



Equip the World With Green Equipments that Originated from China Railway High-speed

## Power Quality Control Products

Reliable, Green, and Efficiency

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# [ CONTENTS ]

<b>01</b>	Company Introduction .....	01
<b>02</b>	Power Quality Control Products Introduction .....	05
<b>03</b>	Application Field .....	06
<b>04</b>	Products Introduction .....	08
	• Static Var Generator (SVG) .....	08
	• Active Power Filter (APF) .....	14
	• TSC Dynamic Reactive Power Compensation Device (SVC) .....	16
	• TCR Dynamic Reactive Power Compensation Device (SVC) .....	18
	• Static Reactive Power Compensation Device (FC) .....	21
<b>05</b>	Application Performance .....	22
<b>06</b>	Testing and Production .....	24
<b>07</b>	Qualification Certificates .....	27

## ➔ Company Introduction

### ➤ CRRC Zhuzhou Electric Locomotive Research Institute Co.,Ltd.

CRRC Zhuzhou Electric Locomotive Research Institute Co., Ltd (CRRC Zhuzhou Institute) was established in 1959, formerly as Zhuzhou Electrical Locomotive Research Institute of Ministry of Railways, and currently is a subsidiary solely held by CRRC Corporation Limited.

Through 50 years' revolution and development, CRRC Zhuzhou Institute, who witnesses the great scientific progress of Chinese railway electrification and industrialization development, always adheres to the science-guiding principle, takes the innovation as priority, prompts the fast grow-up of industry, and already has formed four industry divisions, including Electrical Drive and Automation, Polymer Composites Application, New Energy Equipment, and Power Electronic Device, and nine business units. It possesses three listed companies, five national-level enterprise technology centers, two post-doctoral working stations, and two Sino-foreign joint ventures. The 2015 revenue exceeds thirty billion RMB.

By the strategy of technology introduction, digestion and absorption combined with the independent innovation, CRRC Zhuzhou Institute has been equipped with the strong capability of independent R&D and technology innovation, has finished the reconstruction of the independent R&D and innovation platform in the field of railway transportation electric traction and control system, and has processed the advanced core technologies, including Integration of Electric System, Converting & Its Control, Onboard Control & Diagnosis, Power Semiconductor Device, Train Operation control, Polymer Compound Material, Integration of Wind Power Equipment & Its Core Components Technology, EV System Integration & Its Core Components Technology, Engineering Machinery & Its Electric Control, Communication & Information Application, and synchronously has completed the development of design, manufacturing and testing platform.

CRRC Zhuzhou Institute will continue to carry the enterprise spirit of "Innovation and Excellence", endeavor to complete the great goal of 50 billion Yuan revenue in 2020, target at being the high-end, high efficient, high quality international enterprise that has advanced technology and wonderful relevant diversified industries operation and assets management capability.



## → Company Introduction

### ➤ **CRRC Zhuzhou National Engineering Research Center of Converters Co., Ltd.**

Registered and established on 30th, Jan. 2008 as a subsidy solely by CRRC Zhuzhou Locomotive Research Institute Co., Ltd., Zhuzhou National Engineering Research Center of Converters Co., Ltd.(hereafter be shorted as NERCC) is affiliated to CRRC Corporation Limited. The company now processes a registered capital of RMB 273 million. As a high-tech enterprise accredited by the Department of Science and Technology of Hunan province, it is specialized in research of the frontier science of converter technology, modularity design and systematic application of the core technology.

Construction of National Engineering Research Center of Converters was started in 1995 with the approval of the former State Development and Planning Commission. It is the only state-level engineering research center in the field of converter technology of China, which takes it a historic mission to promote the independent intellectual property, rights and core competitive strength of the converter technology of our country and to play the deserved role of traction and direction in the field of converter and electrical drive technology of the state.

The corporation has a committee of converter technology which comprises of over 20 well-known experts from china and other countries and has constructed an overseas research center in USA engaging in research of high-voltage frequency conversion technology and the technology of improvement of the quality of electrical energy, and development of new products to follow up the trend of development of the converter technology of the world and master the most advanced and frontier converter technology for making the corporation an engineering research base of converter technology with global competitive strength.



Our company mainly engages in the business of wind power converter series products, industrial drive series products,, high-voltage frequency conversion device, motor test system with frequency-conversion, the series of high voltage soft start device, power quality control devices (SVC, SVG, FC, APF etc.), metro rectification power, metro energy-absorption device, metro energy-feedback device, high-power industrial rectifying device and special power supply equipment .All the products are welcomed by the world and praised by the customers, which widely used in the industries as railway, chemical industry, metallurgy, mining, steel, and oil field.

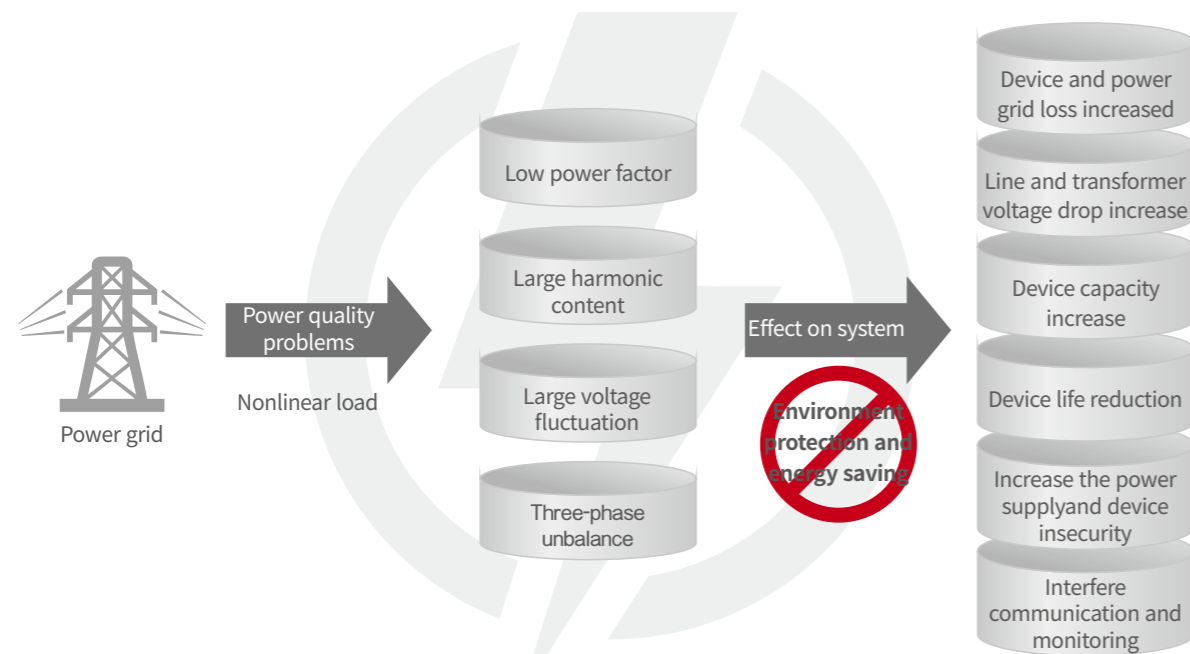
Since the establishment, NERCC has passed ISO 9000 quality system, ISO 14000 environment system, the first-class state standard enterprise certificate of quality safety, set up to the test lab of application of converter technology, integrated test lab of converter technology, test lab of development of control technology and computer-control system, test lab of EMC, test lab of cooling technology and the test lab of high-voltage and medium-voltage dynamic power compensation, and boast a large number of advanced production and experimental equipments such as high voltage soft-starting type test desk, high-power frequency converter test platform etc.. It has professional manufacture bases with the area of 20000 m<sup>2</sup> and total investment of over RMB 100 million Yuan.

