POWER DISTRIBUTION SOLUTION PROVIDER

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APFC
series active power filter

The main circuit of the active power filter (APFC) is an IGBT power converter. It adopts the detection technology based on the instantaneous reactive power theory, automatically tracks the harmonic changes of the power grid, and has high controllability and rapid response. It overcomes the shortcomings of traditional passive filters, such as poor filtering effect, easy resonance, and only being able to compensate for fixed harmonics. It can achieve good filtering and compensation effects for various fast transient impulse loads.

The APFC series active power filters adopt military-grade control chips, featuring extremely strong computing and anti-interference capabilities. They can achieve centralized control of multiple active power filters in parallel by a single controller. They are equipped with an adaptive
current average value control algorithm and combined with the LCL topology structure. It overcomes the shortcomings of traditional hysteresis current control, such as wide output spectrum range, difficult filtering and high-frequency harmonics interfering with the power grid due to the change of switching frequency.



Model definition and description

APFC	–	100A	–	4	/	4L	–	B
1		2		3		4		5

1.Product Model: Active Power Filter

2.Module capacity: 30A, 50A, 75A, 100A, 150A ； Cabinet capacity: 200A, 250A, 300A, 350A, 400A, 450A, 500A, 600A

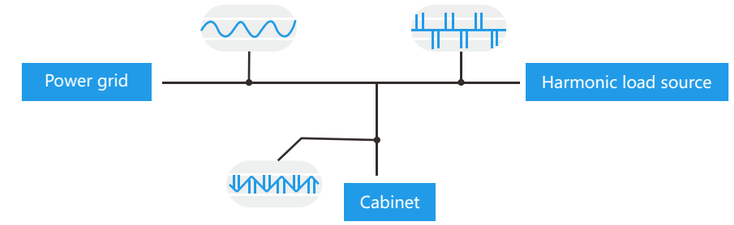
3.Rated voltage: 4: 400V 6: 690V

4.Wiring method: 3L: Three-phase three-wire system; 4L: Three-phase four-wire system

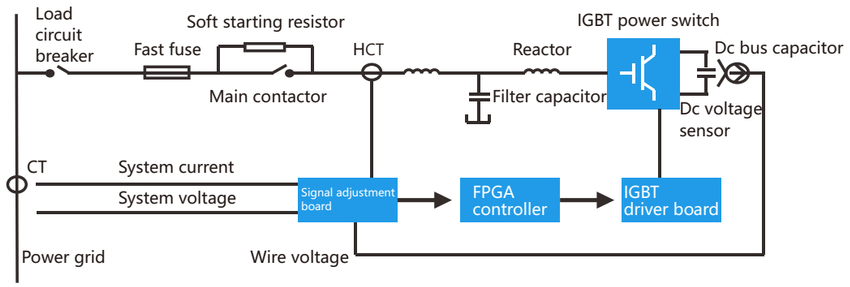
5.Structural forms: B: Drawer type, C: Wall-mounted type, G: Cabinet type

The principle of APFC harmonic control

- The APFC collects the current signal in real time through the external transformer CT, separates the harmonic part through the internal detection circuit, and generates a compensation current with the same magnitude and opposite phase as the system harmonic through the IGBT power converter to inject into the power grid, achieving the function of filtering and removing harmonics.



The internal working principle of APFC



○ Technical advantage

- **Modular and building-block expandable parallel structure for convenient capacity expansion.**
  The APFC active power filter adopts a modular expansion parallel structure: each electrical component in the main circuit is miniaturized and standardized, and the entire topology is encapsulated in a single module. The APFC module and the APFC cabinet are connected by dynamic and static connectors. When users expand their capacity, they push the APFC module into the APFC cabinet and plug in the CAN interface.

- **Convenient for maintenance and supports online maintenance.**
  The APFC active power filter adopts a modular design. The damage of any one electrical component will only affect the operation of the current module. The normal operation of other modules in the APFC cabinet will not cause the entire APFC to fail. During maintenance, simply remove the faulty APFC module from the cabinet and replace it with a new one.

- **High reliability and uniform humidity.**
  The APFC active power filter miniaturizes heat-generating components such as IGBTs in the inverter unit and filter inductors and damping resistors in the LCL filter, reducing power. Moreover, the heat-generating elements are evenly distributed in each filter module, ensuring uniform heat distribution. Electrical components are less likely to fail due to excessive humidity.

