



Always Reliable



## High-voltage Static Var Generator

Reliable quality, Continual grid connection

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Zhuhai Sinopak Electric Ltd.

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# Company Profile



Zuhai Sinopak Electric Ltd is a professional one-stop solution supplier for motor drives and power quality correction equipment; We mainly supply Medium voltage and low voltage variable frequency drives, Mine use flameproof and intrinsically safe drives, Medium voltage magnetically controlled reactor typed soft starter, Medium voltage and low voltage Static synchronous compensator (STATCOM), Active harmonic filter etc. With years of exporting experience, we have cooperative partners in Bangladesh, Pakistan, Vietnam, Iran, Turkey, Poland, Russia, Mongolia, etc. Up to now, our products cover about 20 countries and regions from the South-east Asia and Eastern Europe to Middle East and Africa.



Sinopak will follow the principle of "customer first" , focus on pre-sale and after sales technical support service, continue to spare no efforts to help our customers improve production efficiency, save energy consumption and fulfill its social responsibilities.



One-Stop Power Quality  
Solutions Provider

THDI  
5%

PF  
0.99

# PRODUCT SERIES

## “Reliable quality Continual grid connection”

With gradual increase of installed capacity of the new energy power station, the static var generator (SVG) is used massively in order to solve a series of power quality problems such as voltage fluctuation caused by connection of new energy power station, unqualified grid-connected power factor, and rapid reactive change.

The Sinopak launched TSVG series static var generator by insisting the design principle of “reliability, high efficiency, and energy-saving” based on special working condition of new energy power station. Its excellent smart chain redundancy technology, control system redundancy technology, and parallel control technology of master-slave coordination improve reliability of the product greatly.

power quality problem of the new energy power station accurately can be solved based on unique harmonic compensation and resonance inhibition function, unbalance compensation function, operation capability under frequency out of range, high-accurate module voltage-sharing technology, subsynchronous vibration inhibition technology to guarantee better and more energy production.

Advanced cooling system and container body with high IP degree (IP54) can guarantee the product operates reliably in extremely bad environment. Smart control unit of fan and unique idle operation mode can save 44% energy to the power station so that the operational cost is reduced.

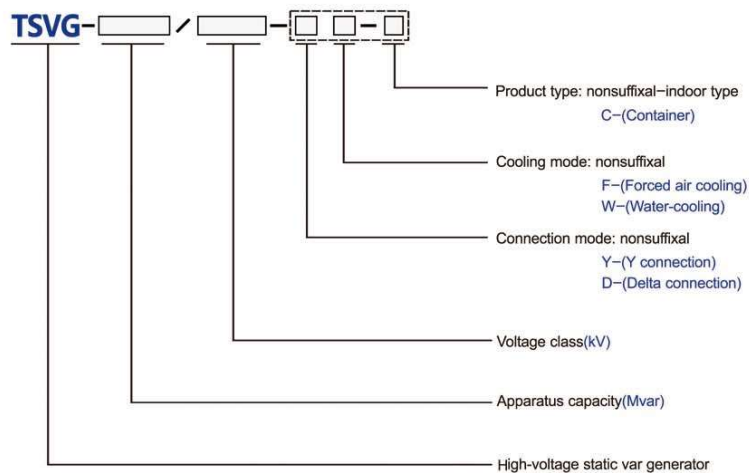
With high-power density power module design and compact high-voltage insulation structure design, TSVG can realize minimal flooring area under the same compensation capacity to reduce the building investment.

TSVG is your first choice for new energy power station.

100Mvar				
60Mvar				
42Mvar				
12Mvar				
7Mvar				
4Mvar				
			3.3kV	6kV
				10kV
				35kV

### Description of product model

Static var generator (SVG), also called high-voltage dynamically reactive compensation generator or static synchronous compensator, refers to the device realizing dynamically reactive compensation by bridge-type current converter of self-commutated electric power semiconductor. SVG is the best solution in reactive power control field at present. Compared to conventional phase modifier, capacitor-reactor, and conventional SVC represented by thyristor controlled reactor (TCR), SVG's strengths are incomparable.



Based on grid parameters and load properties, connection mode of SVG is Y-connection and D-connection mode.

## Product of 3.3kV indoor TSVG series



- The device is composed by a power unit (3-4 Mvar device is equipped with two power units), a control cabinet, and a starting cabinet;
- It can be customized based on actual capacity demand;
- If 35kV voltage degree capacity is lower than 3Mvar device, the 3.3kV voltage-drop type with Y-connection is recommended.

## Product of 6kV indoor TSVG series



- The device is composed by two power units (5-7 Mvar device is equipped with four power units), a control cabinet, and a starting cabinet;
- It can be customized based on actual capacity demand;
- If 35kV voltage degree capacity is higher than 2Mvar device and lower than 6Mvar device, the 6kV voltage-drop type with Y-connection is recommended.

