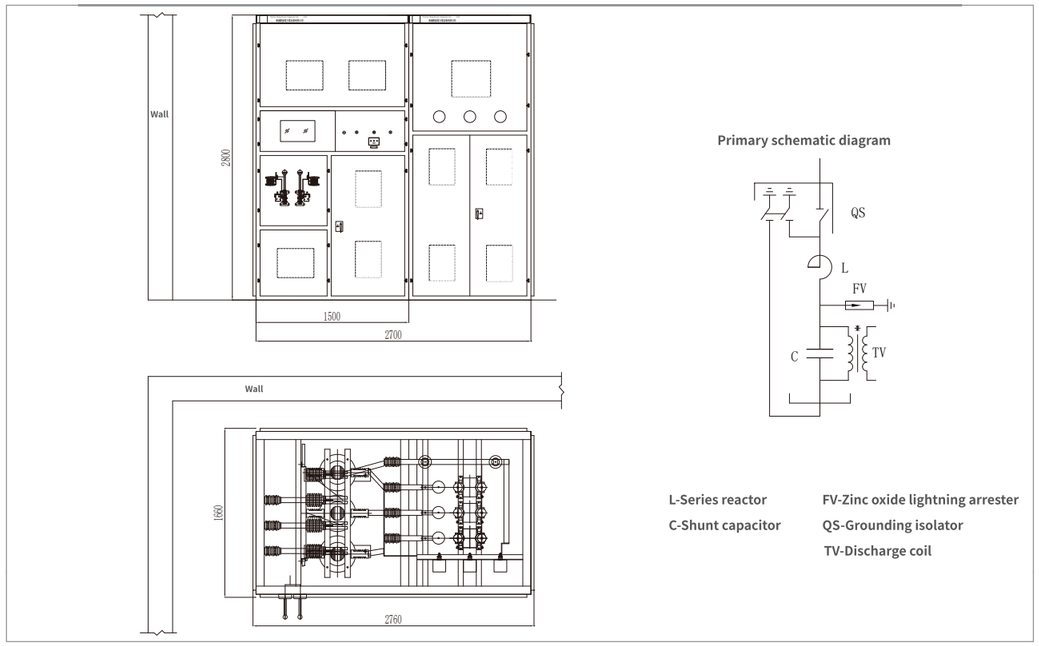


Fig. 10 shows the layout of TBBG10-6012/334-AC (reactance rate: 5%).

