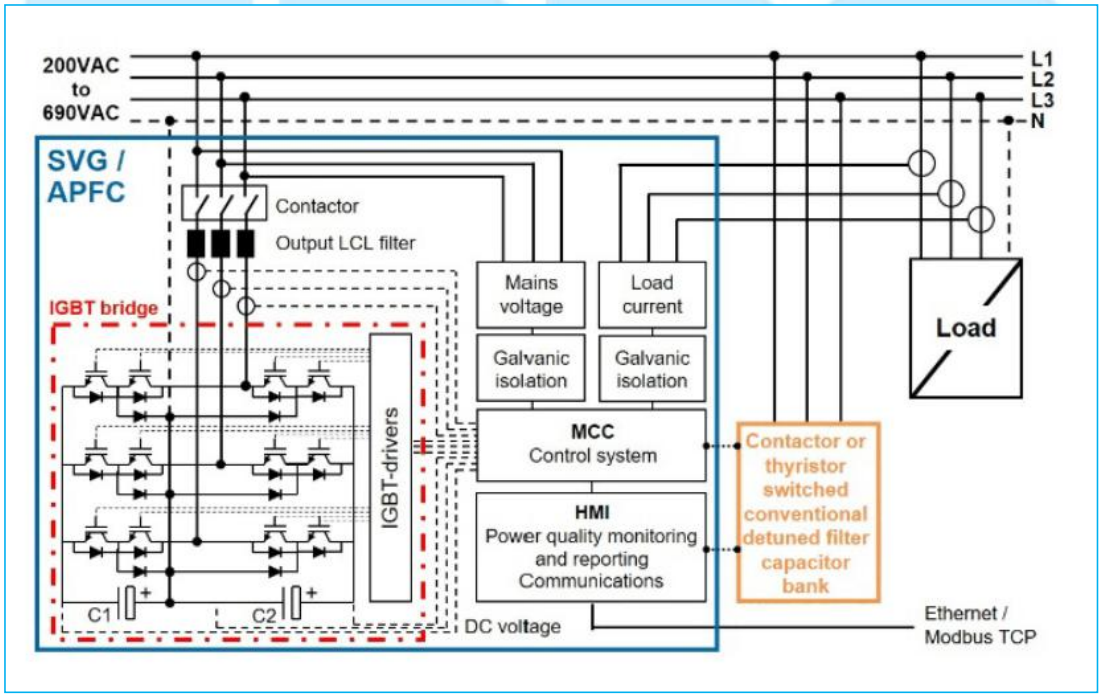
OVERVIEW

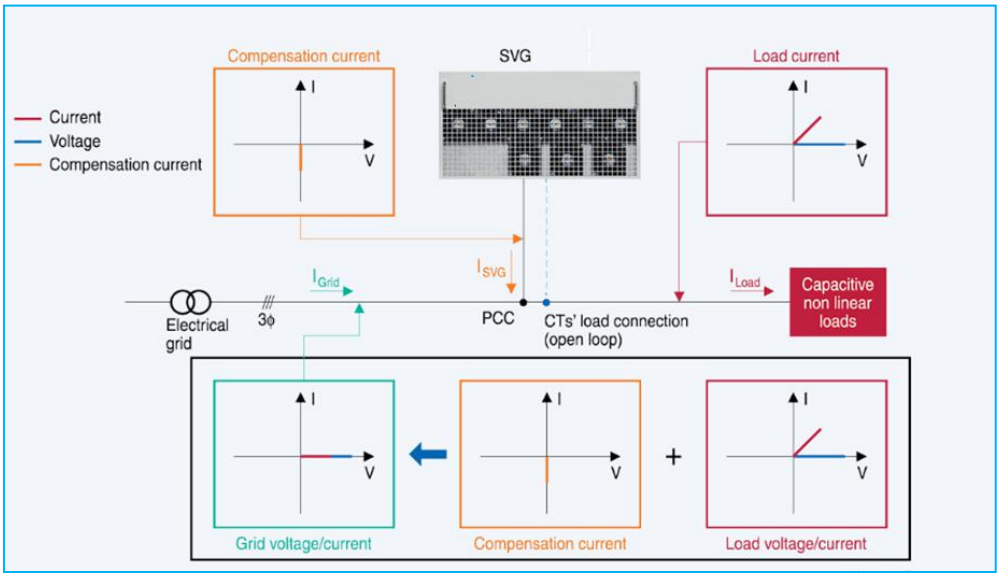
Static Var Generator (SVG) also known as instantaneous stepless reactive power compensators are the ultimate answer to power quality problems caused by low power factor and reactive power demand for a wide range of segments and applications. They are a high performance, compact, flexible, modular and cost-effective type of active power filters (APF) that provide an instantaneous and effective response to power quality problems in low or high voltage electric power systems.
They enable longer equipment lifetime, higher process reliability, improved power system capacity and stability, and reduced energy losses, complying with most demanding power quality standards and grid codes.

Low power factor increases the active energy losses of installations and affects their stability. It is typically caused by inductive or capacitive loads that demand extra reactive power to perform properly. Other contributors to low power factor are harmonic currents produced by nonlinear loads and the change of load in the electric power system.
SVG deliver real-time inductive or capacitive reactive power compensation. Rapid response time provides stable and accurate power factor correction without the drawbacks of conventional solutions like capacitor banks and reactor banks.