- **The control system is built purely with FPGA.**
  The control system of the APFC active power filter adopts the military-grade FPGA chip of the American Xilinx Company. The chip integrates 84 hardware DSP units internally to calculate the situation of flight. In addition, the anti-interference ability of FPGA is much higher than
  that of traditional DSP. Its capability is far greater than that of a single DSP. After burning the program, the entire FPGA chip is equivalent to a hardware circuit. There is no need to call the program, and no program will appear.

- **Data is transmitted between the controller and the APFC module via CAN.**
  The APFC active power filter controller and the power unit are connected by CAN. It features strong real-time performance, adopts a dual-wire serial communication mode, has a strong error detection capability, and can operate in a high-noise interference environment. A
  reliable error handling and error-checking mechanism ensures that the sent information can be automatically resent if it is damaged.

- **Low noise, with noise below 65db when operating at full load**
  The APFC active power filter uses soft magnetic materials. When current flows through the iron-silicon inductor, there is almost no sound. When the APFC is fully loaded, the noise is less than 65db.

- **Unique parallel operation mode and superior current sharing effect.**
  The APFC active power filter is paralleled. There is only one FPGA controller, and there is no precision deviation of voltage sampling resistors, microcurrent transformers, and current sampling resistors inside each APFC module. The APFC modules can evenly distribute the current well, and there is no circulating current.

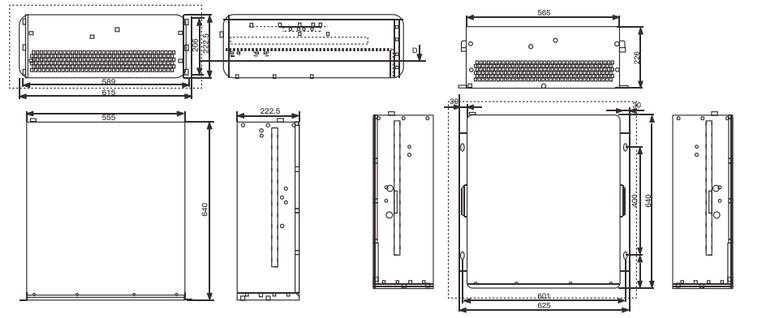
- **Under any load conditions, the compensated system current THD i<3%.**
  The Active Power Filter (APFC) ensures a system current THDi (Total Harmonic Distortion of current) of less than 3% after compensation under any load conditions. It operates with a switching frequency of 21.6 kHz on the inductor and compensates for harmonic orders from 2nd to 50th.

- **A control mode that combines open-loop control with closed-loop control.**
  The APFC active power filter combines the advantages of open-loop and closed-loop control: After the system current sampling is decomposed through FFT operation, the method of combining open-loop control and closed-loop control is adopted. The reactive power compensation APFC adopts open-loop control, which has a fast response speed. The harmonic compensation APFC adopts closed-loop control and has high compensation accuracy.

- **Good limiting ability.**
  The APFC active filter can limit the amplitude of single harmonics and can be used in conjunction with passive filters to control harmonics of the same order.

- **Three-level main current topology.**
  Under the same DC bus voltage, the impulse voltage (dv/dt) generated by the APFC active filter is half that of the first-generation APFC. The second-generation APFC reduces the switching stress and switching loss of each IGBT, making the IGBT more reliable.

○ Technical advantage



The external dimensions of the drawer-type module Wall-mounted module external dimensions

○ Technical characteristics

- It has a wide filtering range and is effective throughout the entire range from 2 to 50 times.
- Full compensation or designated compensation for 2 to 50 different harmonics;
- The response speed is fast. The full compensation response time is less than 300 μ s, and the specified secondary compensation response time is less than 10ms.
- Multi-functionality, simultaneously addressing multiple power quality issues, harmonic and reactive power compensation functions can be freely installed:
- It has neutral line filtering capability (limited to 4L type active power filter);
- The transformer is allowed to be installed on the power supply side or the load side, and users can freely choose according to the on-site conditions.
- Support the automatic current-limiting operation function of the system. Once the compensation current exceeds the compensation capacity, the system will automatically enter the current-limiting working mode.
- Automatically trace and compensate for the varying harmonic currents in the power grid, and the compensation performance is not affected by the system impedance.
- Perfect module parallel technology, supporting multiple units to operate in parallel:
- The perfect self-diagnosis technology upon startup keeps the system under full control.
- Photoelectric isolation is adopted between the strong current main circuit and the weak current control system, which is safe and reliable.
- Military-grade communication error code detection technology ensures the reliability and security of system communication.

