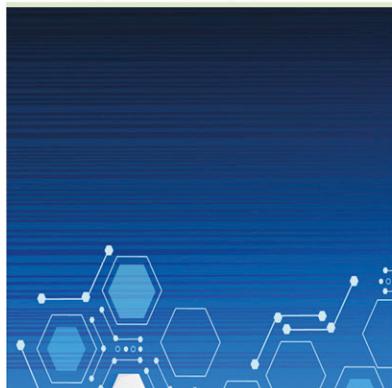


# Sinexcel

# MH



IGBT-based  
PFC solution  
  
for Leading &  
Lagging PF  
Compensation

## STATIC VAR GENERATOR



PF 0.99

Step-less PFC



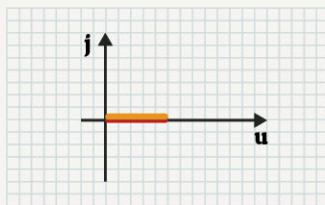




# LEADING & LAGGING PF COMPENSATION

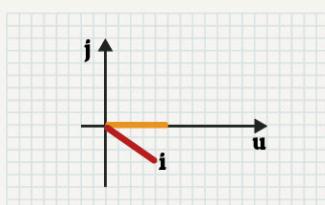
Modern industrial, data center & commercial buildings required a new approach in addressing power factor. The presence of harmonics, rapid PF swing and dynamic reactive load are beyond the capability of conventional capacitor bank system.

\* — Current  
— Voltage  
— Compensation Current



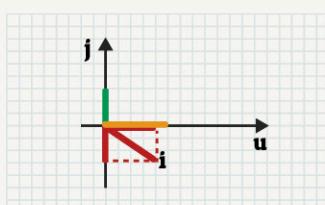
## RESISTIVE LOAD

RESISTIVE LOAD such as filament lamp.  
In phasor diagram, load appears resistive when current and voltage are in phase.

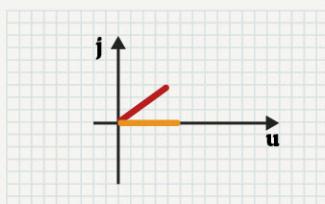


## INDUCTIVE LOAD

INDUCTIVE LOAD such as motor, compressor, relay and transformer.  
1 - Current of inductors lags voltage  
In phasor diagram, anticlockwise direction is set to be positive direction and U direction as the horizontal direction. Load appears inductive and resistive when I is within 0 to -90 degree.

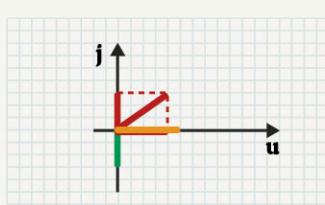


SVG generates capacitive current to neutralize inductive content of the load, achieving the performance for current and voltage phase congruency.



## CAPACITIVE LOAD

CAPACITIVE LOAD such as capacitor bank  
2 - Current of capacitors leads voltage  
In phasor diagram, anticlockwise direction is set to be positive and U direction as the horizontal direction. Load appears capacitive and resistive when I is within 0 to 90 degree.



SVG generates inductive current to neutralize capacitive content of the load, achieving the performance for current and voltage phase congruency.

