

01

**IKM HV-SVG
Product Introduction**



1.1 HV-SVG Function and Technology Features

HV-SVG Functions

Compensate System Reactive Power

SVG can compensate for the reactive power loss caused by capacitive equipment such as electric motors, cold and hot rolling mills and electric arc furnaces, which can also improve power factor and reduce line loss.

Supress Voltage Fluctuation and Flicker

The fluctuation and flicker of voltage are mainly caused by the sharp changes in load, resulting in drastic fluctuations in voltage and current. SVG can provide rapidly changing reactive current to suppress voltage fluctuation and flicker.

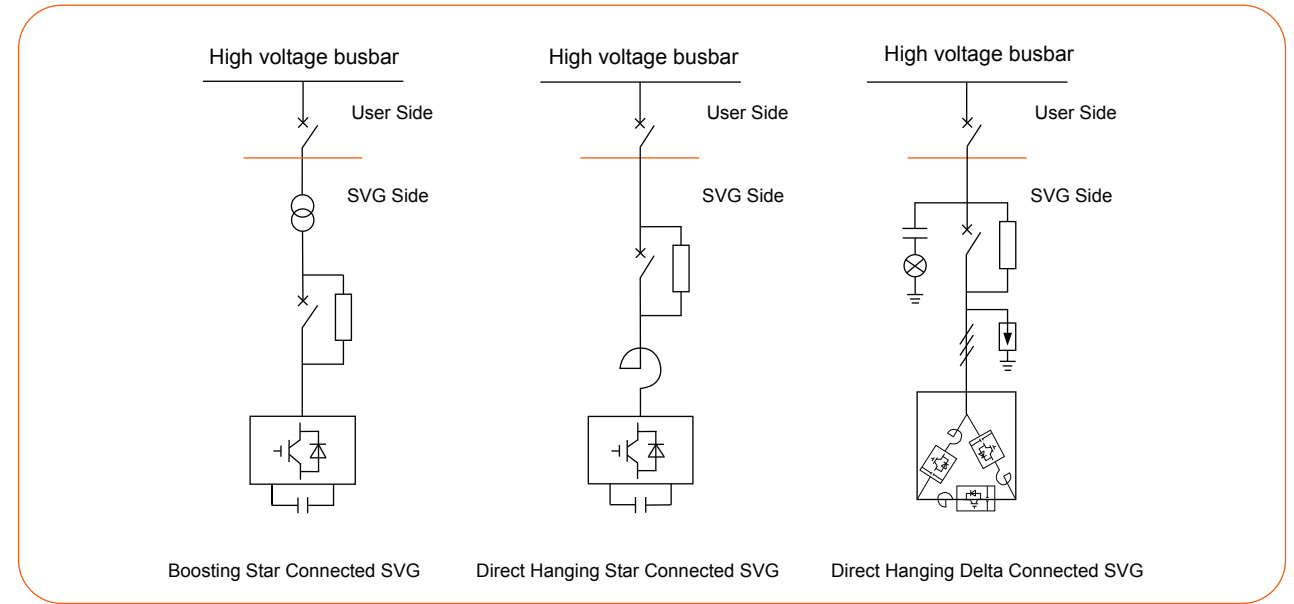
Stabilize Transmission Lines

Installing SVG on long-distance transmission lines can not only compensate for reactive power losses, increase line voltage and enhance effective transmission capacity under normal operating conditions, but also provide reactive power regulation and damping system oscillations in case of system failures, improving transmission line stability.

Adjust Three-Phase Imbalance

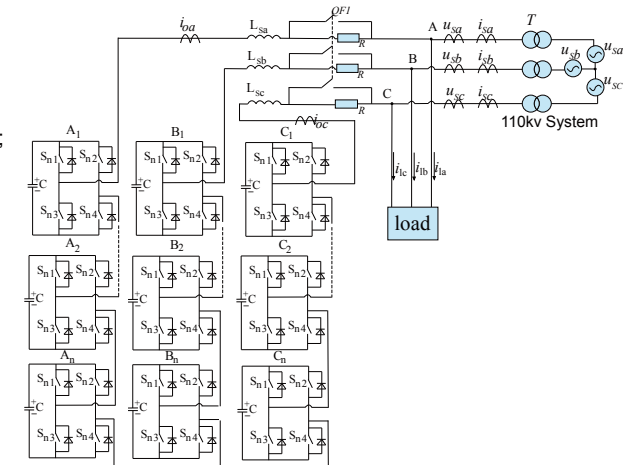
The imbalance of three-phase impedance of transmission and distribution equipment such as lines and transformers in the distribution network can lead to voltage imbalance. Installing SVG can quickly compensate for the negative sequence current caused by load imbalance, ensure the balance of three-phase current in the power grid and improve the power quality of the power grid.