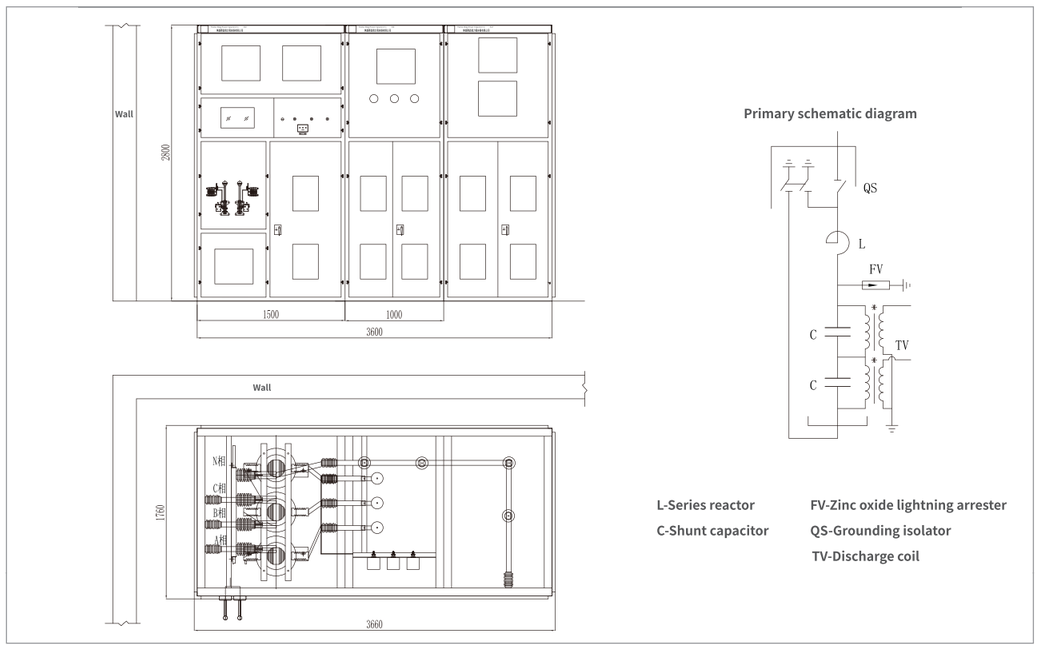
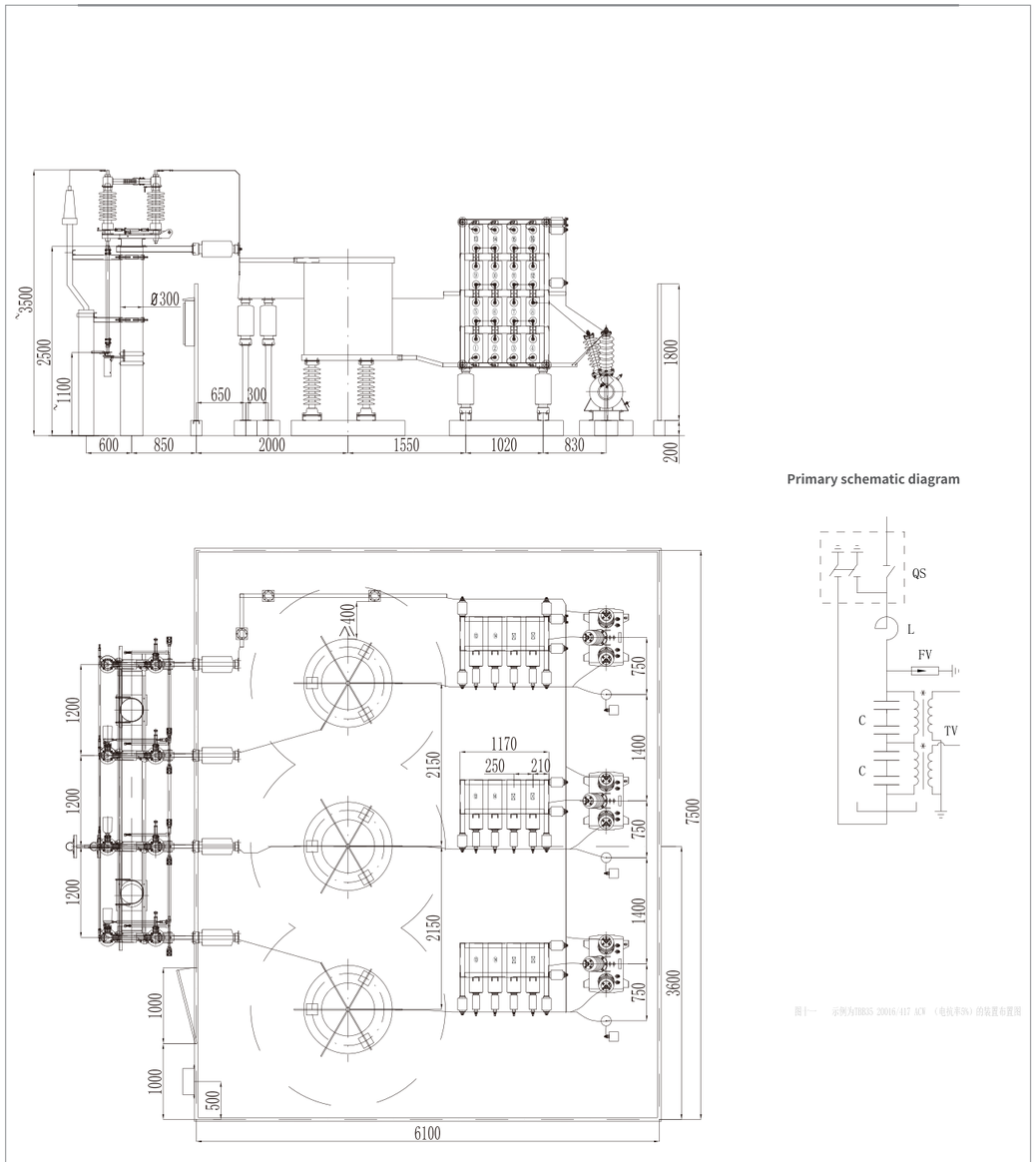


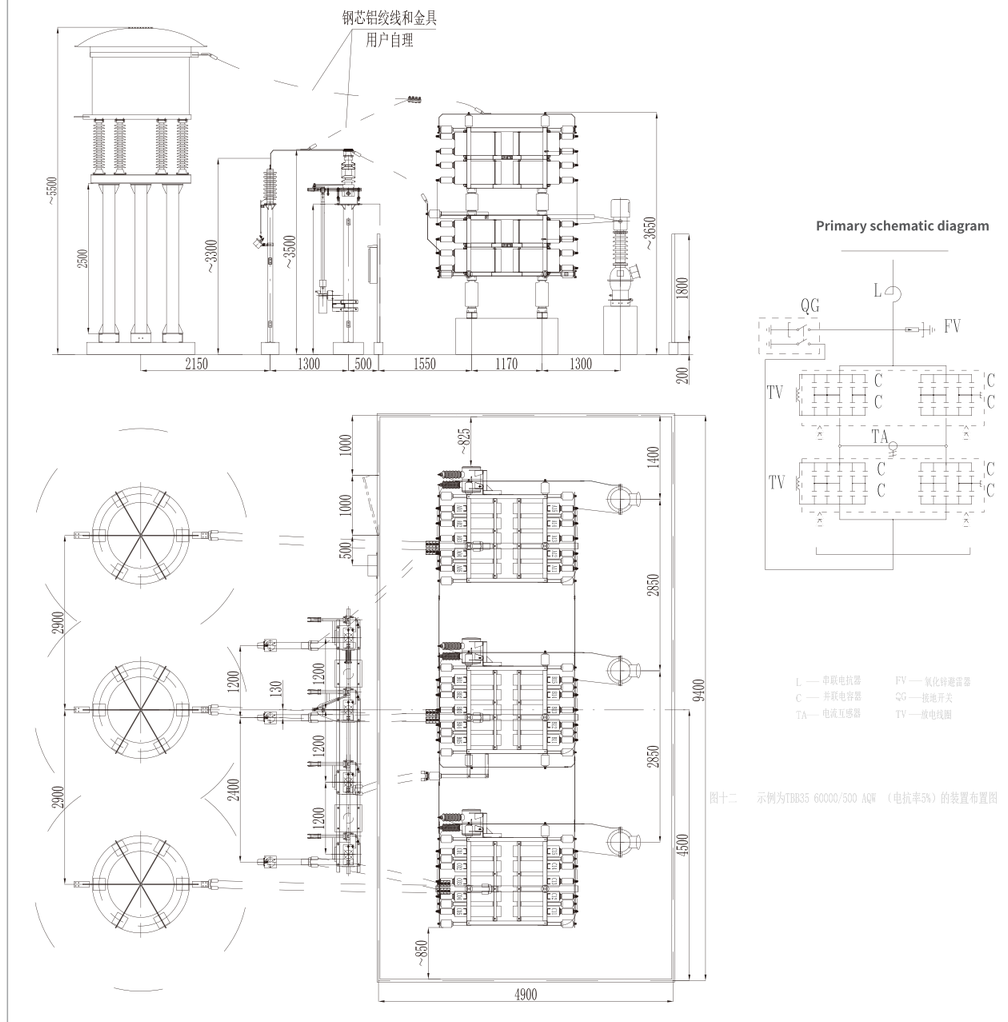
Fig. 11 shows the layout of TBB35-20016/417-AC (reactance rate: 5%).