## BENEFIT OF SVG



★ Suitable for use in Harmonics Loaded Network



★ Avoid penalty for low PF by Utility Company



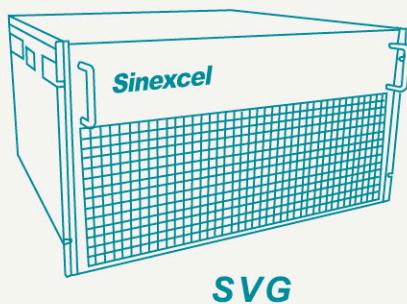
★ Reduce electric energy loss



★ Respond Dynamically to reactive power from Leading to Lagging condition

★ Stepless compensation

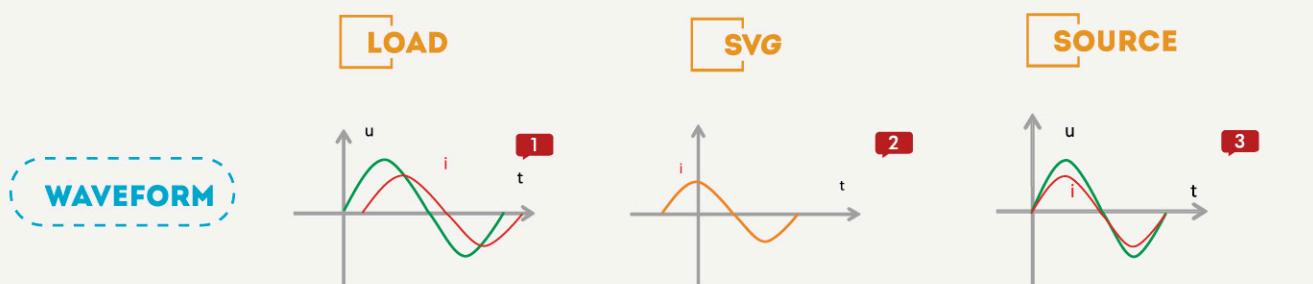
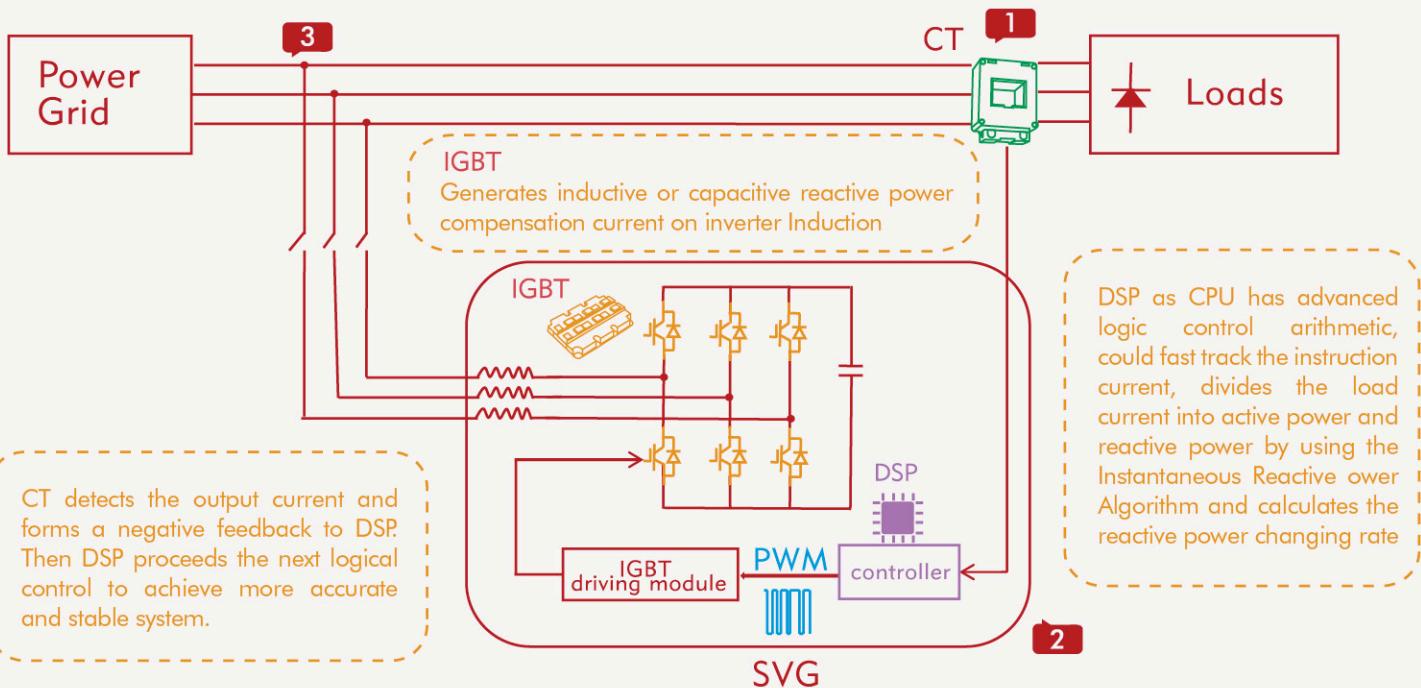
★ Fast response time 15ms to full compensation



