SVG SERIES PRODUCT MANUAL

SVG FC APF

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Introduction

FGSVG series products can be widely used in petrochemical industry, power system, metallurgy, electriffed railway, urban construction and other industries, such as various asynchronous motors, transformers, thyristor converters, frequency converters, induction furnaces, lighting equipment, electric arc furnaces, electric locomotives, hoists, cranes, stamping machines, cranes, elevators, wind turbines, elevators, electric welding machines, resistance furnaces Quartz smelting furnace and other equipment provide high-quality and reliable reactive power compensation and filtering solutions.

FGSVG series products can enhance power transmission capacity, reduce power loss, compensate reactive power, control harmonics, suppress fficker, stabilize grid voltage, balance three-phase system, change system damping characteristics and improve system stability.

Petrochemical industry

Metallurgy

Long-distance transmission

Transformer substation

Wind farm

Photovoltaic power generation

Electric locomotive power supply

Mine

Data center

FGSVG series high voltage dynamic reactive power compensation device

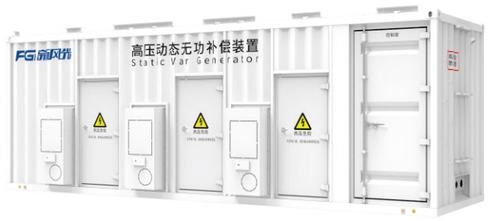
Product Specification

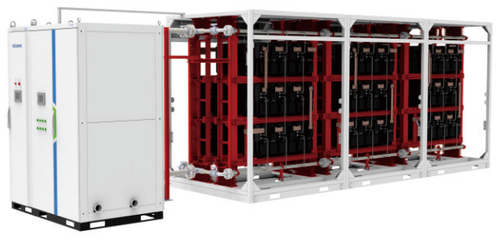
Model number description

FGSVG-C□/□- □□□□□□

- W–Water cooling / NA–Air cooling
- 2–Single phase / NA–Three phase
- T–Delta / NA–Star
- H–Harmonics suppress / NA–Non Harmonics suppress
- O–Outdoor ; / NA-Indoor
- 6.6–6.6kV ; 11–11kV; 27,5–27.5kV; 33–33kV; 35T–35kV Step–down
- Power rating (Mvar) . For example: 2.0–2Mvar; 10.0–10Mvar
- Cascaded type
- FGI SVG

Example: FGSVG-C50.0/35-0-W, indicates 35kV50Mvar outdoor water-cooled model.





Technical parameter

Name	Specifcation
Rated voltage	6kV±10%~66kV±10%(such as，66kV,11kV, 27.5kV, 33kV)
Assessment point voltage	6kV±10%~500kV±10%
Input voltage	0.9~1.1pu; LVRT 0pu(150ms), 0.2pu(625ms)
Frequency	50/60Hz; Allow short-term fuctuations
Output capacity	±0.1Mvar~±200 Mvar
Starting power	±0.005Mvar
Compensation current resolution	0.5A
Response time	<5ms
Overload capacity	>120% 1min
Power loss	<0.8%
THDi	<3%(≥25%P)
Power supply	Dual power supply
Control power	380VAC, 220VAC/220VDC
Reactive power regulation mode	Capacitive and inductive automatic continuous smooth adjustment
Communication interface	Ethernet, RS485, CAN, High-speed fibre-optic communication interface
Communication protocol	Modbus_RTU, Profbus, CDT91, IEC61850- 103/104
Running mode	Constant device reactive power mode, constant assessment point reactive power mode, constant assessment point power factor mode, constant assessment point voltage mode and load compensation mode
Parallel mode	Multi machine parallel networking operation, multi bus comprehensive compensation and multi group FC comprehensive compensation control
Protection	Cell DC overvoltage, Cell DC undervoltage, SVG overcurrent, drive fault, power unit overvoltage, overcurrent, overtemperature and communication fault; Protection input interface, protection output interface, abnormal system power supply and other protection functions.
Fault handling	Adopt redundant design to meet N-2 operation
Cooling mode	Water cooling/Air cooling
IP degree	IP30(indoor); IP44(outdoor)
Storage temperature	-40℃~+70℃
Running temperature	-40℃~ +55℃
Humidity	Monthly average not more than 90 % (25° C) (no condensation)
Altitude	≤5000m
Earthquake intensity	VIII degree
Pollution level	Grade IV