Technical parameters

APFC	Three-phase three-wire	Three-phase four-wire
Rated compensation current	100A-600A	50A~600A
Input		
Working voltage (v)	400V(-20%~+15%),690(-20%~+15%)	400V(-20%~+15%)
Operating frequency (Hz)	50Hz/60Hz	50Hz/60Hz
Performance index		
Filtering ability	THDI<3%	THDI<3%
Filtering range	Eliminate harmonics from the 2nd to the 50th order.	Eliminate harmonics from the 2nd to the 50th order.
Instantaneous response time	<100us	<100us
Full response time	<10ms	<10ms
There is power loss.	<3%(rated)	<3%(rated)
Correct three-phase imbalance	have	have
Reactive power compensation.	Yes, the power factor can be set	Yes, the power factor can be set
Overload protection	Automatic current limiting at 100% rated output	Automatic current limiting at 100% rated output
Switching frequency	20KHz	20KHz
Display and Operation		
Display interface	7-inch Chinese color touch screen	7-inch Chinese color touch screen
Display status	Grid parameters such as current, voltage, power and harmonic distortion rate	Grid parameters such as current, voltage, power and harmonic distortion rate
Communication	Modbus,RS 485, TCP /IP Ethernet	Modbus,RS 485, TCP /IP Ethernet
Input and output dry nodes	5 output nodes and 4 input nodes (customizable by users)	5 output nodes and 4 input nodes (customizable by users)
Product configuration		
Single-machine operation	Ok.	Ok.
Shut down and run	Multiple units can be connected online	Multiple units can be connected online
Environmental conditions		
Ambient temperature	-10C~40℃	-10C~40℃
Storage environment	-40C~65℃	-40C~65℃
Relative humidity	Maximum temperature 95℃, no condensation	Maximum temperature 95℃, no condensation
Altitude	Less than 2,000 meters	Less than 2,000 meters

Product Features

- In the process of APFC design, our company closely follows the development trend of power electronic equipment, widely draws on the advantages of related equipment in various industries, and integrates these technical features to form a new generation of APFC. In terms of cost, performance, delivery speed, adaptability and scalability, it has certain advantages in the domestic industry.

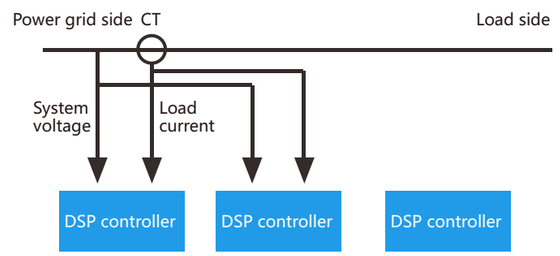
- **Modular pomelo drawer power module.**
  At present, there are two topological structures of active power filters on the market: one is the integrated design. The cabinet is composed of several single independent components, such as three IGBTs for each phase, three fans, three bakers, three lightning arresters, etc. It belongs to a relatively old-fashioned design. The disadvantage of this structure is that when one component fails, it will cause the entire machine to stop working, so its reliability is not high. Another type is modular design, which is the development direction of power electronic products. The cabinet is composed of multiple power modules, each of which is exactly the same and can operate independently. Multiple modules are connected in parallel to operate together. When any one module malfunctions, the other modules automatically share the load evenly and continue to operate normally.

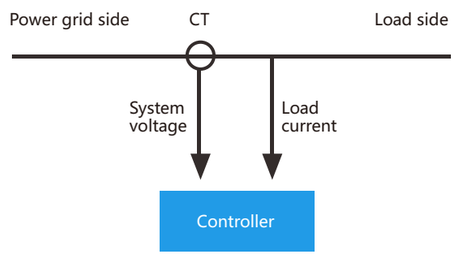
- **Powerful comprehensive power quality management function.**
  The device can simultaneously achieve the following functions. Users can select the priority and simultaneous implementation through the human-machine interface of the touch screen.

Active power filter				
Device current	22.5A	23.3A	21.6A	
System factors	0.593	0.674	0.651	The device is normal.
Power grid THDi	46.0%	48.0%	32.0%	
Status query				
About Settings		View the event		Click to shut down
Route 1	Route 2	Route 3	Route 4	Route 5	Route 6

- Active speed wave: Filters out harmonics within the 50th order. Voltage deviation: Bidirectional compensation for voltage rise and voltage drop. Fixed current: Emits any specified current. Users can observe all electrical parameters such as voltage, current, harmonics, active power, reactive power, power factor, and fault records in real time. It plays a role in power quality monitoring. Meanwhile, the working status, current temperature, fault records, etc. of each module of this machine can all be viewed in real time through the human-machine interface.