Typical Topology



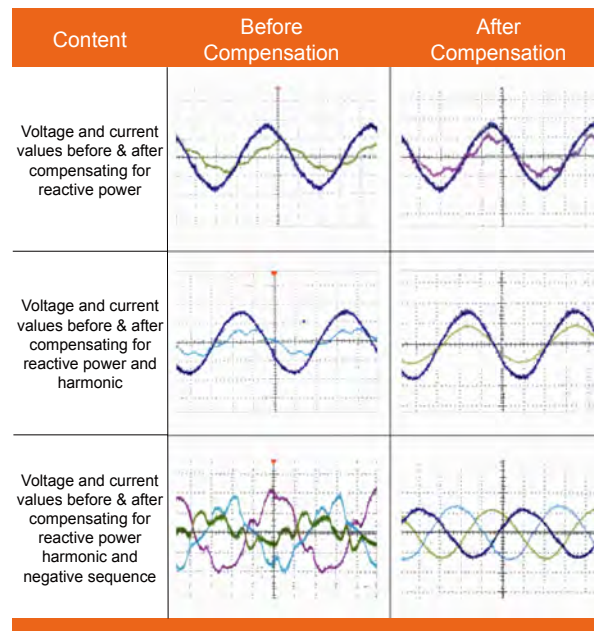
Topology Structure of Converter Chain

- Fully controlled IGBT power devices with fast device response speed, good control effect and flexible configuration;
- The unit adopts modular design to reduce maintenance costs;
- Automatic redundancy design with ability of fault modules being able to automatically exit and SVG being able to continue to run without stopping;
- H-bridge chain cascade structure with low module switching frequency, reducing equipment operating losses;
- PWN carrier phase shifting control technology, with the output waveform being close to a sinewave;
- Integrated chain link design, occupying a smaller area.