The corporation is devoted to satisfy the demand of users of energy saving, lowering cost and improving benefits, acts according to the corporate spirit of "Trusting, Enterprising, Innovating, Surpassing", comprehensively utilizes the advanced research fruits of modern electric power and electrical technology, computer control technology and technology of computer network to provide the users with all-round solutions of application, and makes persevering efforts in creating fine economic returns and social benefits.

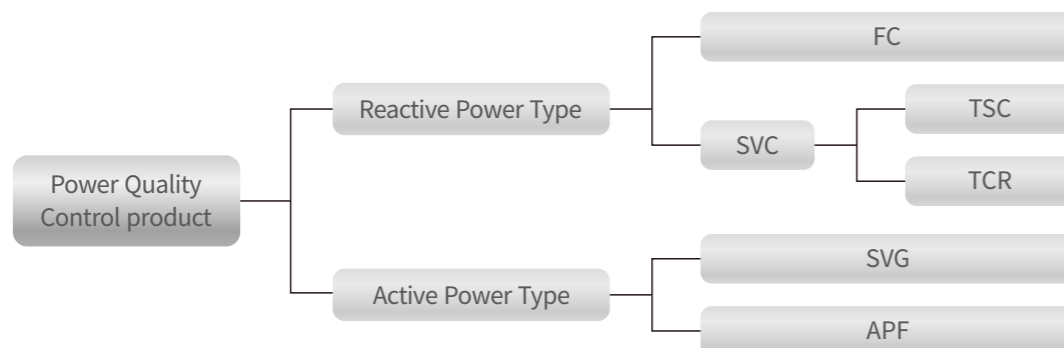


## ➔ Power Quality Control Products Introduction

With the rapid development of social economy, electrical energy is need more and more, the requirement of the power quality is also getting higher and higher. Power quality control device is required to achieve reactive power compensation, harmonic control, voltage fluctuations and flicker control, three-phase imbalance control and other functions in different applications.



At present, our company can provide all kinds of power quality control solutions. It is one of the most complete product category in the country which is engaged in the medium-high voltage power quality control. It has been widely used in rail transit, new energy, industrial and mining enterprises, power system, and other important areas of the national economy , play an important role in improving the power quality, saving energy and reducing consumption ,ensuring the safety of the power grids.



## ➔ Application field

### ➤ Rail Transit

#### ■ Electric railway

High power DC theelectric locomotive uses phase control rectification, it will generate 3, 5, 7th harmonic and lead to the low power factor, it has an adverse impact on the power supply system, such as traction substation load frequent fluctuation, load imbalance etc..



#### ■ The subway

The reactive power loss of cable and the fluctuation of power supply system reactive power are large, the frequent start and stop of locomotive will bring active and reactive power impact to the system, the power supply cable will release more capacitive reactive to power system at night and the power factor is decreased to 0.2.



### ➤ New Energy

The power is supplied by photovoltaic (pv) inverter ,wind power energy storage inverter and distributed grid-connected, the output power changes with light and wind speed. So it needs to stabilize voltage, filter harmonic, compensate reactive power and so on.



### ➤ Ports, Mines

Load characteristics of large hoist changes quickly and frequently, motor starting current is large, it can reach the maximum instantaneously and generate a large number of reactive power. When the hoist is not working, it is near no-load, DC speed regulation rectifier generate not only reactive power but also lots of harmonics.



### ➤ Automobile production line

The power of transmission device, electric welding, painting and other devices is generally supplied by 6 pulse or 12 pulse rectifier , it will generate 5, 7, 11, 13, 23, 25th harmonic and cause grid voltage fluctuation.



## Nonferrous Metallurgy

### Mills

AC drive or DC drive mills will cause reactive power impact and voltage fluctuation, at the same time it will generate 5, 7, 11, 13th and other higher harmonic.



### Arc furnace

It will produce arc cut and short circuit in melting period, which causes three-phase current imbalance, voltage flicker, low power factor, reactive and active current changed dramatically, and also generates 2~7th harmonic, seriously affect the power quality of the power grid.



### Electrolyzer

The power is supplied by rectifier transformer, the working current is very large, the rectifier will generate 5, 7, 11, 13th and other higher harmonic, it will influence the power quality.



## Drilling Platform

The power is generally supplied by 6 pulse rectifier, with a large number of 5th, 7th, 11th, 13th harmonics, which causes system current increased, low motor efficiency and large generator input.



## Buildings

Large shopping malls, airports, communications, stations, residential buildings, which use a large number of fluorescent lamps, projection lights, computers, elevators and other nonlinear loads, will generate harmonic and reactive power, and cause the serious voltage distortion.