- **High-reliability parallel operation mode: Centralized control by the same controller, with no circulating current between modules.**
  APFC can achieve parallel connection of four devices and centralized control with only one controller, with each power module providing uniform current output. There is no circulating current between the modules, which improves the reliability of the device.





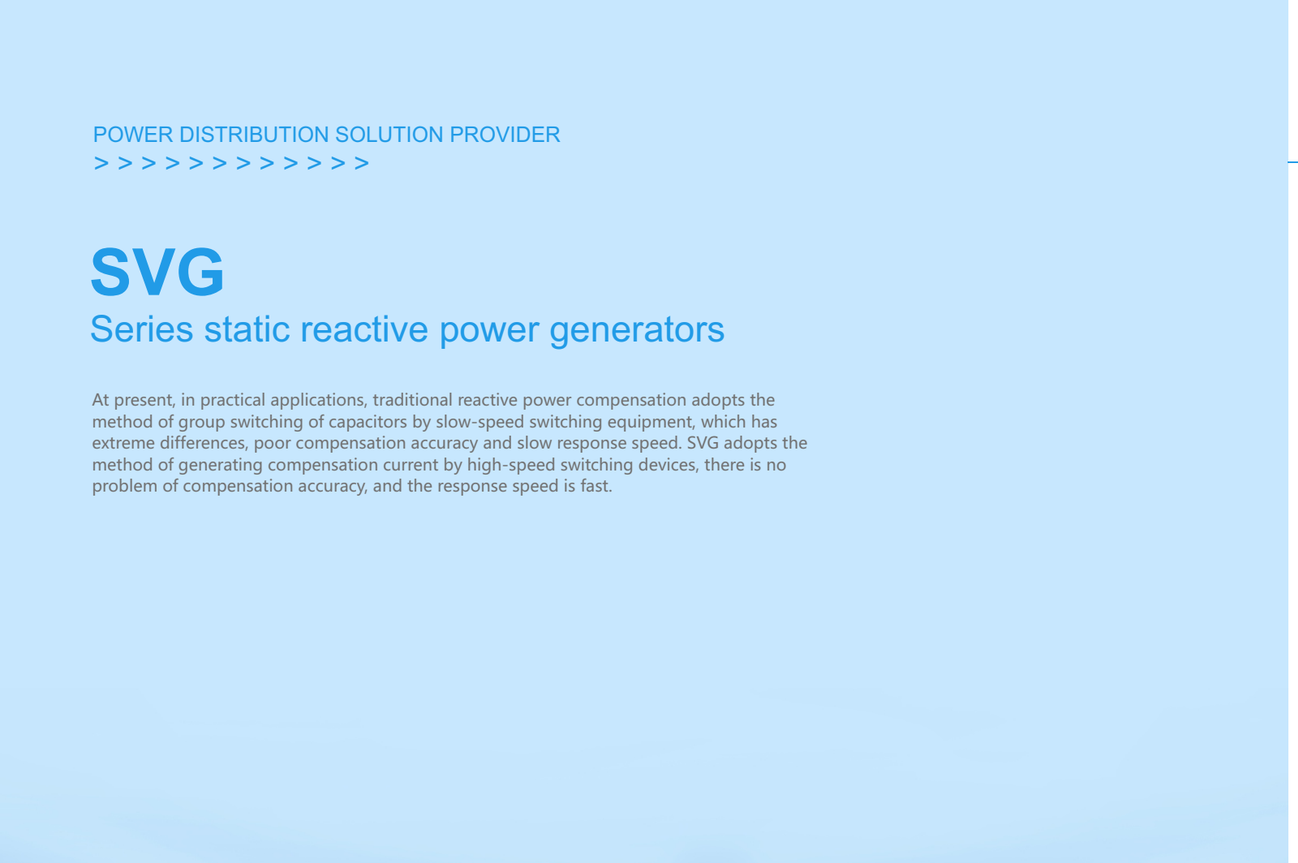
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SVG

Series static reactive power generators

At present, in practical applications, traditional reactive power compensation adopts the method of group switching of capacitors by slow-speed switching equipment, which has extreme differences, poor compensation accuracy and slow response speed. SVG adopts the method of generating compensation current by high-speed switching devices, there is no problem of compensation accuracy, and the response speed is fast.