# SVG WORKING PRINCIPLE

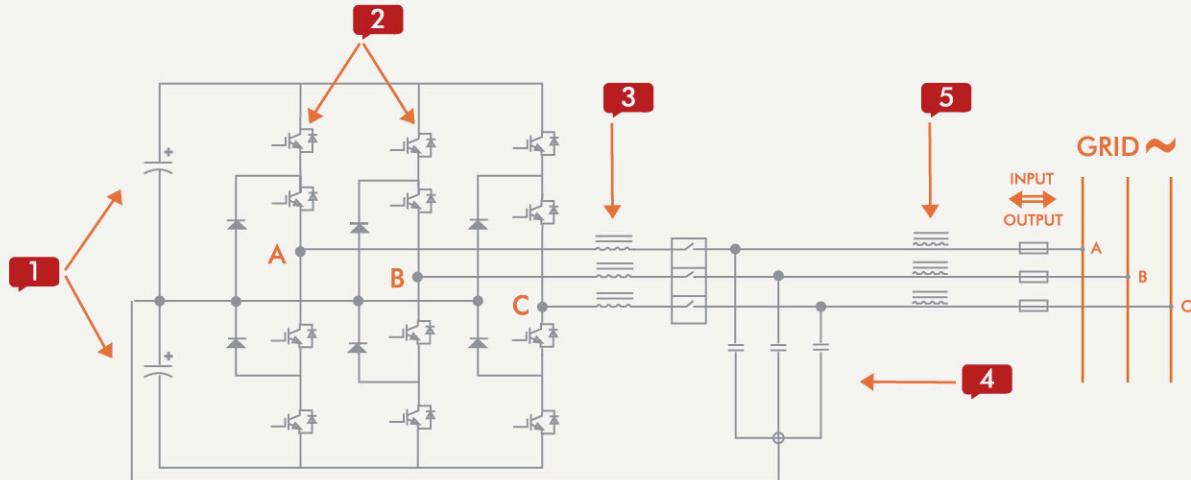


Current Transformer (CT) detects the load current. Digital Signal Processor (DSP) has advanced logic control arithmetic, could analyse the current, divides the load current into active power and reactive power by using the instantaneous Reactive Power Algorithm, and calculates the reactive power change rate rapidly and accurately, then sends Pulse Width Modulation (PWM) signal to Insulated-gate Bipolar Transistor's (IGBT) driver board to control IGBT on and off at average 20kHz frequency. Finally inductive or capacitive power compensation current is generated and injected to network, at the same time CT also detects the output current and forms a negative feedback to DSP. Then DSP proceeds the next logical control to achieve more accurate and stable system.



— Voltage  
— Current  
— Output Capacitive Reactive Power

# UNDERSTAND HOW SVG COMPENSATE REACTIVE POWER

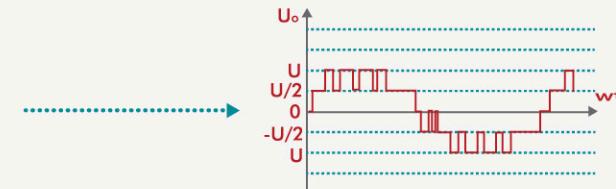


## DC BUS CAPACITOR 1

DC bus capacitor, AC to DC rectifier storage

## IGBT 2

Controlled by DSP software algorithm, IGBT on-off timing selection and length could control inverter to generate an accurate reactive power compensation current.