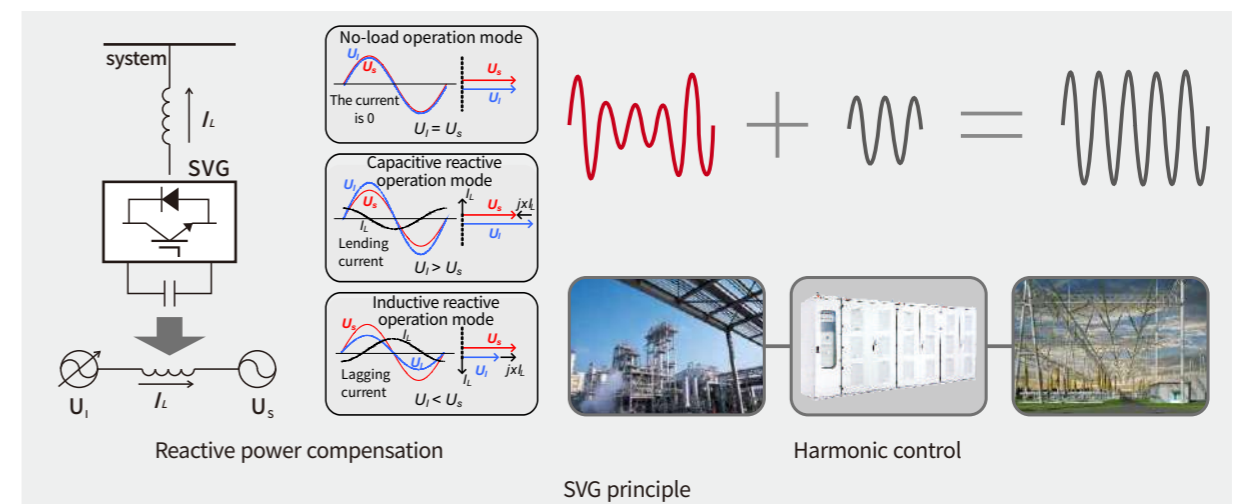
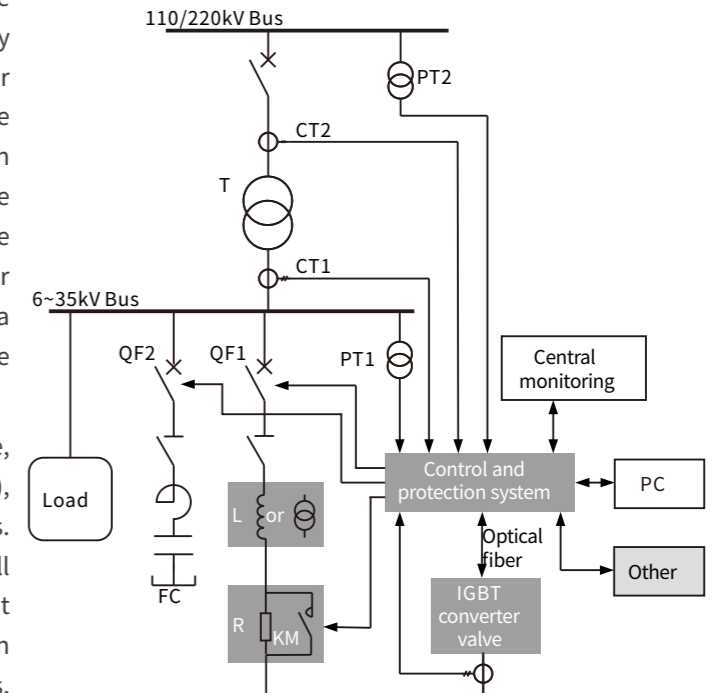
## Products Introduction

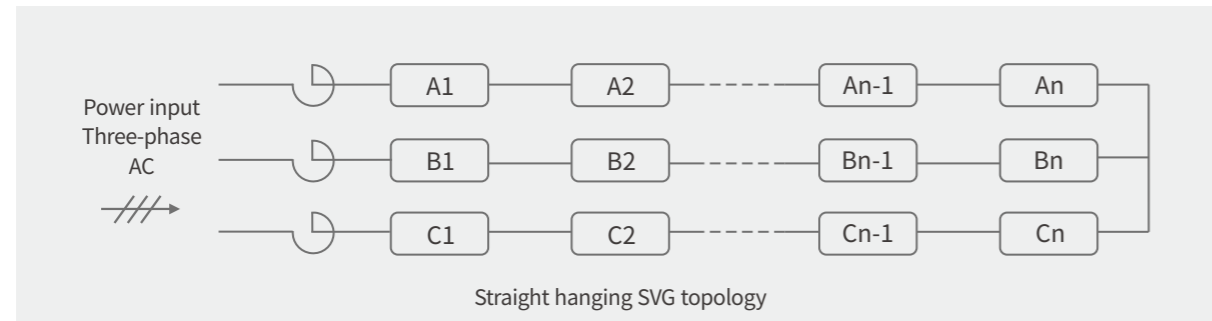
### Static Var Generator (SVG)

#### Product Introduction

SVG, as a new generation of dynamic reactive power compensation products, is the representative of the latest technology application in the field of reactive power compensation. The core of SVG is the voltage source inverter, connected to the grid through reactor or transformer. By regulating the phase and amplitude of the converter AC side output voltage can make converter absorbs or generates the required reactive power. As a result, SVG can realize dynamic reactive power compensation.

Main circuit consists of switch, starting device, connecting reactor (connecting transformer), IGBT converter valve and other components. With its advantages of fast response, small area, wide compensation range, good output characteristic, SVG has been widely applied in power grid, rail transit, new energy, mines, ports, nonferrous metallurgy, petrochemical and other fields. It can effectively improve the power quality of transmission and distribution networks.





### Technical Characteristics

- Self-excited start is used, start fast and no impulse current, it can quickly compensate the impact load;
- Adopt PWM technology, multi-level technology and multiplex technology, generate low harmonic, can control the load harmonic, realize the active filter function;
- Multiple compensation control functions can be realized: reactive power compensation; power factor control; voltage control; harmonic control, three-phase unbalance control etc.;
- The reactive power can be continuously regulated from inductive to capacitive, with fixed capacitor can active continuous compensation for any range;
- Using vehicle converter module technology, has the successful application experience, high reliability;
- Due to the modular design, power modules can be interchanged;
- Low inductance busbar based on proprietary technology can optimize component connection, reduce the device turn off overvoltage, improve the voltage safety margin;
- Adopts double DSP + CPLD + FPGA control platform, and realize photoelectric isolation by using optical fiber connection to the power unit, adopts advanced instantaneous reactive current detection technology and PWM control technology, to provide the best energy for equipment.



### Product Type Spectrum

➢ 0.4kV/0.69kV SVG size

Rated capacity (kVar)	Unit size (mm)			Note
	Width(W)	Depth (D)	Height (H)	
100	800	1000	2200	Reactor is set in starting cabinet
200	800	1000	2200	
300	800	1000	2200	
400	800	1000	2200	
500	800	1000	2200	
750	1600	1000	2200	

➢ 6kV SVG size

Rated capacity (kVar)	Unit size (mm)			Cabinet type	Note
	Width(W)	Depth (D)	Height (H)		
500	2400	1600	2200	6kV-MINI	Reactor is set in starting cabinet
900	2400	1600	2200	6kV-MINI	
1000	5100(4400)	1200	2200	6kV-A	Reactor is set in starting cabinet (set outside)
1500	5100(4400)	1200	2200	6kV-A	
2000	5100(4400)	1200	2200	6kV-A	
2500	5100(4400)	1200	2200	6kV-B	
2500	5100(4400)	1200	2200	6kV-B	
3000	5200(4400)	1400	2200	6kV-C	
3500	5200(4400)	1400	2200	6kV-C	Reactor is set outside
4000	5200(4400)	1400	2200	6kV-C	
4500	4600	1600	2300	6kV-D	
5000	4600	1600	2300	6kV-D	
6000	4600	1600	2300	6kV-D	
7000	4600	1600	2300	6kV-D	
9000	4600	2000	2400	6kV-E	

Note: The above products do not contain the height of cooling fan. If customer need non-standard SVG products, we can customize it according to the requirements.