图十一　示例为TBB35 20016/417 ACW （电抗率5%）的装置布置图

L-Series reactor　　FV-Zinc oxide lightning arrester
C-Shunt capacitor　　QS-Grounding isolator
TV-Discharge coil

Fig. 12 shows the layout of TBB35-60000/500-AQW (reactance rate: 5%).



图十二　示例为TBB35 60000/500 AQW （电抗率5%）的装置布置图

L-Series reactor　　FV-Zinc oxide lightning arrester
C-Shunt capacitor　　QS-Grounding isolator
TA-Current transforme

High-voltage automatic switching

I. Purpose

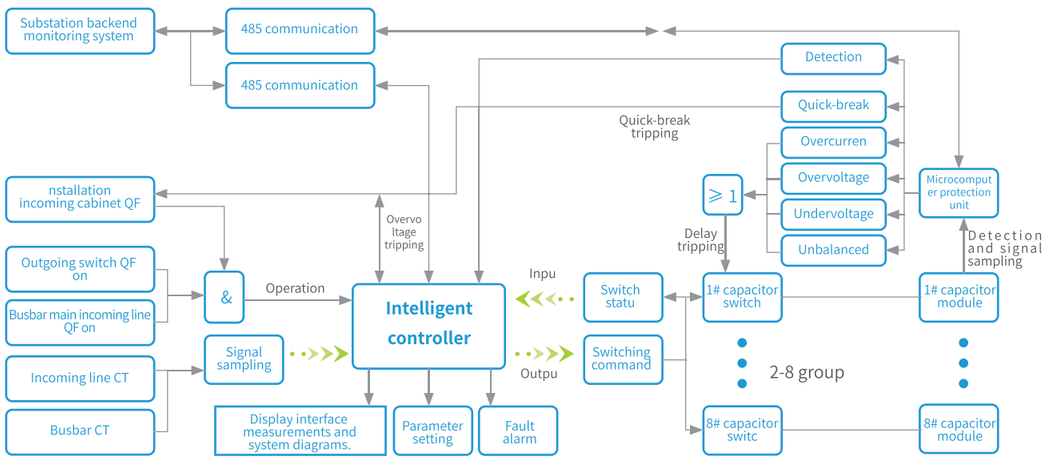
The TBB series high-voltage shunt capacitor automatic switching device is designed for use in power systems at 35kV-220kV substations and also for industrial and mining enterprises' substaitions with busbar voltages ranging from 6kV to 20kV for automatic VAR compensation. With it, the power factor and voltage of the substation can also remain within the predefined ranges, guaranteeing the basic balance of reactive power in the power grid, reducing energy losses, and enhancing power quality.

II. Structure and features

The TBB series automatic switching device features intelligent detection and control, and is designed for application in unmanned, intelligent substations. There are frame (table)-mounted, outdoor box, and indoor cabinet types. The automatic switching VAR compensator, by upgrading the conventional single transformer with a single capacitor bank, regulates the switching operation through a mode with multiple capacitor banks of varying (or equal) capacities.

The controller mainly works through voltage-reactive power comprehensive control to switch the capacitor based on voltage levels and reactive power deficits. To prevent frequent adjustments of on-load tap changers and capacitor switching due to voltage-reactive power decoupling control, and to prevent conflicts between voltage regulation and capacitor switching, the controller functions through a voltage-reactive power comprehensive automatic control scheme. This scheme follows the two-dimensional fuzzy “twelve-zone” control criteria to “ensure voltage compliance, achieve reactive power balance, and minimize adjustment frequency”.