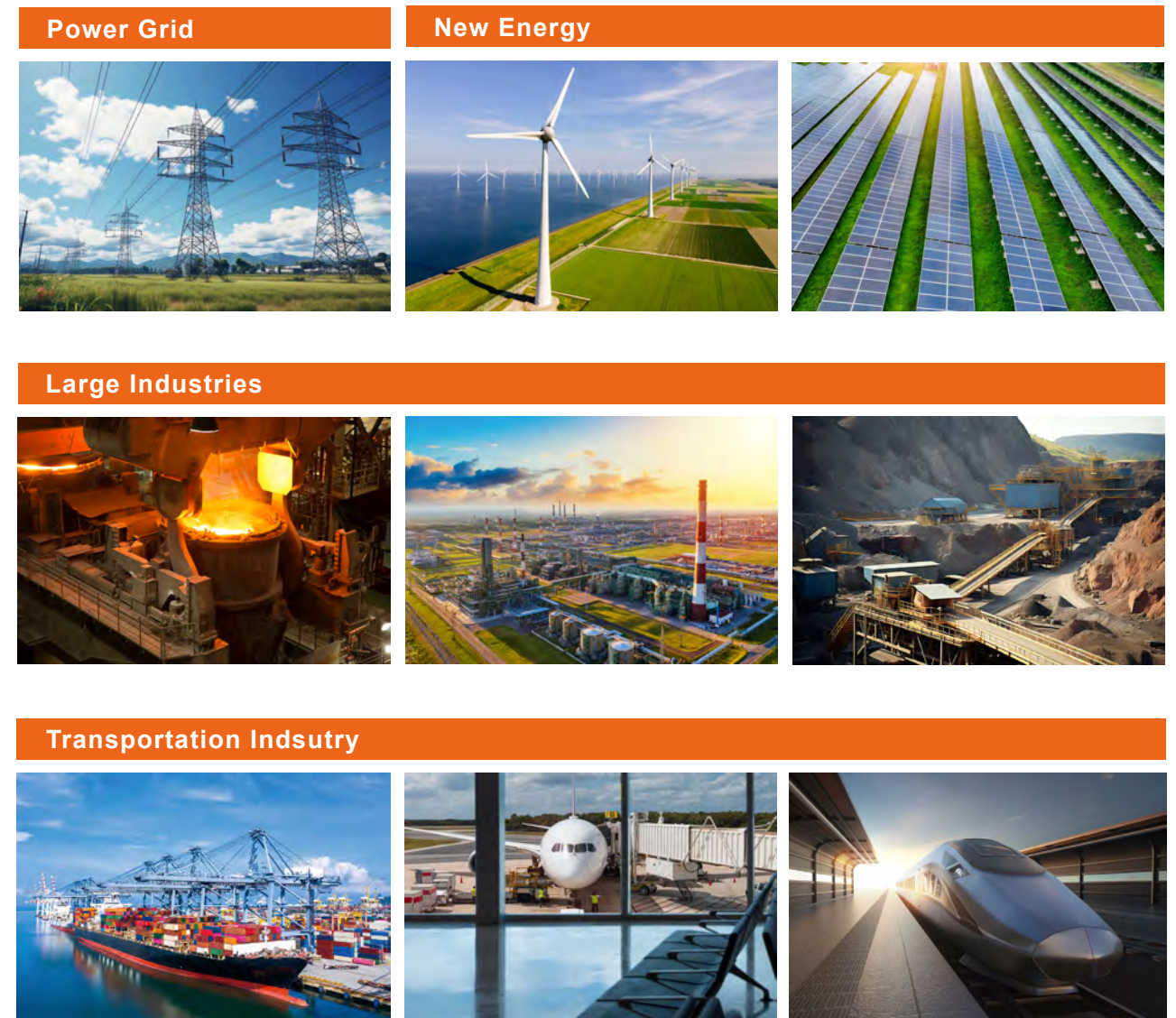
HV-SVG Technology Features

- Adopt instantaneous reactive power theory with controller response time $\leq 5\text{ms}$ and full power response time $\leq 30\text{ms}$;
- Equipped with oscilloscope function, which can display real time waveforms of input current, voltage, output current, voltage, etc. of the device;
- Equipped with black box function, which can view current, voltage and other data before and after protection action;
- Comprehensive protection algorithms and online system status self-checking, ensuring system reliability;
- Industrial class storage media, complete data recording, waveform recording and "fault query expert system";
- Advanced hardware platform + real-time multitasking operating system ensures fast processing capability for "avalanche events";
- Adopt high-speed fiber optic multi machine ring parallel communication technology to improve the redundancy of equipment operation and enhance the stability of parallel operation;
- Excellent anti electromagnetic interference capability, capable of withstanding severity levels up to level IV;
- The control system can be fully configured with dual redundancy, with one main and one backup;
- SVG has functions such as harmonic control, three phase imbalance control, high and low voltage ride through, synchronous oscillation control, etc,
- SVG can collaboratively complete high and low voltage ride through, transient modeling, multi-level parallel connection, primary frequency regulation transformation and sub synchronous oscillation suppression of new energy stations;
- Multiple operating modes, including constant reactive power mode, constant power factor mode, constant voltage mode and negative sequence compensation mode, with the ability to switch operating modes online.



1.2 HV-SVG Application Scenarios

The IKM HV-SVG is widely used in power grids, large industries (such as petrochemicals, steel metallurgy and other high energy consuming and high emission industrial users), new energy industries (such as wind power and photovoltaics) and others (such as airports, ports, rail transit). It plays an important role in energy conservation, improving the safety and stability of power grid, enhancing power factor and improving power quality.



1.3 Product Classifications

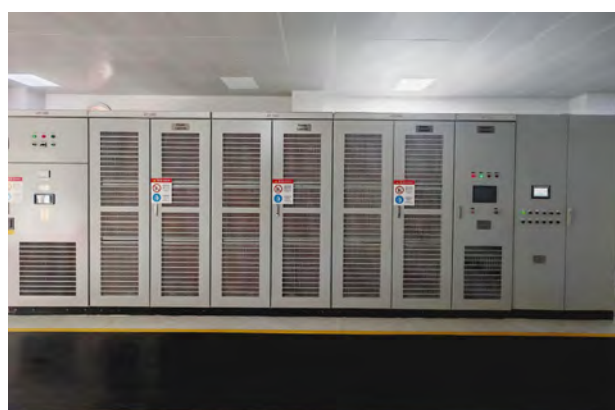
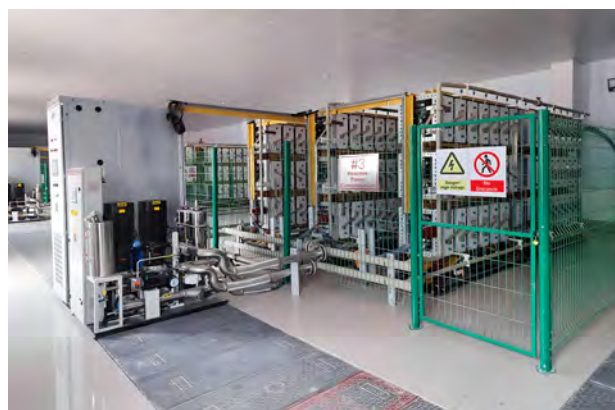
Voltage Level 3 ~ 35kV