Model definition and description

SVG	–	100A	–	4	/	4L	–	B
1		2		3		4		5

1.Product Model: Static Reactive Power Generator

2.Module capacity: 30Kvar, 50Kvar, 75Kvar, 100Kvar; Cabinet capacity: 200Kvar, 250Kvar, 300Kvar, 350Kvar, 400Kvar, 450Kvar, 500Kvar, 600Kvar

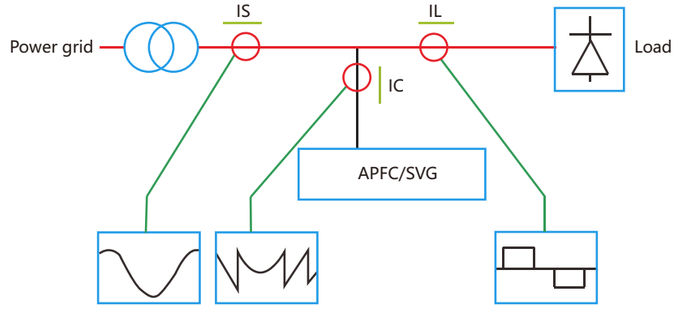
3.Rated voltage: 4:40V, 6:690V

4.Wiring method: 3L: Three-phase three-wire system; 4L: Three-phase four-wire system

5.Structural forms: B: Drawer type, C: Wall-mounted type, G: Cabinet type

Working principle

- SVG detects the grid current or load current in real time through the external transformer CT. The controller extracts the fundamental current and each harmonic current of the load through the fast Fourier transform. The active power, reactive power, negative sequence and other data are obtained by rotating the coordinates through dp. Then, the IGBT power converter generates data that is equal in magnitude and opposite in phase to the compensation target (harmonics, reactive power, unbalance) The compensation current is injected into the power grid to achieve the function of improving the power quality on the power grid side.



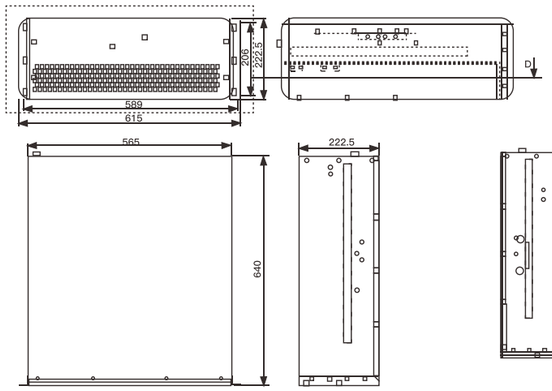
Compensation schematic diagram

The principle of SVG reactive power compensation

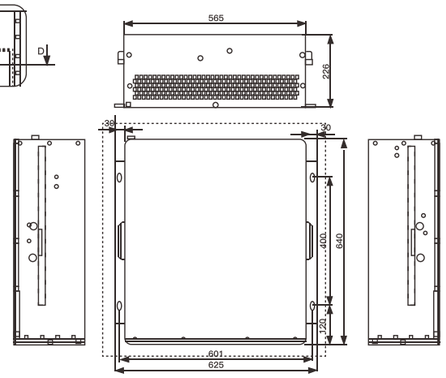
- Real-time detection of the reactive power of the system generates capacitive or inductive fundamental current through IGBT power converters to achieve dynamic continuous reactive power compensation. The target power factor for reactive power compensation can be set through the operation panel.

	SVG	Domestic mainstream SVG
Maximum power of a single cabinet	600kvar	600A/400kvar
Loss	<2.5%	<3%~4%
Noise	<60dB	<70dB
Equivalent switching frequency/current loop bandwidth	80kHz/4kHz	20kHz/1kHz

Module external dimensions



The external dimensions of the drawer-type module



Wall-mounted module external dimensions

Main functions

- **Maintain the voltage at the power receiving end. Strengthen the voltage stability of the system.**
For load centers, due to the large load capacity and the lack of large reactive power sources to support it, it is easy to cause low grid voltage or even voltage collapse accidents. SVG has the ability of rapid reactive power regulation, which can maintain the voltage on the load side and improve the voltage stability of the power supply system on the load side.