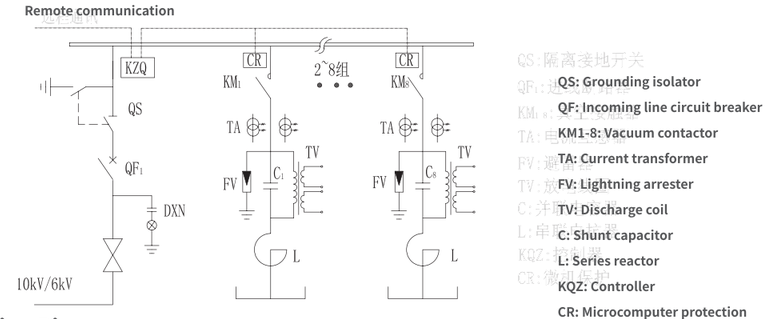
(II) Operation principles



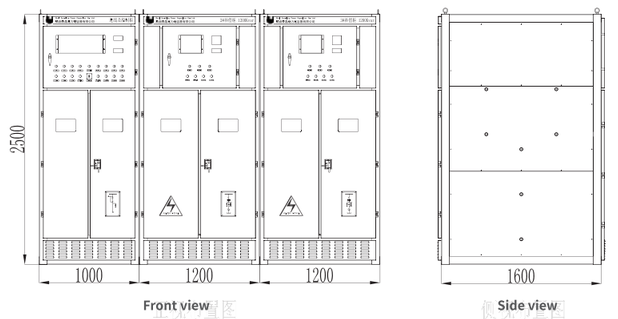
III. Functional features

1. Track and compensate for reactive power without overcompensation or undercompensation, reduce losses, and suppress system harmonics;
2. The complete installation is designed in a modular structure, allowing adding compensation modules as the load increases;
3. The capacitor banks can switch in an automatic, intelligent, and most optimized way, and can be controlled in manual, automatic, and remote modes;
4. It can control 1-2 bus sections, and 2-8 capacitor banks, either at the same time or independently;
5. The capacitor banks can be equally divided or combined with different capacities based on users' load variations;
6. Each capacitor bank is equipped with independent protection units for protection against overvoltage, undervoltage, overcurrent, instantaneous trip, and unbalanced voltage;
7. The controller features functions like interlocking, self-diagnosis, and on-site parameter settings;
8. The specialized vacuum switching device for capacitors is compact, lightweight, free from reignition and has a long service life;
9. The complete installation includes features like rapid discharge, limiting closing surge currents, and protection against operational overvoltages;
10. Indoor cabinet and outdoor box structures occupy small space, are easy to install, and are equipped with intelligent detection and control modules, allowing remote monitoring of installation operations.

IV. Application of indoor cabinet-type automatic switching VAR compensators



Primary Main Wiring Diagram



Layout Diagram of Indoor Cabinet Type Automatic Switching VAR Compensator

Series capacitor bank for high-voltage series capacitor

Main reasons for using series capacitors in transmission systems

- Improve the tolerance of transient stability to increase power transmission capacity;
- Improve system stability;
- Enhance voltage regulation and reactive power balance (the reactive power generated by series capacitors also increases with the increase of transmission load);
- Determine optimal features for load distribution between dual lines;
- Reduce system losses.

Basic principles

Principle to improve stable transmission capacity:

The static stable transmission power of high-voltage transmission lines can be expressed by the following equation:

$$P = \frac{U_1 U_2}{X_L} \sin\sigma$$

Wherein, U_1 and U_2 represent the power supply voltage at both ends of the line;

σ is the phase angle difference of the power supply voltage at both ends of the line;

X_L is the impedance of the line;

U_1 U_2 and X_L represent the maximum transmission power of the line (static stability limit).

When series compensation capacitors are installed in the line, the stable transmission power of the line is:

$$P = \frac{U_1 U}{X_L - X_C} \sin\sigma$$

Under the same phase angle difference conditions, the ratio of stable power transmission before and after the installation of series capacitors is:

$$\frac{X_L}{X_L - X_c} = \frac{1}{1 - K_C}$$

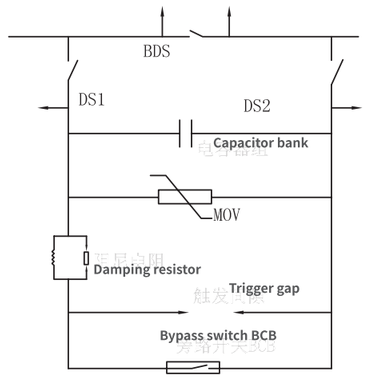
$K_C = X_C / X_L$ is the compensation degree.

500kV ultra-high voltage series capacitors are installed in the transmission system primarily to enhance power transmission capacity and optimize load distribution between parallel transmission lines to reduce losses and save on investments. Series compensation significantly reduces the costs of power transmission systems.

Basic wiring methods

The main body of the series capacitor compensator consists of the main circuit and the protection device of the capacitor.

The protection device consists of a MOV lightning arrester and a fast bypass switch BCB.



Basic Wiring Diagram of Series Compensation Installation

Execution Standards of Series Capacitor Manufacturing

GB/T 6115.1-2008	Series Capacitors for Power Systems - Part 1: General
GB/T6115.2-2002	Series Capacitors for Power Systems - Part 2: Protective Equipment for Series Capacitor Banks
GB/T6115.3-2002	Series Capacitors for Power Systems - Part 3: Internal Fuse
IEC 311.1-2012	Insulation Co-ordination - Part 1: Definitions, Principles and Rules
IEC 60143–1	《Series capacitor for power systems –Part1：General》
IEC 60143–2	《Series capacitor for power systems –Part2：Portective equipment for series capacitor banks》
IEC 60143–3	《Series capacitor for power systems –Part3：Internal fuses》

Model description of series capacitor installation

TCB□–□/□–□□W

- W: Outdoor type
- □: Protection method
- □: Wiring method
- □: Rated capacity of a single capacitor (kvar)
- □: Rated capacity (kvar)
- □: Rated voltage (kV)
- TCB: Series capacitor installation

High-voltage filter capacitor installations

I. Purpose

The high-voltage filter capacitor installation is primarily used in power supply systems of 6kV, 10kV, 35kV, and above, where harmonic sources are present.