## INVERTER INDUCTION 3

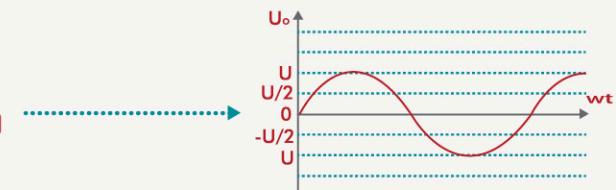
IGBT Compensating inductive reactive power or capacitive reactive power by controlling inverter induction to generate a capacitive current or inductive current to achieve bidirectional reactive power compensation.



## LC FILTER CIRCUIT 4

## HIGH FREQUENCY INDUCTOR 5

Both are for filtering. The combination of LC filter circuit and high frequency inductor are called LCL filter circuit



# KEY FEATURES AND BENEFITS

## PFC PERFORMANCE

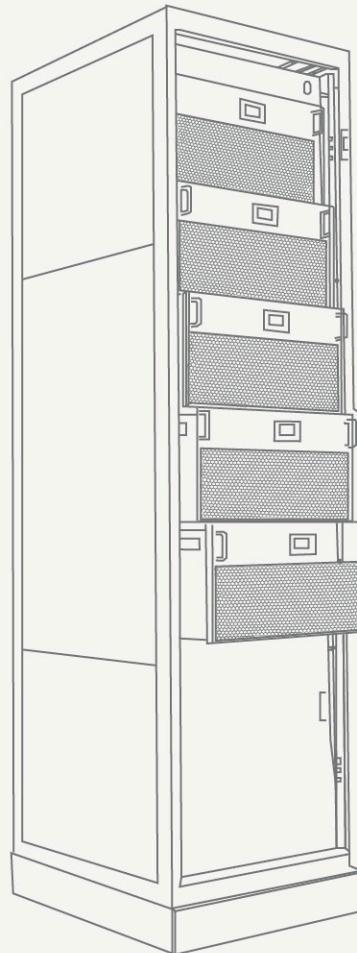
PFC performance 0.99

Stepless compensation without over-compensation and under-compensation, compensate specific capacity that system needs.

Full PFC process within 15ms and maintain at PF0.99 no matter how the system reactive power changes

Compensation with inductive reactive power and capacitive reactive power.

The voltage of the grid has little influence on SVG compensation capacity as SVG is a current source.



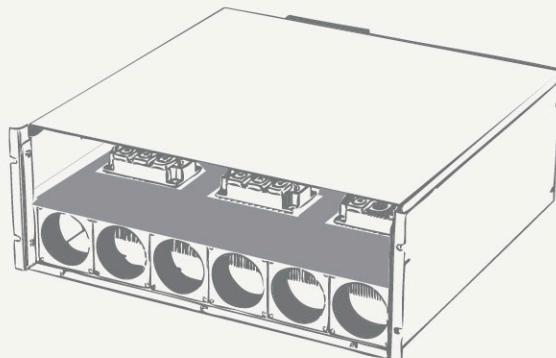
## MAINTENANCE FREE, SAFE AND EASY TO USE

Could work under high THDv up to 15%, no capacitor explosion risk or harmonics resonance problem.

Minimal loss, maintenance-free

MTBF (mean time between failure) 100,000 hours

Advanced technology and easy to use with remote monitoring with EMS, BMS.



## SPACE AND CAPACITY

Minimal footprint to save more than 70% space compared with cap bank.