- **Compensate reactive power, improve power factor, reduce line losses, and save energy.**
In power systems, loads like asynchronous motors, electric arc furnaces, and large rectifiers require significant reactive power, while transformers and line impedances also contribute to reactive power. A low power factor increases energy loss and voltage drop, reducing voltage quality and the efficiency of generation and transmission equipment. For users, this results in higher electricity costs and increased production expenses.

- **Suppress voltage fluctuations and flicker.**
Voltage fluctuations and flicker are mainly caused by sharp changes in load. Sudden changes in load can lead to violent fluctuations in current, thereby causing grid voltage flicker at the power receiving end. Typical loads that cause voltage flicker include electric arc furnaces, steel rolling mills, electric locomotives, etc. SVG can quickly provide variable reactive current to compensate for voltage fluctuations and flicker phenomena caused by load changes.

- **Filter out harmonics.**
There are a large number of nonlinear loads in the distribution network. Typical loads include frequency converters, internal mixers, hoists and electric arc furnaces, etc. Their existence leads to a large amount of harmonics in the power grid, causing distortion of voltage and current waveforms, an increase in the failure rate of electrical equipment, an increase in the loss of the power supply and distribution system, and even power grid resonance, resulting in tripping accidents. SVG can generate equivalent reverse compensation current to filter out harmonics in the power grid, and the maximum compensation capacity is 30% of the device capacity.

- **Suppress three-phase imbalance.**
There are a large number of three-phase unbalanced loads in the distribution network, such as the traction load of electric locomotives and AC electric arc furnaces, etc. At the same time, the imbalance of three-phase impedance of power transmission and distribution equipment such as lines and transformers can also lead to the occurrence of voltage imbalance problems. SVG can quickly compensate for the negative sequence current generated due to load imbalance, always ensuring the balance of three-phase currents flowing into the power grid, and greatly improving the power supply quality.

Technical advantage

- SVG is a compensation device based on voltage source inverters, achieving a qualitative leap in reactive power compensation methods. It no longer adopts large-capacity capacitors and inductors, but achieves the transformation of non-functional quantities through the high-frequency switching of high-power power electronic devices. Technically speaking,SVG has the following advantages over traditional reactive power compensation devices:

- **Faster response speed.**
SVG can achieve a shock-free conversion from rated capacitive reactive power compensation to rated inductive reactive power compensation within 10ms, adapting to rapidly changing loads.

- **High compensation accuracy.**
SVG is an active reactive power compensation device. The reactive power current it outputs is all controllable, so there will be no problems of over-compensation or under-compensation.

- **It has strong voltage flicker suppression ability.**
The maximum suppression of voltage flicker by SVG can reach 2:1, and it can reach 5:1. SVC is limited by its response speed, and its ability to suppress voltage flicker does not increase with the increase of compensation capacity. Due to the extremely fast response speed of SVG, increasing the device capacity can further enhance the ability to suppress voltage flicker.

- **The compensation range is wider.**
The output current of SVG is not dependent on voltage and exhibits the characteristic of a constant current source. It can operate within the range from rated inductive to rated capacitive. It is not only applicable to pure inductive reactive power sites but also to capacitive bidirectional reactive power compensation industries, offering a wider operating range. SVC, on the other hand, is impedance-type compensation, with the output current and voltage having a linear relationship. Therefore, when the system voltage drops, SVG of the same capacity can provide a larger compensation capacity than SVC.

- **Diversification of compensation functions.**
SVG not only has the purpose of quickly compensating the reactive power of the system, but also can comprehensively compensate for power quality issues such as load harmonic current and negative sequence current according to the actual needs of users.

- **Low-switching ripple output characteristics.**
SVG uses two identical three-phase full-bridge inverters in parallel, which increases the equipment capacity. Meanwhile, the IGBT drive adopts the PWM switch ripple interlaced cancellation technology, which greatly reduces the output ripple.