The installation consists of a combination of filter capacitors, filter reactors, and resistors, precisely tuned to make filters present low impedance to high harmonic current at a specific frequency. It can locally absorb harmonic current to improve power quality. During operation, the filter unit operates in parallel with the harmonic source, providing not only filtering but also VAR compensation.

II. Execution

GB50227-2017	Code for Design of Installation of Shunt Capacitors
DL/T604-2020	Technical Specification of High-voltage Shunt Capacitor Installation
GB/T11024.1-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 1: General
GB311.1-2012	Insulation Co-ordination - Part 1: Definitions, Principles and Rules
GB/T14549-1993	Quality of Electric Energy Supply - Harmonics in Public Supply Network
GB/T16927.1-2011	High-voltage Test Techniques Part 1: General Test Requirements
GB/T 1094.6-2011	Power Transformers - Part 6: Reactors
DL/T840-2016	Specification of High-voltage Shunt Capacitors for Service
IEC60871-1	《Shunt capacitorfor a.c.power systems havinga rated voltage above 1000V-Part 1:General》
IEC60871-2	《Shunt capacitorfor a.c.power systems havinga rated voltage above 1000V-Part 2：Endurance testing 》
IEC60871-3	《Shunt capacitorfor a.c.power systems havinga ratedvoltage above 1000V-Part 3： Protection of shunt capacitors and shunt capacitor banks》
IEC60871-4	《Shuntcapacitorfora.c.powersystemshavingarated voltage above 1000V-Part 4：internalfuses》

III. Applicable standards

Metallurgical industry: Rolling mills, pipe mills, and calenders driven by AC or DC converters; DC electric arc furnaces powered by rectifiers; AC electric arc furnaces powered by AC power supply; phosphorus furnaces, and various ore heating furnace loads

Power system: Substation reactive power compensation and voltage stability control for long-distance power transmission;

Electric railway: Dynamic VAR compensator for locomotive traction substations, voltage and reactive power control units for sub-switching posts; Water company: variable frequency speed-control units;

Petrochemical industry: Various rectifier loads, electrolytic loads, ore heating loads, and electric heating loads.

IV. Ordering instructions

Filter devices are designed mainly to ensure that the bus voltage distortion rate and various harmonic current values of the system meet prescribed standards under specified system harmonic conditions while minimizing investment, meet VAR compensation requirements, and guarantee safe, reliable, and cost-effective device operation. For this sake, prior to designing filter devices, users are required to provide the following information:

Main wiring and equipment parameters (main transformers, cables, etc.) of the system;

Grid operating parameters (voltage, frequency variations, voltage imbalance, etc.); Harmonic impedance characteristics of the system;

Load characteristics (nature, size, harmonic impedance of the load, etc.); Characteristics of harmonic sources (harmonic frequencies, amplitudes, and fluctuations); Background harmonic levels of the system;

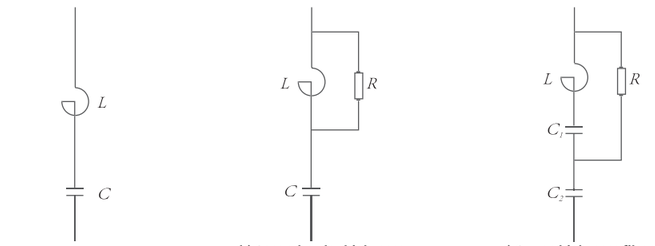
VAR compensation requirements and desired harmonic performance indicators;

Details of existing shunt compensation capacities, including installation positions, capacities, voltages, connection methods, and reactance rates.

V. Principles and types of AC filters

Passive filters, comprising a filtering circuit (consisting of resistor (R), inductor (L), capacitor (C)) and switch, control, and protection units, are designed to be connected in parallel with the system to eliminate harmonic currents of specific frequencies.

There are various types of AC filters, with the most commonly used ones including single-tuned filters, second-order high-pass filters, and C-type filters.



a) Single-tuned filte b) Second-order high-pass filte c) C-type high-pass filter

Principles for determining filter types:

1. When the load exhibits significant harmonic currents at a specific harmonic frequency near the tuning frequency without adjacent harmonics, a single-tuned filter is recommended;

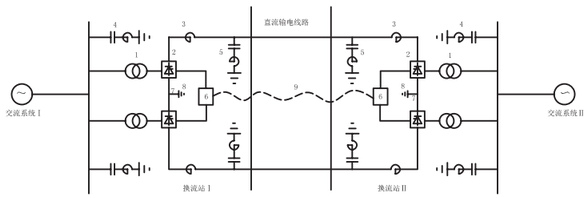
2. If there are interharmonics present near the tuning frequency, not exceeding the fourth harmonic, a high-damping C-type high-pass filter is advisable;

3. For requirements of high-damping high-pass filters with a tuning frequency not lower than the fourth harmonic, a second-order high-pass filter is recommended.