# SVG SPECIFICATION 400V NETWORK TYPE

Items	400V				480~690V (Large capacity)									
	Sinexcel SVG 030	Sinexcel SVG 050	Sinexcel SVG 100	Sinexcel SVG 200	Sinexcel SVG 480	Sinexcel SVG 600	Sinexcel SVG 690							
System Parameter														
Rated Voltage	400V			480V	600V	690V								
Voltage range	228V~456V			384V~576V	480V~720V	552V~759V								
Rated frequency	50/60Hz (range:45Hz~62Hz)													
Parallel operation	Unlimited			Unlimited										
Overall Efficiency	>97%			>99% (at 50% induction load)										
Distribution system	3P3W/3P4W			3P3W										
CT ratio	150/5~30,000/5		600/5~10,000/5		800/5~10,000/5									
Circuit topology	3-Level													
Performance Indicator														
Rated capacity	30kVar	50kVar	100kVar	200kVar	480/960/1440/ 1920/2400kVar	600/1200/1800/ 2400/3000kVar	690/1380/2070/ 2760/3450kVar							
Response time	<15ms			<40ms										
Target power factor	Adjustable from -1 to +1													
Cooling air requirement	222L/sec		405L/Sec	500L/Sec	Smart air cooling: 3,000m³/h(*1-4)									
Noise level per module	<65 dB			<75 dB	<70 dB									
Communication & Monitoring Capability														
Communications ports	RS485, CAN (reserved), Ethernet port (RJ45)				RS485, Ethernet port (RJ45)									
Communications protocols	MODBUS													
Protection functions	Abnormal voltage / frequency protection; Inverter short-circuit protection; Abnormal output current protection; Inverter over-loaded protection; Over-temperature protection etc.													
Alarm	Available													
Interfacing	4.3-inch touch screen monitor and optional 7-inch touch screen centralized monitor				7-inch touch screen centralized monitor									
Mechanical Properties														
Mounting type	Wall mount / Rack mount / Cabinet				Fixed cabinet									
Cable entry mode	Rear entry for rack mount type Top entry for wall mount type; Top or bottom entry for cabinet				Bottom entry									
Dimension(W x D x H) (mm³)	500*560*190 (Rack mount) 500*191*585 (Wall mount)	500*520*269 (Rack mount) 500*286*557 (Wall mount)	500*690*370 (Rack mount) 500*370*690 (Wall mount)	600*800*2200/1200*800*2200/1800*800*2200/ 2400*800*2200/3000*800*2200										
Net weight	36kg	48kg	110kg	500kg (per cabinet)										
Color	RAL7035(gray)													
Environment Requirement														
Altitude	≤1,500m; Between 1,500m to 4,000m, derating 1% every additional 100m													
Ambient temperature	-10°C~40°C (may derate capacity if ambient temperature exceeds 45°C)													
Relative humidity	5%~95%, non-condensing													
Protection Class	IP20 (other IP degrees are customizable)													
Related Qualifications & Standards														
Qualifications	CE, cETLus				CE									