Performance index

		SVG(kvar)			
Specification	Module Specification	30	50	75	100
	Module size (WxHxD)(Note1)	480×222x520 / 510x222x570	480x222x520 / 510x222x570	640x222x570 / 670x222x615	
	Available parallel connections	15			
Input	Working voltage	400V/690(-20%~+15%)			
	Working frequency	50Hz(-10%~+10%)			
	Current transformer	100:5~10000:5			
Cabinet (W x D)	600x600	Power≤200kvar			
	800x600	Power≤400kvar			
	800x800	Power≤500kvar			
	1000x1000	Power≤600kvar			
Function	Compensation harmonic	2 to 13 times (50% of the rated current)			
	Harmonic filtering rate	>97%			
	Compensate for reactive power	Adjustable from -1 to +1			
	Compensate for three-phase imbalance	100% imbalance is fully compensated			
	Communication method	RS232, 485, Modbus protocol and TCP/IP are optional			
	Communication method	RS485. Network Port			
	Upper computer software	Yes. All parameters can be set through the upper computer			
Comm. protocol	Fault alarm	Up to 500 alarm messages can be recorded at most			
	Monitoring	Independent module monitoring / Centralized machine monitoring			
Technical indicators	Full response time	<10ms			
	Active power loss	<2.5%			
	Heat dissipation method	Intelligent air cooling			
	Noise	<60dB			
	Sampling/control frequency	160kHz			
	Equivalent switching frequency	80kHz			
	Current ambient stop frequency	4kHz			
	Protection function	20+ types: overvoltage, undervoltage, overheating, overcurrent, short circuit.			
	CT installation position	The load side/grid side is optional			
Mech. characteristics	Wall-mounted size	The wall-mounted is of the same size as the module			
	Module weight	25kg(≤75/50kvar)50kg(≥100A/100kvar)			
	Colour	Fine orange stripes, International 7035			
Env. Requirements	Working temperature	-10℃~+45℃			
	Altitude	<5000m (Power decreases by 1% for each additional 100m over 1000m)			
	Relative humidity	<95% no condensation			
	Protection grade	IP20(Higher protection level customizable)			

- Note 1: For mid-sized modules, the appropriate size can be selected based on different cabinet widths.
- Note 2: The default cabinet height is 2200mm. By default, each module inside the cabinet is equipped with a circuit breaker to facilitate future power expansion.

Model definition and description

TSVG	–	200	–	4	/	4L
1		2		3		4

1.Product Model: Hybrid Dynamic Reactive Power Compensation Device

2.Rated capacity: 30Kvar-10Mvar

3.Rated voltage 4: 400V

4.Wiring method: 3L: Three-phase three-wire system; 4L: Three-phase four-wire system

Overview

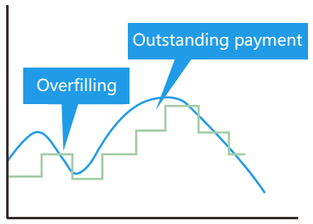
- Traditional compensation devices use capacitors to provide reactive power. The capacitance of capacitor banks is fixed in groups, and the output capacitance has a step difference, making it difficult to achieve a safe balance with the system's reactive power. Moreover, large-capacity SVGS are costly. Therefore, after years of practice and exploration, our company has developed TSVG, which combines small-capacity SVGS with large-capacity TSC, saving costs and achieving The SVG has achieved the effects of fast response speed and stepless compensation, ensuring continuous regulation and smooth output of reactive power capacity.

Technical characteristics

- Continuous adjustment of reactive power capacity to achieve stepless compensation.
- It can dynamically and bidirectionally continuously adjust reactive power, compensating for both reactive loads and capacitive loads.
- Modularization: The entire series of units are designed in a modular way, featuring an attractive appearance.
- Convenient maintenance: TSVG and its power units can operate simultaneously or independently, being mutually independent and highly reliable.
- Fast response: The TSVG hardware system adopts IGBT high-power switching devices and instantaneous reactive power algorithms, which can quickly suppress voltage fluctuations and voltage flicker, compensate reactive power, and shorten the response time to within 10ms. This can significantly reduce the power shock of the load and protect electrical equipment.
- Low harmonics: TSVG adopts a chain main circuit structure and high-frequency PWM control technology, generating very few low-order harmonics and reducing the pollution of harmonics to the power grid.
- Low power consumption: The TSVG with a chain main circuit structure does not require large-capacity multiplexing transformers, various filters, or large-capacity reactors, thus having low power consumption.
- Low noise: Utilizing aerospace heat pipe heat dissipation technology, the noise is less than 50dB.
- Comprehensive protection: A well-designed self-protection system monitors the working status of TSVG components and features bypass protection.
- Convenient maintenance: TSVG units can be interchanged, and modular TSVG units can be inspected and repaired independently without affecting each other.
- High power density: The impedance and volume of the connection reactor are smaller, and the valve group volume is also smaller.
- Wide operating range: The reactive current provided by the TSVC device is independent of the bus voltage. When the bus voltage decreases, the T SVG operates in a constant current source state and has a strong ability of reactive power compensation. The reactive power compensation capacity of the TSVG device with the same capacity is equivalent to 1.3 to 1.5 times that of the SVC device with the same capacity.
- Flexible control mode: It can adopt various control strategies such as constant reactive power or constant voltage control, three-phase balance control or phase-by-phase control.