Capacitor installation for high-voltage direct current transmission (HVDC)

High-voltage DC transmission

The basic operational principle of a high-voltage direct current (HVDC) transmission system involves converting alternating current (AC) to direct current (DC) using converter equipment, transmitting the DC power to the receiving-end converter unit, which will convert the DC back to AC to transmit to the receiving-end AC system.



Schematic Diagram of the Composition of the Two-end DC Transmission System

1-Converter transformer 2-Converter 3-Flat wave reactor 4-AC filter 5-DC filter 6-Control and protection system 7-Grounding electrode lead 8-Grounding electrode 9-Remote control communication system

Execution Standards of Capacitor for DC

GB/T20993-2012	DC Filter Capacitors and Neutral Bus Surge Capacitors for HVDC Transmission System
GB/T20994-2007	Shunt Capacitors and AC Filter Capacitors for HVDC Transmission Systems
GB/T16927.1-2011	High-voltage Test Techniques Part 1: General Test Requirements
GB50260-2013	Code for Seismic Design of Electrical Installations
GB311.1-2012	Insulation Co-ordination for High Voltage Transmission and Distribution Equipment
GB/T26218.1-2010	Selection and Dimensioning of High-voltage Insulators Intended for Use in Polluted Conditions - Part 1: Definitions, Information and General Principles
IEC 60871-1	《Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 1：General》
IEC 60871-2	《Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 2：Endurance testing》
IEC 60871-3	《Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 3：Protection of shunt capacitors andshunt capacitorbanks》
IEC 60871-4	《Shunt capacitor for a.c. power systems having a rated voltage above 1000V-Part 4： internal fuses》

Main structure and parameters of capacitor

The structural form of the capacitor bank depends on factors such as the number of capacitors, insulation requirements of the installation, installation dimensions, and overall height. The following factors should be considered as a minimum in the design of the capacitor bank:

Mechanical loads during operation, installation, and maintenance; Electrical stresses from external or internal faults on the capacitor bank. Wind load;

Seismic requirements;

The impact of expansion and contraction caused by temperature and load changes.

Insulation structure of capacitor bank tower

The insulation structure of the capacitor bank tower mainly consists of interlayer insulation, ground insulation, and interphase insulation.

Mechanical strength of capacitor banks

The mechanical strength of capacitor banks is mainly affected by the following factors:

the bending and compressive strength of post insulators;

the arrangement and connection method of post insulators;

the structure and weight of the steel frame, the model, grade and quality of the steel, and the quality of fasteners;

the overall structure of the tower;

the intensity of earthquakes and wind speed;

the stress condition during installation and maintenance;

the required safety factors for the device.

Through specialized simulation software, the mechanical strength of the capacitor bank under the influence of the aforementioned factors can be calculated and verified. This helps to select the most secure, reliable, cost-effective, and rational design solution.

Unbalance protection

For AC filter capacitors, the unbalance protection alarm and trip setting are divided into the following three protection levels:

1. Alarm: Capacitor components that withstand the highest voltage can still function safely, and the fault is inhibited from worsening;

2. Alarm and delayed trip after two hours: Capacitor components that withstand the highest voltage can still function safely for two hours, and the fault is inhibited from worsening;

3. Immediate trip protection level: The occurrence of capacitor component group explosions can be prevented.

Seismic requirements

A simulation system is adopted. After inputting specific parameters into the system, it will generate simulated seismic waves for verification according to the specific seismic requirements.

Noise reduction measures

1. Our capacitor designs prioritize low-noise design solutions;

2. Internally, our capacitors incorporate soundproofing and vibration reduction measures to minimize vibration noise during electrical operation;

3. Externally, vibration-reducing measures are implemented between the capacitor and the mounting bracket to minimize vibration noise at the connection point.

Model description of AC filter capacitor installations

TAL□□ □–□–□ W

- Wiring method
- Protection method
- Rated capacity of a single capacitor (kvar)
- Rated capacity (kvar)
- Rated voltage (kV)
- AC filter capacitor installation

Model description of DC filter capacitor installations

TDL□ – □ – W

- Rated capacitance of capacitor bank (μF)
- Rated voltage (kV)
- DC filter capacitor installation

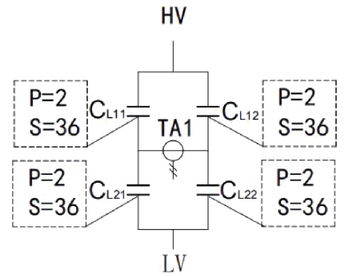
HVDC Projects

I. HP11/13 filter capacitor bank 5621#C1 in Yidu Converter Station of Sanxia-Shanghai ±500kV DC Transmission Project

Parameters of HP11/13C1 Device in Sanxia-Shanghai 500kV DC Transmission Project

1	Installation model	TAL500-402624/466-AQW
2	Nominal system voltage	500kV
3	Rated capacity	402624kvar
4	Rated voltage	514kV
5	Rated current	309A
6	Rated capacitance	1.617μF
7	Capacitance	-1 ～ +1%
8	Wiring method	H-shaped, double-tower
9	Number of series and shunt connections per phase	4-shunt 72-series
10	Seismic grade	Grade 8
11	Unit model	AAM 7.14-466-1W
12	Temperature category	-40/B