Excellent process & Durable and reliable

01 Low voltage ride through (LVRT) and fearless fuctuation (passing the type test of Wu Gao Institute)

In case of instantaneous drop and rise of user's main power supply voltage and large load switching of plant, within the scope allowed by the national standard, SVG can quickly and automatically operate normally after power grid recovery without personnel operation, enhance the adaptability of power grid, can adapt to U0 (100% - 0%) grid drop.

02 Voltage flicker & Fluctuation suppress

When the load changes sharply, it is easy to produce voltage fluctuation and flicker, suchas electric arc furnace, rolling mill, oxygen station turbine air compressor unit, etc. FGI SVG can quickly provide changing reactive current according to the change of grid voltage to compensate for voltage fuctuation and ficker caused by load change.

03 Dual power supply & More stability and reliability

The control power supply adopts two voltage systems of 380VAC, 220VAC or 220VDC, and the two power supplies are on-line hot standby for each other; If one power supply fails, the other can be switched seamlessly to continue to supply power to the control power supply. At the same time, the relay protection circuit alarm and HMI (man-machine interface) display which power supply fails.

04 Cabinet anti-interference and electromagnetic compatibility

The cabinet of the whole machine adopts anti-interference design, and EMC tests such as electrostatic discharge immunity test, surge (impact) immunity test, radio frequency electromagnetic feld radiation immunity test and electric fast pulse group immunity test have been tested by national authorities.

05 System redundancy & More safety and stability

Dual master control system design can be selected, which means the control systems are backup for each other and can be switched automatically. The power unit has an automatic bypass function, which can be automatically removed in case of failure to ensure the normal operation of the equipment.

Skilled in design, fearless of tough environment

Zimbabwe ferrochrome smelting project

Installation location：776/777TraffordRoad H.I.S Gweru
System voltage：35kV
Compensat io n capacity：8M,2M
Project characteristics：This project is loaded by arc furnace, and there are power quality problems such as flicker and high harmonic content
Effect：A total of three SVG units are installed in the project to effectively control the on-site harmonics and stabilize the voltage

Chad photovoltaic power station project

Installation location：N'Djamena, Chad
System voltage：15kV
Compensation capacity：6Mvar
Project characteristics: The power grid in this area is weak, unstable and fluctuating
Effect：Enhance the high and low voltage tra versal performance, adapt to the field conditions, improve the power factor

Serbian copper project

Installation location：A mine in Serbia
System voltage：6kV
Compensation capacity：-3Mvar~+3Mvar
Project characteristics：The large amount of mining equipment results in a large amount of reactive power in the power grid, causing voltage fluctuations in the grid.
Effect：Improve the power factor of the assessment point and stabilise the grid voltage。

Kazakhstan wind power project

Installation location：Astana, Kazakhstan
System voltage：35kV-40Mvar~+40Mvar
Project characteristics：The average temperature of the project site is low, and the local power grid fluctuates greatly, which requires high stability of equipment operation.
Effect：Upgrade the control strategy, optimize the product design, improve the stability of the product, and the equipment is successfully connected to the network for a time and keeps stable operation

High-voltage filter compensation (FC)

Introduction

High-voltage filter compensation device, referred to as FC, is suitable for 35-110kV substations in power systems and industrial and mining enterprises, and 6-35kV voltage level enterprise distribution stations. It uses the LC principle to control the high-order harmonics generated by the rectifier load.

FC type high voltage filter compensation device can effectively improve the power factor of the power grid, absorb the harmonic current of the tuning order, prevent the harmonic current from being fed back to the upper power grid, reduce the loss of transformers and transmission lines , and effectively improve the power quality of the power system .