➤ 10kV SVG size

Rated capacity (kVar)	Unit size (mm)			Cabinet type	Note
	Width(W)	Depth (D)	Height (H)		
500	2800	1600	2200	10kV-MINI	Reactor is set in starting cabinet
1000	2800	1600	2200	10kV-MINI	
1500	2800	1600	2200	10kV-MINI	
2000	6600(5900)	1200	2200	10kV-A	Reactor is set in starting cabinet (set outside)
2500	6600(5900)	1200	2200	10kV-A	
3000	6600(5900)	1200	2200	10kV-A	
3500	6600(5900)	1200	2200	10kV-B	
4000	6600(5900)	1200	2200	10kV-B	
4500	6600(5900)	1200	2200	10kV-B	
5000	6600(5900)	1200	2200	10kV-B	
5500	6700(5900)	1400	2200	10kV-C	
6000	6700(5900)	1400	2200	10kV-C	
6500	6700(5900)	1400	2200	10kV-C	
7000	6100	1600	2300	10kV-D	Reactor is set outside
8000	6100	1600	2300	10kV-D	
9000	6100	1600	2300	10kV-D	
10000	6100	1600	2300	10kV-D	
12000	6100	1600	2300	10kV-D	
15000	6100	2000	2400	10kV-E	

Note: The above products do not contain the height of cooling fan. If customer need non-standard SVG products, we can customize it according to the requirements.

➤ 35kV straight hanging SVG size

Rated capacity (kVar)	Single phase unit size (mm)			Cabinet type	Note
	Width(W)	Depth (D)	Height (H)		
2500	2000	1400	3300	35kV-MINI	Single phase unit size
4000	2000	1400	3300	35kV-MINI	
5500	2000	1400	3300	35kV-MINI	
8000	3550	1600	3500	335kV-A	
10000	3550	1600	3500	35kV-A	
12000	3550	1600	3500	35kV-B	
14000	3550	1600	3500	35kV-B	
17000	3550	1600	3500	35kV-B	
22000	3550	1600	3500	35kV-C	
28000	5350	1600	3500	35kV-D	
33000	5350	1600	3500	35kV-D	
42000	5350	1600	3600	35kV-D	
51000	5350	2000	3600	35kV-E	

Note: The above products do not contain the height of the cooling fan, the size is single phase unit size. If customer need non-standard SVG products or other SVG within 100Mvar capacity, we can customize it according to the requirements.

➤ 35kV step-down to 6kV/10kV cascaded NSVG size

Note: The capacity of SVG is less than 9000kVar, recommended to use isolation transformer step-down to 6kV/10kV.





## Technical Parameters

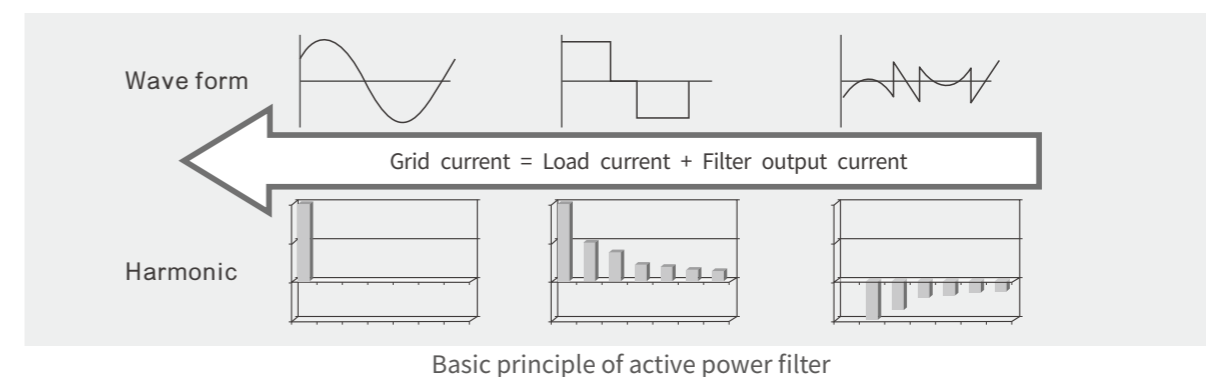
Electrical characteristics	
Standard capacity	0~100Mvar
Standard voltage	0.4kV、0.69kV、1.14kV、3kV、6kV、10kV、27.5kV、35kV (Can be customized according to user requirements)
Frequency	50Hz
Allow power fluctuations	±10%
Range of reactive power regulation	The reactive power can be continuously regulated from inductive to capacitive.
Response time	≤5ms
Average loss	≤0.8%
Overload capacity	110% 1min,120% 30s (Can be customized according to user requirements)
Control mode	
Control (auxiliary) power supply	DC220V、AC220V、AC380V
Control function	Constant power factor control, constant reactive power control, constant voltage control, harmonic control
Control mode	Direct control /AVC control
Controller	DSP+FPGA+CPLD
Main circuit protection	Quick break, over current, over voltage, under voltage, etc
Converter protection	IGBT component fault protection, DC voltage over voltage (under voltage) protection, output overload protection, power failure protection, module overheat protection, etc.
Communication	RS232/485 interface, Modbus protocol
Cabinet structure	
Cabinet protection level	IP 21, or according to user needs
Cabinet color	RAL7035 (can be customized according to user requirements, the user provide color code)
Cooling mode	Forced air cooling/water coolin
Installation method	Indoor cabinet type/ indoor frame type / outdoor box type, optional import line
Environmental conditions	
Working temperature	-10°C—40°C (Special environmental conditions can be customized)
Relative humidity	≤95% (20°C without dew)
Altitude	≤2000m, When > 2000m, corrected according to the actual altitude.
Pollution level	III级
Setting place	Indoor, no corrosive gas, dust, fire and detonating gas
Implementation standards	GB/T 3859.3-1993, GB 10229-88, GB 1094.11-2007, DL/T672-1999

## Active Power Filter(APF)

### Product Introduction

With the widely application of non-linear load, the harmonic pollution in the power grid is forming a potential threaten to the safety, stability, commercial operation of electric system and it is publicly known as one of the greatest harms. APF is a new kind of power electronic device restraining harmonics and compensating reactive power, which can compensate harmonic with the amplitude and frequency varying and varying reactive power, its application can overcome LC filter and other traditional harmonic suppression and reactive power compensation methods.