Bus Connection Direct Hanging Type
Boost Type

Topological Structure Star, Delta

Cooling Methods Forced air-cooled
liquid-cooled
airconditioning internal circulation
air liquid cooled, etc

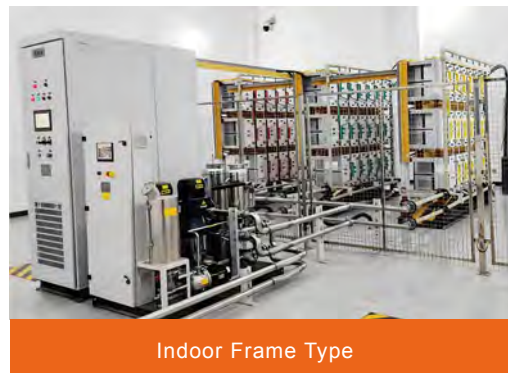
Installation Method Indoor cabinet
frame installation
outdoor container installation



1.4 Main Technical Parameters and Dimensions

Category	Indicators	Parameters
Rated Output	Rated output voltage	3kV, 6kV, 10kV, 20kV, 22kV, 24kV, 33kV, 35kV
	Rated capacity	-150Mvar~+150Mvar
Input	Main circuit	Three-phase 3kV, 6kV, 10kV, 20kV, 35kV
	Control circuit	DC220, AC380V
	Allowable power fluctuations	≤120%
Functions		Meet the standards of IEEE Std 519-1992, GB/T 14549-93
Control Functions	Control mode	Fixed reactive power, fixed voltage, fixed power factor, comprehensive control of voltage/power factor
	Control chip	DSP+FPGA
	Operating frequency	50Hz/60Hz
	Response time	≤5ms
	Unit DC voltage control	Stable unit DC busbar control ensures normal operation of the device
	Carrier phase shifting	Eliminate or reduce output harmonics
	Subsidiary functions	Fault recording, harmonic current compensation, negative sequence current compensation, etc
Run/Stop setting		Touch screen, DCS control, upper communication
Upper communication		RS485, Ethernet, Optical Fibre, RS232, 4G
Protection function		Overcurrent, quick break, overvoltage, instantaneous drop, cooling fan failure, power unit failure, PT disconnection, unit overvoltage, system voltage abnormality, input voltage imbalance
Display/Operation		Local: Touch screen, cabinet door buttons, etc Remote: SCADA, AVC, etc
Cooling mode		Forced air-cooled, liquid-cooled, air conditioning internal circulation, air liquid cooled
Protection level		≥IP30
Mechanical Properties	Ambient temperature	-10°C ~ +40°C
	Storage/transportation temperature	-40°C ~ +85°C
	Ambient humidity	≤95%, no condensation
	Application environment	Below altitude of 2000 meters, there are no corrosive gases, flammable gases or salt spray; Customization is required for environments above 2000 meters or for special use

HV-SVG Outline Dimensions



Voltage		Outline Dimensions: Width * Depth * Height (mm)					
3kV	6kV	Indoor air-cooling		Indoor liquid-cooling		Outdoor	
Rated Capacity Q (Mvar)		Direct hanging type	Boosting voltage type	Direct hanging type	Boosting voltage type	Air-cooling	Liquid-cooling
		0<Q≤0.4	0<Q≤0.9	1400x1300x2400	1400x1300x2400		
0.4<Q≤0.6	0.9<Q≤1.2	1520x1350x2400	1520x1350x2400	3200x1300x2400	3200x1300x2400	2300x2300x2700	3250x2350x2800
0.6<Q≤0.9	1.2<Q≤1.8	2520x1300x2400	2520x1300x2400				
0.9<Q≤1.4	1.8<Q≤2.8	4160x1300x2400	2560x1300x2400	5020x1300x2400	3420x1300x2400		3250x2350x2800
1.4<Q≤2.1	2.8<Q≤4.2	4400x1300x2400		5500x1300x2400		3000x2900x3200	
2.1<Q≤2.5	4.2<Q≤5.0	4600x1300x2400		2800x1300x2400			4500x2350x3100
2.5<Q≤3.6	5.0<Q≤7.2	6400x1300x2400		5700x1300x2400	3900x1300x2400		
3.6<Q≤4.5	7.2<Q≤9.0	6600x1300x2400		4600x1300x2400		3500x3000x3200	
				5900x1300x2400			5000x2350x3100