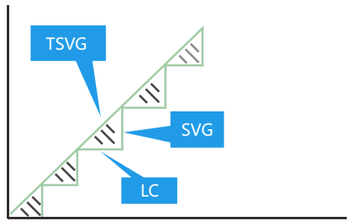
Working principle

- The TSVG hybrid dynamic reactive power generator is a combination of the SVG reactive power generator and the TSC thyristor dynamic reactive power compensation device, forming a large-capacity continuous reactive power compensation device TSVG. Signals are collected through the control system to calculate the reactive current magnitude of the system. First, the TSC dynamic reactive power compensation is used for rapid switching, and then the SVG reactive power generator is utilized to perform stepless compensation on the step difference part, achieving a smooth static compensation effect and achieving a complete balance with the system reactive power to a large extent.
- The core part of TSVG, SVG, is based on the principle of active compensation. It uses high-power IGBT tubes to form a three-phase inverter to provide reactive power, which can be equivalently regarded as an AC voltage source of the same frequency as the power grid with controllable output voltage amplitude. Change the amplitude of the output voltage U on the AC side of the SVG. When U is greater than the system voltage Us, the SVG compensates for reactive power (equivalent to capacitive components;) When the system voltage is less than Us, SVG absorbs reactive power (equivalent to inductive components). By changing the magnitude of the U amplitude, the reactive power provided by the SVG can be controlled to achieve the purpose of continuous compensation.
- The entire set of equipment coordinated control eliminates the discontinuous compensation problem caused by the traditional reactive power compensation device and the capacitor group switching method adopted. The reactive power capacity ensures continuous regulation and smooth output, guarantees rapid compensation and high power factor operation throughout the process, and achieves energy conservation and consumption reduction to a large extent. Ordinary compensation uses capacitor compensation. Capacitors are switched in groups, and the reactive power output capacity is stepped with a step difference, making it difficult to achieve complete balance with the system reactive power. To avoid over-compensation, some reactive power may remain uncompensated, failing to achieve the desired effect.



Traditional reactive power compensation is prone to over-compensation or under-compensation.

Load reactive power demand
LC compensation capacity



In the TSVG solution, LC provides stepwise compensation, and the SVG module offers blind spot coverage for stepless switching.

Lc compensation capacity
SVG compensation capacity

Technical parameters

Function	Data
Nominal voltage of the system	0.4 kv, 0.55 kv
Rated frequency	50Hz
Phase number	3 phases
Active power loss	<1%
Compensation effect	1
Measurement errors	Voltage <±0.2%, current <±0.5%, cos <±0.1%, reactive power <±0.5%;
Protection functions	IGBT Protections: Overvoltage, Overcurrent, Current Limiting.
Control input signal	Load phase voltages Ua, Ub, Uc, load currents Ia, Ib, Ic;

Technical parameters

- In the TSVG solution
- Rapid response is achieved by the SVG module. The fast response time of SVG is less than 50us and the response speed is less than 20ms.
- The SVG in TSVG demonstrates the advantages of power electronic switches. In traditional SVC, thyristors are only used for rapid switching and cannot reflect the value of high-frequency and rapid switching. Typically, a single switching takes over 100ms, while the IGBT in SVG can switch more than 15,000 times per second. The fast response is achieved by the SVG module. The fast response time of SVG is less than 50us and the response speed is less than 20ms. The SVG in TSVG demonstrates the advantages of power electronic switches. In traditional SVC, thyristors are only used for rapid switching and cannot reflect the value of "high-frequency and rapid switching". (Typically, a single switching takes over 100ms, while the IGBT in SVG can switch more than 15,000 times per second.)
- By combining any power component (SVG module or LC) in the TSVG solution, the following can be achieved:
- Performance adjustment of the TSVG scheme: The compensation range of TSVG is from -1 to 1;
- Price adjustment of the TSVG solution
- The application industry coverage of the TSVG solution.

Take 300kvar compensation capacity as an example:

	TSVG Solution 1	TSVG Solution 2	TSVG Solution 3
LC	50×5	50×4	30×9
SVG	50	100	30
Compensation capacity	-50~100	-100~100	-30~100

Schematic diagram of TSVG system