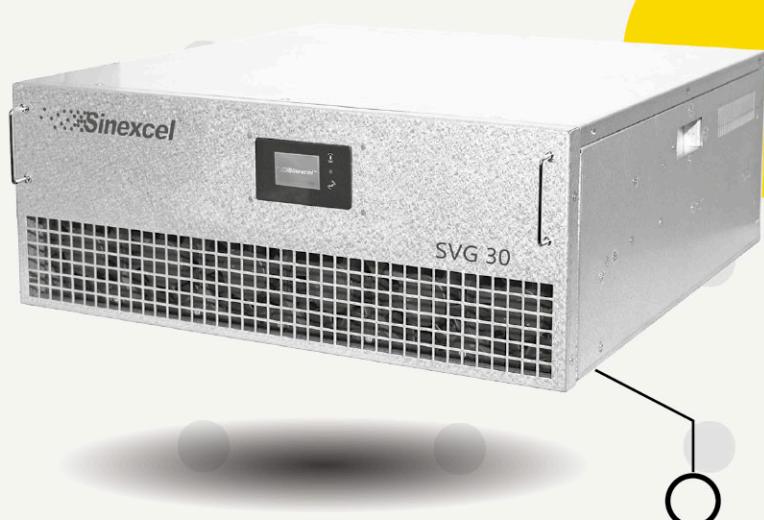
# SVG SPECIFICATION 480V / 690V / 600V

Items	400V	480~690V		
	Sinexcel SVG 35	Sinexcel SVG 30/40/50/80	Sinexcel SVG 40/50/80/100	Sinexcel SVG 40/50/80/120
System Parameter				
Rated voltage	208V	480V	600V	690V
Voltage range	220V(176V~364V)	384V~552V	420V~690V	483V~793V
Rated frequency	50/60Hz (range:45Hz~62Hz)			
Parallel operation	Unlimited			
Overall Efficiency	>97%			
Distribution system	3P3W/3P4W			
CT ratio	150/5~30,000/5			
Circuit topology	3-Level			
Performance Indicator				
Rated capacity	35kVar	30/40/50/80kVar	40/50/80/100kVar	40/50/80/120kVar
Response time	<15ms			
Target power factor	Adjustable from -1 to +1			
Cooling air requirement	359L/sec	342L/sec (30/40kVar) 359L/sec (50/80kVar)	342L/sec (40/50kVar) 359L/sec (80/100kVar)	342L/sec (40/50kVar) 359L/sec (80/120kVar)
Noise level per module	<65 dB			
Communication & Monitoring Capability				
Communications ports	RS485, CAN (reserved), Ethernet port (RJ45)			
Communications protocols	MODBUS			
Protection functions	Abnormal voltage/frequency protection; Inverter short-circuit protection; Abnormal output current protection; Inverter over-loaded protection; Over-temperature protection etc.			
Alarm	Available			
Interfacing	7-inch touch screen centralized monitor (Rack mount) and 4.3-inch touch screen monitor (Wall mount)			
Mechanical Properties				
Mounting type	Wall mount / Rack mount / Cabinet			
Cable entry mode	Top or bottom entry for cabinet			
Dimension(W x D x H)(mm <sup>3</sup> )	500*675*250 (Rack mount) 500*250*723 (Wall mount)	For 30/40kVar 500*540*180 (Rack mount) 500*184*627 (Wall mount)	For 40/50kVar 500*540*180 (Rack mount) 500*184*627 (Wall mount)	For 40/50kVar 500*540*180 (Rack mount) 500*184*627 (Wall mount)
Net weight	70kg	40kg (30/40kVar) 70kg (50/80kVar)	40kg (40/50kVar) 70kg (80/100kVar)	40kg (40/50kVar) 70kg (80/120kVar)
Color	RAL7035(gray)			
Environment Requirement				
Altitude	≤1500m; Between 1500m to 4000m, derating 1% every additional 100m			
Ambient temperature	-20°C~40°C (may derate capacity if ambient temperature exceeds 45°C)			
Relative humidity	5%~95%, non-condensing			
Protection Class	IP20 (other IP degrees are customizable)			
Related Qualifications & Standards				
Qualifications	CE, cETLus, cULus			

**400V**



**SVG 30kVar (wall mount)**



**SVG 30 / 50kVar (rack mount)**

**400V**



**SVG 100kVar (wall mount)**



**SVG 100kVar (rack mount)**

400V



### Flexible Cabinet

- Flexible dimension  
600\*1000\*2200mm
- Flexible capacity
- Flexible incoming connection  
Top / Bottom cable entrance
- Top / Bottom MCCB position

400V



### PLUG-IN TYPE CABINET

One plug-in type cabinet could hold five 100kVar modules to achieve 500kVar.  
The plug-in type cabinet has built-in module which can be easily removed  
and added.

The dimension of plug-in type cabinet: 600\*800\*2200mm.

# Mun Hean SVG Project Reference

- Petrochina Bohai Oil Drilling, China
- LiaoYang Huitong Street Rolling, China
- State Grid of China – Jiangsu Province, China
- Shanghai Pufeng Harbour, China
- Far East Financial Centre, Admiralty, Hong Kong
- NTT Data Centre, Tseung Kwan O, Hong Kong
- China Unicom, Hong Kong
- Siu San Wan Sport Ground, Hong Kong
- Perodua Car Manufacturing Plant, Malaysia
- RongMao Cast Steel, Malaysia
- PTP Johor, Malaysia
- Plotting Yard at Botanic Gardens, Singapore
- Prima Flour Mill Factory, Singapore
- Seng Hong Warehouse, Singapore
- Mitrphol Sugar Mill Factory, Thailand
- TexHong Textile Factory, Vietnam
- Steel Factory, Philippines
- Hutchison Ports SITV, Vietnam

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