Primary schematic



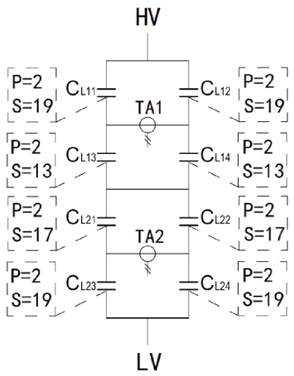
Note: Single H-type wiring, with protection against bridge differential unbalanced current. S-Series connection number of capacitor bank units per arm, P-Shunt connection number of capacitor bank units per arm

II. C-Shunt Capacitor Banks of Lingzhou Converter Station of Lingzhou-Shaoxing ±800kV DC Transmission Project

SC Installation Parameters of Lingzhou-Shaoxing ±800kV DC Transmission Converter Station Project

1	Installation model	TBB750-460387.2/564.2-AQW
2	Nominal system voltage	750kV
3	Rated capacity	460387.2kvar
4	Rated voltage	551.67kV
5	Rated current	278.2A
6	Rated capacitance	1.605μF
7	Capacitance deviation	-1 ～ +1%
8	Wiring method	Double H-type, double-tower
9	Number of series and shunt connections	4-shunt 68-series
10	Seismic grade	Grade 8
11	Unit model	BAM 8.113-564.2-1W
12	Temperature category	-40/B

Primary schematic



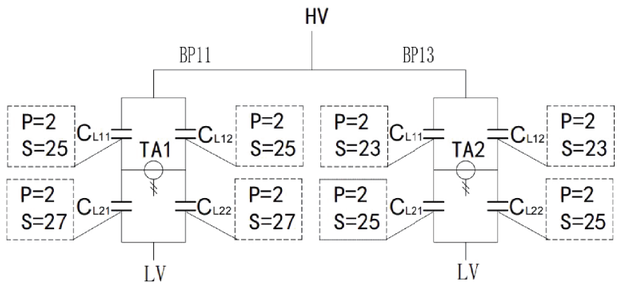
Note: Double H-type wiring, with protection against series double bridge differential unbalanced current. S-Series connection number of capacitor bank units per arm, P-Shunt connection number of capacitor bank units per arm.

III. Baihetan-Zhejiang ±800kV UHV DC Transmission Project

Parameters of BP11 and BP13 Capacitor Banks in Baihetan Phase II Converter Station

1	Branch	BP11	BP13
2	Installation model	TAL500-359424/576-AQW	TAL500-284544/494-AQW
3	Nominal system voltage	500kV	500kV
4	Rated capacity	359424kvar	284544kvar
5	Rated voltage	487.573kV	467.686kV
6	Rated current	364.672A	279.092A
7	Rated capacitance	1.6035μF	1.3776μF
8	Capacitance deviation	-1% ～ +1%	-1% ～ +1%
9	Wiring method	H-shaped, single-tower	H-shaped, single-tower
10	Number of series	4-shunt 52-series	4-shunt 48-series
11	Seismic grade	Grade 9	Grade 9
12	Unit model	AAM9.38-576-1W	AAM9.75-494-1W
13	Temperature category	-40/B	-40/B

Primary schematic diagram



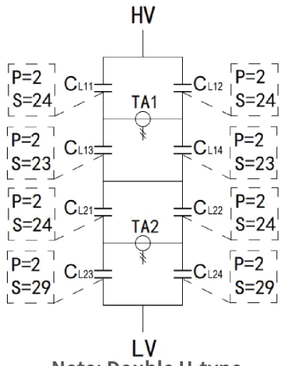
Note: Single H-type wiring, with protection against bridge differential unbalanced current. S-Series connection number of capacitor bank units per arm, P-Shunt connection number of

IV. Changji-Guquan ±1,100kV UHV DC Transmission Project

Parameters of Shunt SC Capacitor Banks in Changji Converter Station

1	Installation model	TBB750-685200/571-AQW
2	Nominal system voltage	750kV
3	Rated capacity	685200kvar
4	Rated voltage	600.1kV
5	Rated current	341.06A
6	Rated capacitance	2.0139μF
7	Capacitance deviation	-1% ～ +1%
8	Wiring method	Double H-type, double-tower
9	Number of series	4-shunt 100-series
10	Seismic grade	Grade 8
11	Unit model	BAM6.01-571-1W
12	Temperature category	-40/B

Primary schematic diagram



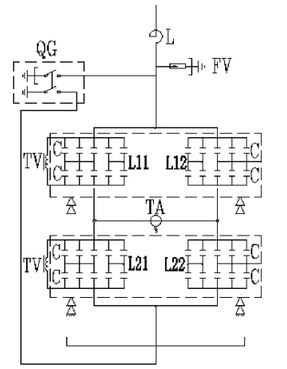
Note: Double H-type wiring, with protection against series double bridge differential unbalanced current. S-Series connection number of capacitor bank units per arm, P-Shunt connection number of capacitor bank units per arm.