Feature

· Efficient harmonic control

Through the LC series resonance principle, the FC equipment generates a low impedance channel at the target harmonic frequency, and introduces more than 90% of harmonic currents into the filtering branch circuit, which significantly reduces the harmonic distortion rate of the power grid. It supports multi-frequency harmonic management of 2nd, 3rd, 5th, 7th and above, effectively suppressing the risk of harmonic expansion.

· Dynamic reactive power compensation

For the fundamental frequency (60Hz, 50Hz), the equipment provides capacitive reactive power to raise the power factor to 0.9 or above, reducing line losses, improving transformer utilisation, and reducing the enterprise's electricity bill.

· Intelligent adaptive control

The equipment is equipped with harmonic controller, which monitors the load changes in real time and adjusts the working state automatically to ensure that the filtering effect and compensation efficiency are always optimal. It also supports manual/automatic dual mode switching, which is convenient and reliable.

· Reliable structural design

Filter reactors: it is a single-phase dry air-core structure with copper/aluminium conductors. Inductance is continuously adjustable ±5%. It supports horizontal or vertical mounting flexibility.

Filter capacitor: It is full film composite dielectric with the advantages of small size and low loss. It has a built-in discharge resistor and fuse protection for excellent safety performance.

Modular Configuration: It supports multi-branch combinations and is suitable for cabinet or frame mounting to meet the diversified needs of indoor/outdoor.

· Multiple security protections

It has multiple protection functions such as over-voltage, under-voltage, over-current, zero sequence current, unbalanced voltage, and so on, to ensure the long-term stable operation of the equipment. Capacitor residual voltage is reduced to below 50V within 5 seconds after power failure to ensure maintenance safety.

Typical application

FC can be used with SVG and is widely used in the following high harmonic pollution fields:

Metallurgical industry: electric arc furnace, rolling mill, medium frequency furnace
Rail transit: electrified railway, rectifier station
Energy and power: wind farms, substations, photovoltaic power stations
Industrial manufacturing: inverter, electrolysis equipment, hoist
Chemical and petrochemical industry: rectifier, compressor system

Technical parameters

Item	Parameters
Rated voltage	6kV, 10kV, 20kV, 35kV
Fundamental frequency	60Hz, 50Hz
Filter type	Passive filter
Filter connection	Star connection
Filter branch type	According to customer's requirements
Power factor after compensation	≥0.9 (customisable)
Ambient temperature	-25℃~+45℃
Relative humidity	≤95% (no condensation)
Altitude	≤2000m (customisable)
Installation place	Indoor/Outdoor

Low voltage SVG

Introduction

The SVG is an intelligent, active new type of power electronic device developed by our company. It adopts efficient power electronic topology and advanced full digital control technology to dynamically compensate reactive current and harmonic current, improve power factor and eliminate harmonic current.

SVG is a flexible power converter. It measures the reactive and harmonic currents generated by the load and then generates new reactive and harmonic currents of the same amplitude in opposite phases, to eliminate most of the reactive and harmonic currents in the supply network. By cancelling the reactive and harmonic currents in the circuit the following effects can be achieved:

Significantly reduce the voltage and current waveform distortion of the power supply network;

Significantly improve the power factor of the power supply system, reduce the design capacity of the transformer, and reduce the primary cost investment;

Reduce the loss of transformers and cables, lower their temperature, and save electricity;

Reduce the risk of interference with other equipment due to system harmonics;

Increase terminal voltage and improve power quality.

Feature

Multiple functions & High definition display

●One machine is multi-purpose with harmonic compensation and reactive power compensation,
●There is the high definition colour touch screen, which displays system and device operating parameters in real time;

Comprehensive protection features to improve user application stability

●RMS and Peak dual-setting automatic current limiting algorithm can automatically limit the output of the device to 100% output with no risk of overload;
●Complete protection functions, with over-current, over-voltage, under-voltage, over-temperature and other protection functions, to ensure safe and reliable system operation;
●Rainproof and dustproof design to meet outdoor installation requirements;

Advanced control strategy and topology design

●The improved detection technology based on instantaneous reactive power theory is highly controllable and fast response;
●Adopt LCL topology filtering, which will not introduce high-frequency IGBT switching harmonic interference and resonate with the power grid.