The basic principle of active power filter as shown below: detects the voltage and current signals of the compensated object, obtain the compensation current command signal through the command current calculating circuit, the signal is amplified by the compensation current generating circuit, and then the compensation current is obtained, which offset the harmonic and reactive current in the load, eventually get the expected supply current.



The high- low voltage series active power filter developed by our company has many advantages, such as environmental protection, energy saving, multi-functions, easy-operation, good result in harmonic treatment, strong real-time characteristic etc. It is widely applied in power systems, ports, mines, chemical, rail transit and other fields, it can effectively improve the distribution quality of power grid.

### Technical Characteristics

- Using internationally famous brands, technology mature IGBT component;
- Full digital control based on double DSP+FPGA, adopts vector filtering technology, can filter 2 to 50 times, or choose to filter out specific harmonics;
- Multiple compensation functions can be realized: harmonic compensation, reactive power compensation, unbalanced compensation etc.; the user can choose the compensation functions;
- It has perfect function of protection and fault diagnosis, including overload, over voltage, under voltage, over current, over heat, over voltage, and so on;
- Adopts modular design, good scalability, several sets can be used together in parallel, APF can also be used with passive filter, easy maintenance;
- Friendly man-machine interface, can provide the complete field information, the operation is simple and convenient, the daily maintenance workload is small.

### Technical Parameters

Electrical Characteristic	
Rated voltage	0.4 kV~35 kV
Working frequency	50Hz
Effective filtering capability of single unit	0.4kV/0.69kV:50A/60A/100A/150A 3kV~35kV:45A/70A/90A/130A/160A/190A/235A/280A
Filtering range	2~50次
Harmonic degree	Can be set separately for each harmonic
Harmonic capacity	≥96%
Reactive power compensation	Mode optional, automatic capacity control
Response time	5ms
Power loss	<2.5%,rated output capacity
Overload capacity	110% 1min,120% 30s (can be customized according to user requirements)
Multiple operation mode	Parallel operation
Control Features	
Controller	Full digital platform based on double DSP+CPLD+FPGA
Control algorithm	Frequency domain filtering vector compensation algorithm with adaptive capacity
Communication function	RS485/RS232 , Modbus protocol
Control connection	Optical fiber
Structure Features	
Protection level	IP21, or according to user requirements
Colour	RAL7035, can be required to provide other colors
Cooling mode	Forced air cooling
Installation method	Indoor cabinet / indoor frame type / outdoor box type, optional import line
Environment condition	
Working temperature	-10°C—40°C (special environmental conditions can be customized)
Relative humidity	≤95% (20°C without dew)
Altitude	≤2000m,When > 2000m, corrected according to the actual altitude
Pollution level	III级
Setting place	Indoor, no corrosive gas, dust ,fire and detonating gas

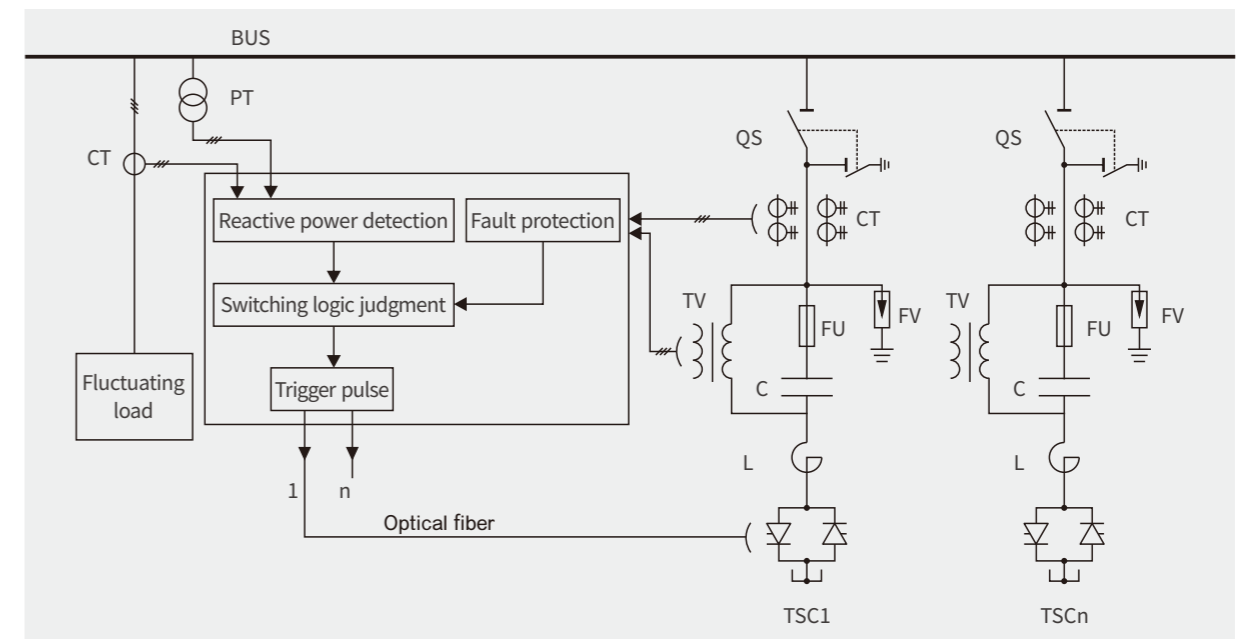
### TSC Dynamic Reactive Power Compensation Device(SVC)

#### Product Introduction

TSC dynamic reactive power compensation device employs high-power thyristor to form a nontouched switch, which can switch the multilevel capacitor unit rapidly and without a transition. It has overcome the defects of heavy impact, burn-down of the touch point of switch and damage to the capacitor due to that the traditional reactive power compensation device utilizes mechanical switch, and has realized the non-impact, non-flow and non-transition process of switch of capacitor unit. The controller follows up the power factors of the load of measurement in real time, compare them with the pre-set value and dynamically control the switches of the capacitors with different number of units to ensure that the power factors can always meet the set requirements.

TSC can bring about good effects of automatic compensation for various loads. The speed of dynamic response is fast (less than 15ms) while the effect of energy saving and reduction of consumption is quite obvious. It has the functions of lowering losses, stabilizing load voltage and increasing the load capacity of the transformer etc.

The main circuit of TSC consists of switch, arrester, current inductor, capacitor, discharge coil, reactor, thyristor and valves. It is widely applied in power transmission and distribution systems, ports, mines, smelting, mining enterprises and other industries.