Voltage	Outline Dimensions: Width * Depth * Height (mm)						
	10kV		Indoor air-cooling		Indoor liquid-cooling		Outdoor
Rated Capacity Q (Mvar)		Direct hanging type	Boosting voltage type	Direct hanging type	Boosting voltage type	Air-cooling	Liquid-cooling
		0<Q≤1.5		1400x1300x2400	1400x1300x2400		
1.5<Q≤2.0		1520x1350x2400	1520x1350x2400	3200x1300x2400	3200x1300x2400	2300x2300x2700	3250x2350x2800
2.0<Q≤3.0		2520x1300x2400	2520x1300x2400				
3.0<Q≤4.5		4160x1300x2400	2560x1300x2400	5020x1300x2400	3420x1300x2400		3250x2500x2800
4.5<Q≤7.0		5000x1300x2400		5500x1300x2400		3000x2900x3200	
7.0<Q≤8.0		5200x1300x2400		3400x1300x2400			4500x2350x3100
8.0<Q≤12.0		7600x1300x2400		5700x1300x2400	3900x1300x2400		
12<Q≤15.4		7800x1300x2400		5800x1300x2400		5600x3000x3200	5000x2350x3100
				5900x1300x2400			

Voltage				Outline Dimensions: Width x Depth x Height (mm)		
20kV, 22kV	24kV	33kV	35kV	Air-cooling	Liquid-cooling	
Rated Capacity Q (Mvar)				Outdoor, direct hanging type	Outdoor, direct hanging type	Indoor, direct hanging type
0<Q≤4.2				4000x2500x2700		
4.2<Q≤9.0	0<Q≤10.5	0<Q≤15.0	0<Q≤16.0		5000x2500x3100	5000x4500x2850
9.0<Q≤16.0				5600x3000x3200		
16.0<Q≤18.0	10.5<Q≤21.5	15.0<Q≤30.0	16.0<Q≤32.0	/	6200x3000x3100	5000x5000x2850
18.0<Q≤27.0	21.5<Q≤32.5	30.0<Q≤45.0	32.0<Q≤50.0	/	7000x3000x3100	6000x6000x2850
27.0<Q≤34.0	32.5<Q≤41.0	45.0<Q≤56.5	50.0<Q≤60.0	/	8500x3000x3100	7000x7000x2850

Note:

1. The above voltage levels are common grid connection point voltage levels for SVG equipment. If there are other voltage levels, SVG equipment can be customized according to the voltage level.
2. The above SVG equipment dimensions are for reference only. Customization can be made for special scenarios, please refer to the actual supply.

1.5 Successful Projects



Shuifa Group Tongyu Wind Power 35kV Direct Hanging Indoor liquid-cooled SVG project

Large Capacity
Multiple Parallel Units
Provincial Key Project



10kV direct hanging indoor air-cooled SVG project of a stone factory in Fujian

Nonlinear harmonic control
High energy consuming industries



Cuomei, Xizang 35kV direct hanging outdoor liquid-cooled SVG project

High Altitude (>3000 meters)



6kV direct hanging indoor air-cooled SVG project for Yangjiang LNG storage facility in Guangdong Province

High temperature
High humidity
High salt spray



GuangZhou Baiyun Airport 10kV Direct hanging indoor liquid cooled SVG project

Lower Noise
Airpot Industry



Vietnam 35kV direct hanging outdoor air-cooled SVG project

High temperature
High humidity



China Huaneng Group, Power Construction Corporation of China and other distributed Photovoltaic 10kV direct hanging outdoor air-cooled SVG projects

Smaller size
Convenient installation
New energy industry



Uzbekistan 35kV direct hanging outdoor air-cooled SVG project

Three phase unbalance control
Nonlinear harmonic control
Power factor control of substations



Beijing Automobile 10kV direct hanging outdoor air-cooled SVG project

Smaller size
Compact structure
New energy industry



Poland 6kV direct hanging indoor air-cooled SVG project

Nonlinear harmonic control
High energy-consumption industries