Highly integration, modularity and serialisation

●Modular design, small size, light weight, high power density, easy installation and maintenance;
●Support the flexible combination of parallel machines to meet different capacity requirements to achieve standardised production, while improving the reliability and maintainability of the equipment, greatly facilitating the installation and maintenance of the system;
●Single-module independent air duct design can effectively isolate the environmental dust adhesion and improve product cooling efficiency.

Failure self-diagnosis and self-start function

●The device has a self-recovery function that is not caused by problems of the device itself. Before self-recovery, it is necessary to carry out automatic diagnosis of the external power grid and the device itself, and the diagnosis will be passed before it can be self-started. If there is any problem with the external power grid, the device will not start again, and transmit the device fault alarm to the host computer and light up the device fault indicator;

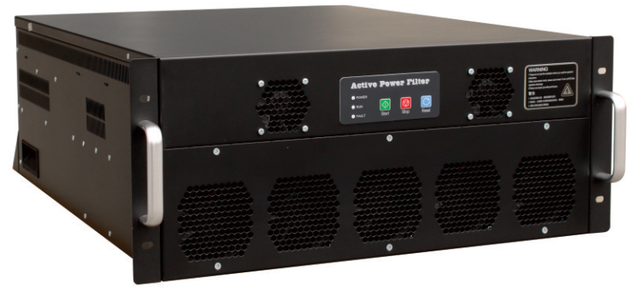
Technical parameter

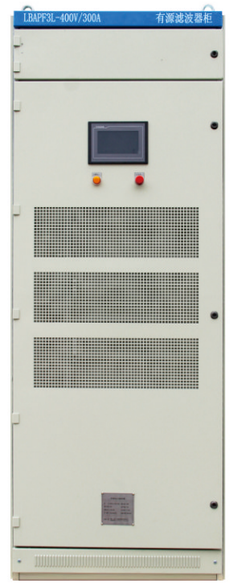
Input	System voltage (V)	400V AC	
	System voltage range	± 1 0%	
	Frequency (Hz)	50/60 +/−5%	
	Wiring method	Three−phase four−wire system	
Output and installation method	Rated current (Kvar)	50kVar /75kVar / 100 kVar	50kVar to 600kVar
	type	Rack−mounted/wall−mounted power modules	Complete cabinet/outdoor cabinet
	Line entry method	Rear inlet / upper inlet	Upper inlet / lower inlet / cabinet top penetration busbar (Cabinet inlet method to be specified in the contract)
	Installation	Outdoor/indoor/pole installation (customisable)	
	Power factor setting compensation	Support	
	Inductive or capacitive compensation	Optional	
	Filter range	2nd to 13th harmonics	
	Filter rate	⩾ 90% (within the ordered capacity range, and the load harmonic content is higher than 30% of the ordered capacity)	
	Total response time	⩽ 10ms	
	Instantaneous response time	⩽ 100us	
	Dynamic Current	1.2 times the filter rated capacity output, 1min	
Protect	Overload protection	Automatic limiting of current at 100% of rated output	
	Other protections	Overvoltage protection, undervoltage protection, overtemperature protection	
Operation mode	Single machine or parallel operation	Support	
Display and Operation	Display interface	Wall−mounted modules with 4.3−inch touch screen. Complete cabinets with 7−inch touch screen.	
	Display Status	Current, voltage, power, harmonic distortion rate, etc.	
	Operation	Multiple operation mode options, remote or local	
	communication	Modbus−RTU, Rs485	
	Phase sequence adaptation	Support	
Environm−ental conditions	Protection level	IP20 (customisable)	
	Operation ambient temperature	−10℃~40℃	
	Storage/Transportation Temperature	−40℃~60℃	
	Operation/Storage Humidity	Relative humidity 20~95%, no condensation / Relative humidity 10~95%	
	Altitude	Below 1000m (higher altitudes require reduced capacity)	

APF

Introduction

Active filter compensation device (active power filter APF) is an intelligent, active new power electronic device developed by our company. It is a new type of special equipment for power harmonic control made by modern power electronic technology and digital signal processing technology based on high−speed DSP devices.