Typical Design of SVG

OVERVIEW



Typical Design of SVG

WORKING PRINCIPLE

Static Var Generator is a power electronics-based device connected in parallel with the load that requires harmonics mitigation. SVG works as a controlled current source providing any kind of current waveform in real time.

When the load generates inductive or capacitive current, it makes load current lagging or leading the voltage. An SVG detects the pase angle difference and injects in real time leading or lagging current into the electric power systems, making the phase angle of the current almost the same as that of the voltage, bringing fundamental power factor to unity.

OPERATION MODE	FIGURE FOR WAVE FORM & PHASE POSITION	REMARKS
No load	(a) $U_I = U_S$	In case of UI=US, Statcom doesn't compensate
Inductive operation	(b) $U_I < U_S$	In case of UI<US, Statcom can output inductive current continuously
Capacitive operation	(c) $U_I > U_S$	If UI>US SVG can output capacitive current continuously

Working Principle

FEATURES AND BENEFITS

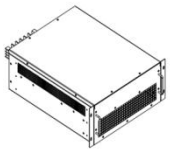
PRECISE COMPENSATION

Continuously outputs and compensates reactive power to maintain power factor >0.99. The compensation performance is 1.2 times better than a traditional compensation device (capacitor).

CAPABLE OF INDUCTIVE AND CAPACITE COMPENSATION

Realize inductive and capacitive compensation, avoid under and over compensation issues.

SUPPRESS HARMONICS



Configures the required amount of reactive current in real-time and compensates the reactive power to filter high order harmonics.

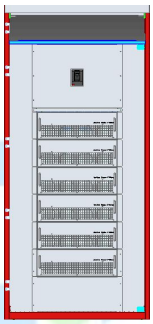
FAST RESPONSE

Fast configuration capability provides fast analysis and response time. Provides cycle response <5ms and dynamic response <200us.

LOW VOLTAGE BENEFITS

Output current is not affected by the mains voltage fluctuation, providing stable support for mains voltage.

MINIMAL LOSS, BETTER ENERGYEFFICIENCY



Adopts new standard IGBT with low power consumption rate and improves full set device efficiency up to 97%. The system provides low power consumption.

MODULAR DESIGN, EASY EXTENSION

No need for additional reactor or capacitors and the compact design reduces volume by20~30%. It is easy to maintain with a specially designed air path that facilitates module assembly and extension.

HIGH RELIABILITY AND SAFETY

Robust design for power system eliminates resonance problems, with no more amplified harmonic current and voltage. It extends components' life cycle and protects the system.

SVG/STATCOM 6KV 10KV 35KV

Medium SVG using IGBT as the core power modules which can quickly and continuously provide capacitive or inductive reactive power, achieve constant reactive power, constant voltage and constant power factor control through the assessment point, and ensure the power grid stable, high efficiency and high quality. MV SVG can significantly enhance power quality (improve power factor, correct phase unbalance, eliminate voltage flicker and fluctuation, filter harmonic)

Number of phases (system input)	3-phase 3-wire or 3-phase 4-wire
Mains frequency	50/60Hz
Mains voltage	6kv 10kv 27.5kv 35kv
Control power	380VAC,220VAC,220VDC
Rated Capacity indoor	±1Mvar~±100Mvar
Rated Capacity outdoor	±1Mvar~±42Mvar
Start capacity of correction	5kVAr
Dynamic response time	≤5ms
Reactive power compensation effect	PF＞0.98
Total harmonic current distortion THDi	≤3%
Filtering control effect	≥97%
3 phase unbalance compensation effect	＞5%
Active power loss	≤0.8%
Compensation mode	Compensate Harmonic,Reactive power, and 3 phase load unbalance
Resolution of compensate current	0.5A
Over-load capaicty	More than 1.2 times overload
Inverter topology	IGBT
Controller	DSP+FPGA
Reactive power correction	Inductive,capacitive correction smoothly.
Communication interface	Ethernet,RS485,CAN,Modbus_RTU
Installation	Indoor and outdoor
Comprehensive protection	Component Protection, Device Protection, System Protection
Protection Function	over/under voltage,over current,Short cut,over breakdown,over heat, lost pulse, triggering abnormal, power electronics protection.
Relative humidity	<90% non-condensing
Storage Temperature	-30~70°C
Running Temperature	-10~40°C
Cooling type	Air cooling
Ambient conditions	<2000 m
Protection class	IP40

SVG/STATCOM 6KV 10KV 35KV

◆ Key components list of SVG

SN	ITEM	Brand
1	IGBT module	GER Infineon
2	IGBT driver	USA Avago
3	Power capacitors	GER Trefan
4	Centrifugal fan	GER/EBM Shiro/EBM
5	Breaker	FR Schneider
6	HMI	TW Weinview
7	PLC	GET Siemens
8	Air Switch	GER Siemens
9	Relay	FR Schneider
10	DSP	USA TI
11	FPGA	USA ALTERA
12	Analog converter chip	USA ADI
13	Fiber optic transmitters/Receiver	USA Avago
14	Terminals	GER Phoenix

◆ Indoor 10Kv SVG