### Technical Characteristics

- Full digital controller, high control precision, stable and reliable, with serial communication function;
- Intelligent optimizing switching method, automatically exit when external fault or power off, and operation recovers automatically after transmission;
- Adopts the way of photoelectrical trigger. The system has excellent capability of anti-interference; Good synchronization of trigger and reliable operation;
- Over-voltage zero-switching, over-current zero-switching, realize non impact, non surge ,non switching during transition, and the capacity life is prolonged in maximum;
- Realize three-phase or split phase dynamic compensation, applicable to asymmetric load or impact load;
- Control signal using optical fiber transmission, main circuit getting electricity, high and low voltage isolation, system is simple, stable and reliable;
- Capacitor specific protection, electronic switch fault on-line monitoring, real-time protection.

### Product Type Spectrum

Voltage level	Single-set capacity (kVar)	Valve size (width * depth* height) mm	Capacitance cabinet size (width * depth* height)mm
6~10kV	150~850	1400*1600*2500	1400*1600*2500
6~10kV	850~3000	1600*1600*2500	1600*1600*2500
below 1kV	25~500	800*1600*2300	800*1600*2300

Note: The above list shows mechanical dimensions for general altitude requirements, when the altitude > 2500 meters, please contact us.

### Technical Parameters

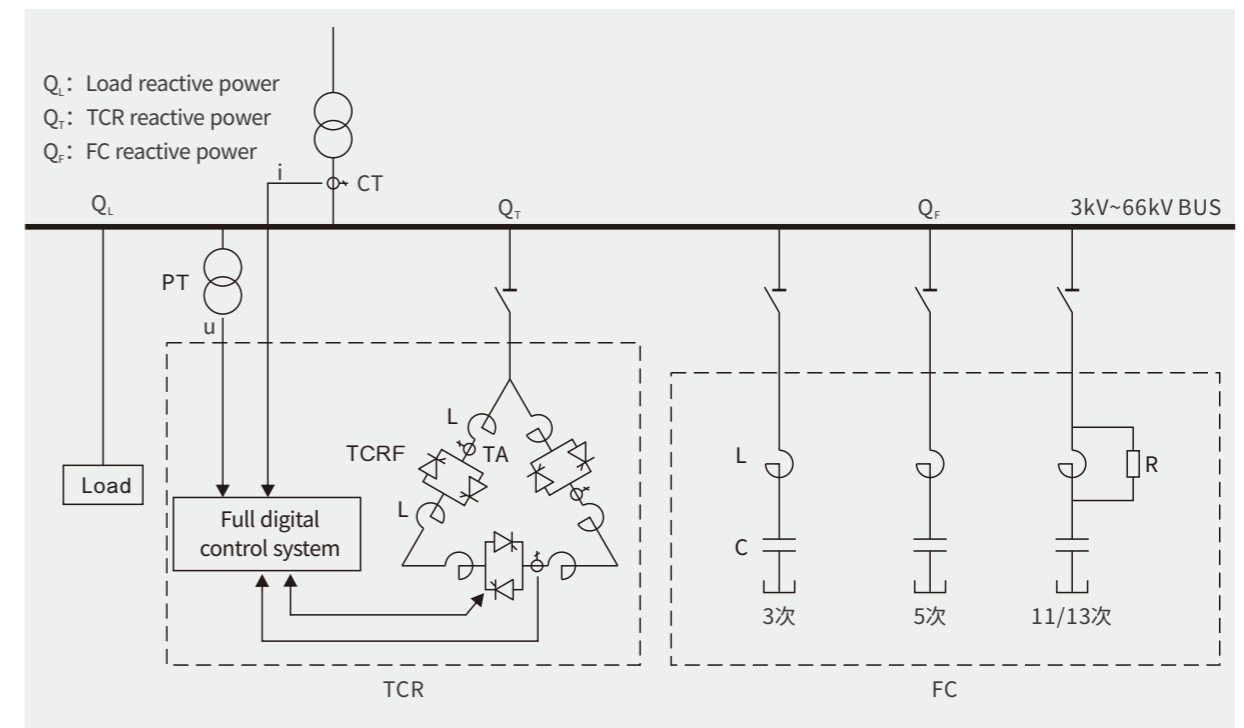
Rated voltage	0.4kV~10kV
Capacity	Single branch ≤500 kvar (below 1 kV), several sets can be used together. Single branch ≤3000 kvar (6-10 kV), several sets can be used together.
Overload capacity	Over voltage: 1.2 times,1min; Over current: 1.1 times,1min;1.2 times,30s
Response time	≤15ms
Grade of switch	1-12
Trigger mode	Photo-electricity trigger method
Cooling mode	Air
Efficiency	>99%

### TCR Dynamic Reactive Power Compensation Device (SVC)

#### Product Introduction

TCR dynamic reactive power compensation device uses the thyristor in opposite shunt-wound to connect with the reactor in series, control the current of the reactor through phaseshift control of the thyristor, automatically adjust inductive reactive power, suppress voltage fluctuation with FC, improve the power factors and arrest the harmonic of the power grid. It boasts the features of stepless adjustment, no impact and high reliability etc. TCR controller gives a control angle according to system PCC point voltage  $u$  and current  $i$ . Applying to change the current of phase control reactor i.e. current of inductor and realize smooth modulation of reactive power. The variety of load reactive power ( $Q_L$ ) is balanced by the variable reactive power ( $Q_T$ ) from TCR, which can maintain the sum of both to be a constant. The constant sensitive reactive power is balanced by capacitive reactive power ( $Q_F$ ), i.e.  $Q_F=Q_L+Q_T$ , so that the power factor can be maintained nearby the setting value 0.95-0.99, and the voltage can be retained in the requiring range. For the asymmetry load, to realize the separated phases and three phase balance, eliminate negative sequence current with steinmets theory.

Main circuit consists of switch, arrester, current inductor, TCR valve group, phase control reactor and corner current inductor. It is widely applied in power transmission and distribution system, electric railway, ports, mines, smelting, mining enterprises and other industries.



### Technical Characteristics

- The whole set of the device has introduced the design and manufacture technology of thyristor valve of ABB;
- The body of the valve is designed in horizontal structure with compact equipments. It occupies small area of land and needs small amount of work for maintenance;
- The valve unit of thyristor adopts the way of photoelectrical trigger;
  - The system has excellent capability of anti-interference and reliable protection;
  - Each element real-time monitoring, high safety and reliability;
  - Good trigger synchronicity, reliable operation;
  - Obtaining electricity through the main circuit, the system is simple and reliable;
- The thyristor employs compulsory trigger protection (BOD) with the three protective lines of hardware, software and BOD;
- Possess complete natural cooling, heat pipe cooling and water cooling systems;
- Control protection device applying integrative single cabinet structure, modularization design;
- Full-digital controller based on DSP, fast dynamic response, high control precision, strong programme function, multi-monitors and protection functions, stable and reliable; has series communication, realize no-man on duty;
- Provide friendly man-machine interface, displaying various system operating data, real-time monitor various thyristor state;
- Can obtain various preferential grade customer setting, parameter setting, fault record, history curves query.
- Flexible control method, realize three phase voltage, reactive individual control, solve three phase unbalanced problem;
- Past EMC test of European Standard and has strong anti-interfere;
- Ex-factory tests of full voltage and full current to reduce the rate of on-site failure to the lowest and cycle period of on-site trial run to the shortest.