V. ±500kV Zhangbei Flexible DC Grid Test Demonstration Project

TBB66-60000/500-AQ (W) Installation Parameters for Zhangbei Station, Kangbao Station, and Beijing Station

1	Installation model	TBB66-60000/500-AQ（W）
2	Nominal system voltage	66kV
3	Rated capacity	60000kvar
4	Rated voltage	42kV
5	Rated current	476.2A
6	Rated capacitance	36.1μF
7	Capacitance deviation	0% ～ +3%
8	Wiring method	Single-star type
9	Number of series and shunt	4-shunt 10-series
10	Seismic grade	Grade 9
11	Unit model	BAM21/2-500-1W
12	Temperature category	-40/B

Primary schematic diagram



4-series 10-shunt per phase
L-Reactor FV-Zinc oxide lightning arrester
C-Shunt capacitor
TV-Discharge coil
TA-Current transformer

Capacitor installation for electrified railway

Shunt capacitor for electric railway

1. Service environment

Ambient temperature: -40-+45°C

Altitude: ⩽ 1,000m (otherwise, please specify in the order)

Insulation pollution level: Equivalent value salt density: 0.12mg/cm2

Seismic strength: 0.25g (horizontal ground acceleration), 0.125g (vertical acceleration), where g is the gravitational acceleration

Wind speed: ⩽ 35m/s

Installation site: outdoor or indoor

II. Purpose

This capacitor is designed for use in traction power supply systems of electric railway traction substations with rated bus voltages of 27.5kV and 55kV. It is utilized to improve power factor, absorb high-order harmonics, and reduce line losses.

III. Main performance parameters

Rated voltage of traction substation busbar: 27.5kV, 55kV

Installed capacity: 1,000-6,000kvar

Ratio of fundamental impedance to capacitive impedance: 0.12 (adjustable within 0.12 and 0.14)

Insulation level: subject to applicable standard requirements

The deviation between the measured capacitance and the rated value of the capacitor does not exceed 0-+5%.

The tangent value of the dielectric loss angle of the capacitor, tanδ, does not exceed 0.02%.

IV. Model description

The single unit and device of the shunt capacitor for electric railway has the same model with the shunt compensating capacitor installation, but is single-phase.

V. Execution standards

TB/T2890-1998	Technical Conditions for Shunt Capacitors for Electric Railway
TB/T3040-2002	Technical Conditions for Dry-type Air Core Series Reactors for Electric Railway
GB/T11024.1-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 1: General
GB/T11024.2-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 2: Endurance Testing
GB/Z11024.3-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 3: Protection of Shunt Capacitors and Shunt Capacitor Banks
GB/T11024.4-2019	Shunt Capacitors for A.C. Power Systems Having a Rated Voltage above 1kV - Part 4: Internal Fuse

VI. Main models and specifications of shunt capacitors for electric railway

Model and specification	Rated voltage (kV)	Installed capacity (kvar)	Rated current (A)	Nominal capacitance (μF)
BAM10.5-100-1W	10.5	100	9.52	2.887
BAM10.5-200-1W	10.5	200	19.05	5.774
BAM10.5-300-1W	10.5	300	28.57	8.661
BAM8.4-100-1W	8.4	100	11.90	4.511
BAM8.4-200-1W	8.4	200	23.81	9.022
BAM8.4-300-1W	8.4	300	35.71	13.533
BAM8.4-200-1W	8.4	200	23.81	9.022
BAM8.4-300-1W	8.4	300	35.71	13.533

Main models and specifications of shunt capacitor compensator for electric railway

Model and specification	Rated fundamental voltage of capacitor (kV)	Rated voltage of capacitor (kV)	Installed capacity of capacitor (kvar)
TBB33-1000~6000-1W	33.33	42	1000~6000

Series capacitor for electric railway

I. Purpose:

This capacitor is connected in series with 27.5kV traction power supply systems of electric railway. By compensating for systems' inductive reactance, it can reduce voltage losses in the contact network and enhance the dynamic and static stability of systems, thereby improving the transportation capacity of the railway.

II. Main performance parameters

Rated voltage of traction substation busbar; 27.5kV

Rated voltage of capacitor installation: 3-4kV

Rated capacity of capacitor installation: 900-3,200kvar

Rated current of capacitor installation: 300-900A

Insulation level: subject to applicable standard requirements

The deviation between the measured capacitance and the rated value of the capacitor does not exceed 0-+5%.

The tangent value of the dielectric loss angle of the capacitor, tanδ, does not exceed 0.02%.

III. Model description

The single unit and device of the series capacitor for electric railway has the same model with the series compensating capacitor installation, but is single-phase.

IV. Execution standards

Execution Standards of Capacitor for Electrified Railway

GB/T6115.1-2008 Series Capacitors for Power Systems - Part 1: General

GB/T6115.2-2017 Series Capacitors for Power Systems - Part 2: Protective Equipment for Series Capacitor Banks

GB/T6115.3-2002 Series Capacitors for Power Systems - Part 3: Internal Fuse

TB/T2890-1998 Technical Conditions for Shunt Capacitors for Electric Railway

TB/T3040-2002 Technical Conditions for Dry-type Air Core Series Reactors for Electric Railway

V. Main models and specifications of series capacitors for electric railway

Model and specification	Rated voltage (kV)	Installed capacity Qn (kvar)	Rated current In (A)	Nominal capacitance Cn (μ)
CAM3-100-1W	3	100	33.3	35.4
CAM3-200-1W	3	200	66.7	70.8
CAM4-100-1W	4	100	25	19.9
CAM4-200-1W	4	200	50	39.8
CAM5-100-1W	5	100	20	12.7
CAM5-200-1W	5	200	40	25.5

Main models and specifications of series capacitor compensator for electric railway

Model and specification	Rated voltage of capacitor (kV)	Rated fundamental voltage of capacitor(kV)
TCB3-900~2700-1W	3	900~2700
TCB4-3200-1W	4	3200