Feature

· Multiple functions and modes

●One machine is multi-purpose, with harmonic compensation (factory default function), reactive power compensation, three-phase unbalance compensation and other functions.
●Settable harmonic sub-compensation function and settable reactive power ratio function;
●Friendly HMI and using high-definition 7-inch color touch screen. The screen displays the system and device operating parameters in real time;
●It can be customised with communication modes such as 485 and WIFI, and supports remote control by mobile phone or PC;

· Comprehensive protection features to improve user application stability

●RMS and Peak dual-setting automatic current limiting algorithm can automatically limit the output of the device to 100% output with no risk of overload;
●Complete protection functions, with over-current, over-voltage, under-voltage, over-temperature and other protection functions, to ensure safe and reliable system operation;
●Support fault alarm and memory function;

· Advanced control strategy and topology design

●Support real-time detection of harmonic current and automatic tracking of load harmonic changes, with high controllability and fast response;
●Unique split-phase harmonic extraction algorithm, which can realise independent control of each phase;
●The double converters inside the module are interleaved in parallel, and the LCL topology is used for filtering, which makes it possible to greatly reduce the switching ripple;
●Passive damping is combined with active damping to avoid multi-machine parallel resonance;

· High power density and easy installation

●Modular design, small size, light weight, high power density, easy installation and maintenance;
●Combination of parallel machines to meet different capacity requirements, and it can achieve standardised production, to improve the reliability and maintainability of the equipment;
●Single-module independent air duct design can effectively isolate the environmental dust adhesion and improve product cooling efficiency.

Technical parameters

Input	Rated voltage (V)	400V AC	
	System voltage range	± 10%	
	Frequency (Hz)	50/60 +/-5%	
	Wiring method	Three-phase three-wire / three-phase four-wire	
Output and installation method	APF Capacity	15A~150A	15A~150A
	type	Rack-mount/wall-mount modules	Rack-mount/wall-mount modules
	Inlet method	Rear inlet	Upper inlet / lower inlet / cabinet top penetration busbar (Cabinet inlet method to be specified in the contract)
	Filter rate	⩾ 90% (within the ordered capacity range, and the load harmonic content is higher than 30% of the ordered capacity)	
Performance Indicators	APF filter range	2~ 50th harmonics (if even-order harmonics need to be controlled, please specify when ordering)	
	Total response time	⩽ 10ms	
	Instantaneous response time	⩽ 100us	
	Dynamic current	1.2 times the filter rated capacity output, 1min	
	Power factor setting compensation	Support	
	Inductive or capacitive compensation	Optional	
	Overload protection	Automatic current limiting at 100% rated output	
	Other protections	Overvoltage protection, undervoltage protection, overtemperature protection	
Protect	Single machine or parallel operation	Support	
	Display interface	Wall-mounted modules with 4.3-inch touch screen. Complete cabinets with 7-inch touch screen.	
Operation mode	Display Status	Current, voltage, power, harmonic distortion rate, etc.	
Display and Operation	Operation	Multiple operation mode options, remote or local	
	Communication (RS485 interface)	Modbus-RTU, with remote monitoring interface and background database, to facilitate the user in the Internet terminal monitoring equipment operation parameters	
	Phase sequence adaptation	Support	
	Protection level	IP20 (customizable)	
	noise	⩽55DB	
Environmental conditions	Operating ambient temperature	-10℃~40℃	
	Storage/Transportation Temperature	-40℃~60℃	
	Operating/Storage Humidity	Relative humidity 20~95%, no condensation / Relative humidity 10~95%	
	Altitude	Below 1000m (higher altitudes require reduced capacity)	