### Product Type Spectrum

Rated voltage	Capacity (kvar)	Structure	Cooling mode	Single set quantity (unit)	Valve size (width*depth*height)mm
6kV	≤4000	Cabinet type	Profile+Air	1 unit / three-phase	1400*1600*2500
	4000~10000	Frame type	Heatpipe+Air	1 unit / phase	1400*1200*1750
	>11000	Frame type	Water	1 unit / phase	1000*1200*1750
10kV	≤6500	Cabinet type	Profile+Air	1 unit / phase	2000*700*1450
	6500~30000	Frame type	Heatpipe+Air	1 unit / phase	1700*1200*1705
	>30000	Frame type	Water	1 unit / phase	1000*1200*2500
27.5kV	≤6000	Cabinet type	Profile+Air	3 unit / three- phase	2000*700*1450
	6000~27000	Frame type	Heatpipe+Air	3 unit / three- phase	1700*1200*1705
	>27000	Frame type	Water	1 unit / phase	1300*1400*3000
35kV	≤23000	Cabinet type	Profile+Air	3 unit / three- phase	2000*700*1450
	23000~60000	Frame type	Heatpipe+Air	3 unit / three- phase	1700*1200*1705
	>60000	Frame type	Water	1 unit / phase	1700*1200*1680

### TCR Valve Technical Parameters

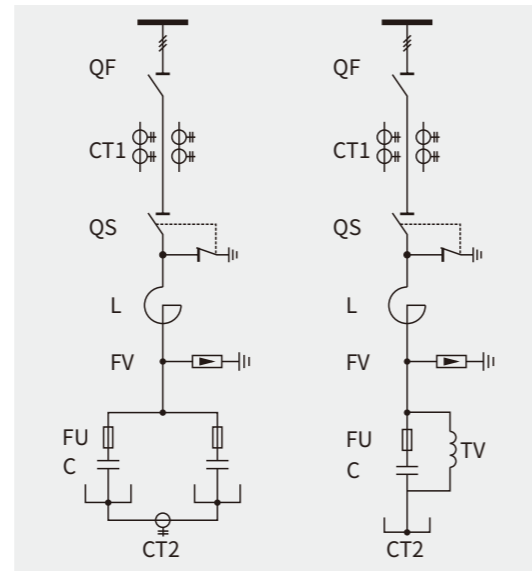
Rated voltage	3kV~66kV
Number of phase	Single-phase/three-phase
Capacity	0~200Mvar
Response time	≤20ms
Overload capability	Overvoltage: 1.2 times, 1min; Over current: 1.1 times, 1min; 1.2 times, 30s
Trigger mode/ Obtaining electricity mode	Photo-electric trigger, obtain the power supply form high voltage side (the introduction of ABB Technology)
Cooling mode	Profile (≤200A) /Heatpipe (≤900A) /Water (≥900A)
Efficiency	>98.5%

## ➤ Static Reactive Power Compensation Device (FC)

### ■ Product Introduction

Static reactive power compensation device (FC) employs mechanical switch of breaker, generally with the filtering branches of 5, 7, 11, and 13 times etc. It has the function of filtering harmonic waves and reactive power compensation as well. The device is easy to be assembled and is simple in structure and stable and reliable in performance.

The main circuit consists of switch, lightning arrester, current inductor, capacitor, discharge coil and reactor etc. It is widely applied in the industry of aluminum such as electrolytic aluminum and aluminum oxide etc., transformer and contributing substations of electrical, industrial and mining enterprises, as well as ports, mines, chemical and smelting etc..



### ■ Technical Parameters

Rated voltage	0.4kV~132kV
Capacity	0~200Mvar
Cooling mode	Natural
Structure	Indoor cabinet type / frame type, outdoor frame type



## ➔ Application Performance

### ➤ Part of the performance in recent years

#### Rail Transit

- Chengdou metro Line 1 and 2 SVG project
- Kunming metro line 3, first-period, and 6 SVG project
- Changsha metro line 1 SVG project
- Wuhan metro line 6 SVG project
- Yu Meng railway line, Tiande, Haigong railway line, Hengnan railway line, Hukun railway line, Yiwan railway line, Wuhan North substation, Jiayuguan substation, Baocheng railway line, Taizhongyin railway line, Luo Zhang, Lianyuan substation, Wulandabusen substation, Cangshan substation, Dazhun railway line, Shenshuo railway line, Yanqing substation SVC project
- ...

#### New Energy

- Daxiongshan wind farm, Baoliangshan wind farm, Yaoposhan wind farm, Zijinshan wind farm SVG projects
- Rucheng Donggangling wind farm, Guanjiazui wind farm, Niupaishan wind farm, Longshan wind farm, Daqingshan wind farm, Jiepai wind farm, Yanzishan wind farm SVG projects
- Datang Songmenshan wind farm, Huanyuan Mima wind farm, Jingtai Qianfeng and Shatangzi wind farm SVG projects
- Huaneng Guizhou Jiucaiping wind farm, Jinzhou Laolongkou wind farm SVG projects
- Guotou Tulufan Xiaocaohu wind farm, Dongchuanyeniu wind farm SVG projects
- ...

#### Ports

- Huanghua port SVC&SVG project
- Caofeidian Port SVC&SVG project
- Zhoushan port SVC project
- ...

#### Mines

- Pingzhuang coal SVG project
- Shanxi Hongyuan coal SVG project
- Shanxi Yangcheng Daxi coal SVG project
- Shanxi Gujiaoxinfeng coal SVG project
- Shuangyashan coal SVC&SVG project
- ...

#### Nonferrous Metal

- Guangxi Xiangji alumina FC project
- Guangxi Pingguo alumina FC project
- Guangxi Nanping alumina FC project
- Guangxi Huayin alumina FC project
- Huadong alumina FC project
- Henan Shuangqiu alumina FC project
- Xinjiang Shenhua alumina FC project
- Xinjiang Changji Yuhong alumina FC project
- Qinghai Huanghexinye alumina FC project
- Chongqing Tiantai alumina FC project
- Shandong Jiutai energy SVC&SVG project
- Neimeng Zijing zinc industry SVG project
- Nanfen Bengang mining industry SVG project
- Zhongjinling Nanfankou lead zinc ore SVC project
- ...

#### Steel

- Zhongyehuatian SVG project
- Jinsheng steel SVG project
- Yunnan Yuxi Xianfu steel SVG project
- Hubei Xinyegang Yangchun steel SVC project
- Lengshuijiang Boda steel SVC project
- Zhanjiang Baogang steel SVC project
- 430 vehicle plant SVC project
- Tongling vehicle plant SVC project
- Anhui Magang FC project
- ...

## Typical Projects

- ✓ **Typical Application 1**  
**Kunming Metro Line 6 SVG Project**  
Voltage: 35kV  
Compensation mode: SVG  
Capacity: 3600kVar  
Effect: average power factor is over 0.98, and it has eliminated the reactive power releasing.



- ✓ **Typical Application 2**  
**Huanghua Port SVG Project**  
Voltage: 10kV  
Compensation mode: SVG  
Capacity: 1800kVar  
Effect: after the device was put into operation, power factor is over 0.98, harmonic is reduced by 70%, the parameters of the system are excellent, and the power quality is obviously improved.



- ✓ **Typical Application 3**  
**Pingzhuang Coal SVG Project**  
Voltage: 35kV/25kV/10kV/6 kV  
Compensation mode: SVG+FC  
Capacity: 3000~8000kVar  
Effect: it has solved the problem of reactive power and harmonics of hoist at the same time, power factor is over 0.95, and bus voltage harmonics has meet the requirement of national standards.



- ✓ **Typical Application 4**  
**Jinsheng Steel SVG Project**  
Voltage: 10kV  
Compensation mode: SVG+FC  
Capacity: 10000kVar  
Effect: after the device was put into operation, the power factor is improved and above 0.95, voltage fluctuations and harmonic content is better than the national standard requirements.



- ✓ **Typical Application 5**  
**Rucheng Donggangling Wind SVG Project**  
Voltage: 35kV  
Compensation mode: SVG  
Capacity: 5000kVar  
Effect : meet wind farm reactive power-voltage regulation requirements.



## Testing and Production

### Advanced Testing Equipments

**The largest and most perfect electromagnetic compatibility laboratory in the industry field**

EMI and anti-interference tests are done for semiconductor modules, electronic products and other equipments in the frequency rang of 9kHz--1GHz, from the two aspectsives of transmission and radiation.

Our experimental center is the joint experimental center of Germany Rhine TUV, CE, Golden-Sun and other certification agencies.



**The largest conversion technique integrated test lab in the industry and first-class in the world**

This The laboratory is recognized and accredited by the National Accreditation Committee of the Chinese National Laboratory in 2000, and it suitable for rated voltage of 10kV, 6 kV and below. Type test, routine test and research test can be done for load power test and traction converter according to IEC and relevant standards.



**The largest national traction electrical equipment testing and detecting stations in the industry**

This laboratory is a research and test base for our company, and it can provide test site for different levels of power needs, from small power to high power. Our lab has two sets of small power test system and a set of medium power test system. Both of traction test and braking test can be carried out in this laboratory. The test data can be sampled, analyzed, processed, printed and draw to realize the automation of testing.



### Autonomous Supply of Power Electronics (basic) Core Components

The power electronics (basic) industry of CRRC Zhuzhou Institute includes three major product lines: power semiconductor devices, sensors and power connectors, covering thyristor, IGCT, IGBT, SiC, power components. Its industrial scale is the first in china and industry chain is complete that including chip - module - power unit – equipment.

The products are widely used in wind power converters, HVDC transmission, traction converter, photovoltaic inverter, ship drive inverter, electric cars inverter, rolling mill drive inverter and the power transmission and compensation device of smart grid.



4 inches and below bipolar device production line



6 inches and below bipolar device production line



8 inches IGBT chip line



IGBT module automatic packaging line



**Lincoln base in the UK**  
6 inches and below bipolar devices and six inches IGBT production line



**Zhuzhou base in China**  
6 inches SiC pilot line

### Strong Production Capacity

Our company has thirty thousand square meters of modern isothermal plant and two hundred thousand square meters of modern isothermal plant.

Electronic installation, cabinets and accessories processing, whole assembly, inspection and test, production line layout technology, tooling design and other core industrial techniques have been formed, meeting the requirements of railway products industrial products.

By means of information technology platform, an efficient process management system has been adopted to efficiently serve the specialized manufacturing base of electronic assembly, whole assembly, and test.

We have electronic assembly production line, monitoring computer production line, chassis production line, cabinet production line, screen production line, power supply cabinet production line, silicon unit production line, power module production line, IGBT converter production line, GTO converter production line, wire harness production line, overhaul production line and so on. These production lines are efficient, orderly, and clearly divided. What's more, the production processline is controlled to make sure eet customers's requirements are met as soon as possible.

In the normal state, it has an annual production capacity of 2.4 million 6U plug-in, 250 sets of auxiliary converter cabinets, 500 sets of traction converter cabinets, 500 sets of industry converter cabinets, 660 sets of ATP devices, 2000 sets of monitoring devices, 200 sets of network systems, 750 sets of rectifier cabinets and 800 sets of control cabinets.

All the working procedures are equipped with inspection and control means. We continuously improve the quality system construction, actively promote continuous improvement of staff ffrom bottom to top by employee, and enhance product reliability through the development of test and detection means at the same time.

### GreenShadeservice

We are customer focused, to meet customer needs as the starting point and destination, to provide customers with all-weather 365 days and 24 hours on-site service, and to provide customers with a full range of services and technical support.

- 24 Hours On-site Service
- Preventive Maintenance
- Product Modification
- Training
- Spare Parts After-sales Service
- Upgrading
- Maintenance and Replacement
- Professional Services
- After-sales Service and Technical Support



## ➔ Qualification Certificates



RPC type test report



SVG type test report



Filter compensation device inspection report



SVC inspection report



National key new products-SVG



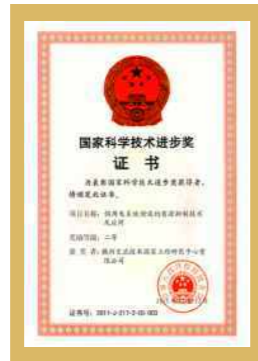
National key new products-SVC



Power quality control software product registration



Dynamic reactive power compensation system software copyright certificate



Harmonic suppression technology and application of power supply system- The second prize of National Scientific and Technological Progress Award



Key technology and application of large enterprise energy conservation- The second prize of National Scientific and Technological Progress Award



Metering authentication certificate of test center of National Engineering Research Center



A hybrid power quality control method- National patent medal



National outstanding unit of enterprise culture



Achievements industrialization base of National High Technology Research and Development Plan



National advanced unit of patent work



National advanced unit of following contract and enhancing credit



National Engineering Center of Converters



Lab ratification certificate of test center of National Engineering Research Center



ISO 9001:2000 authentication certificate



Post-doctoral scientific research workstation



AAA-level quality certificate of Hunan



National advanced unit of spiritual civilization construction work