## Product of 10kV indoor TSVG series



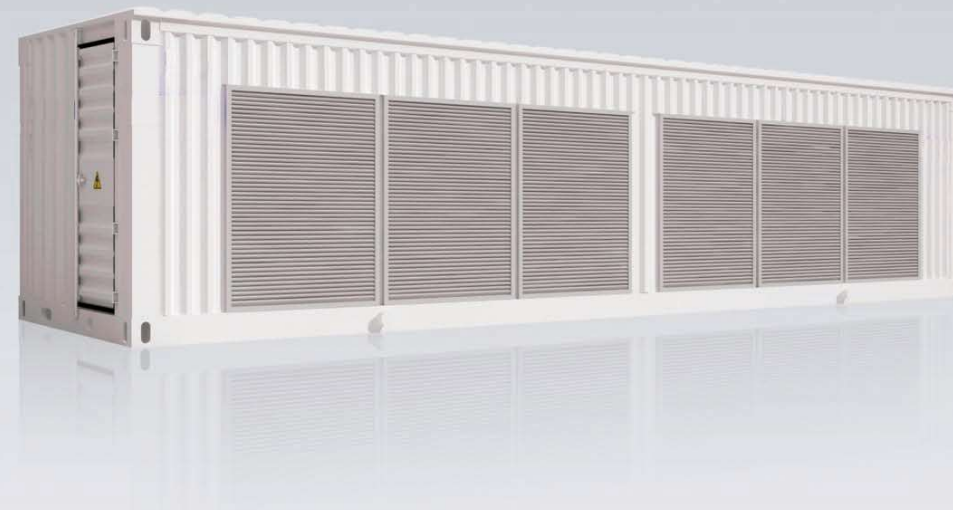
- The device is composed by three power units (7-12 Mvar device is equipped with six power units), a control cabinet, and a starting cabinet;
- It can be customized based on actual capacity demand;
- If 35kV voltage degree capacity is higher than 6Mvar device and lower than 10Mvar device, the 10kV voltage-drop type with Y-connection is recommended.

## Product of 35kV indoor TSVG series



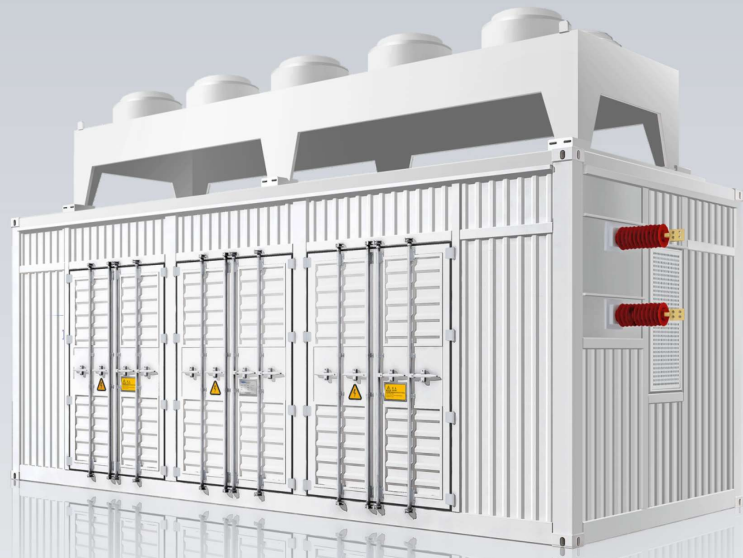
- The device is composed by power unit, control cabinet, incoming cabinet, and outdoor connecting electric reactor;
- It can be customized based on actual capacity demand;
- If capacity is higher than 10Mvar, the 35kV device voltage-drop type with Y-connection is recommended.

## Product of container-type TSVG series



Product of container TSVG series mainly contains three parts: starting container, power unit, and control room. The air vent is professional fixed shutter, which can prevent water from flowing into the device from any direction within range of 180° and stop access of large sand effectively. At the same time, the device is equipped with an outdoor air filter to stop micro dust. The lower air incoming type design can guarantee the container TSVG to be applied in bad weather such as serious sand blown, heavy salt mist, and extreme wind and snow to guarantee continual grid connection. For power part, it adopts H bridge cascade structure and every power unit is designed with drawer-type plug structure so that it is easy and convenient for maintenance. Professional high-voltage insulation coordination helps the product having minimal overall dimension in the industry.

## Product of 100MVar TSVG series



- The device can maintain and control node voltage, improve transient stability limit of the system, reduce low-voltage release load quantity, prevent transient voltage collapse, maintain node voltage of power transmission line dynamically, and improve transient transmission power limit of power transmission line;
- In the load side, the voltage flicker can be inhibited, load unbalance can be compensated, and power factor can be improved.
- One hundred Mvar STATCOM system is composed by tubular bus, starting cabinet, electric reactor, valve group container, control container and water route system. Wherein, the three valve group containers adopt D-connection, connecting to low-voltage side of 500/35kV professional transformer via 35kV isolation switch.

## Product Technical Parameters

Reference coefficient	
Rated voltage	3.3kV,6kV,10kV,35kV
Input voltage range	0.2 ~ 1.2pu
Grid frequency	50±5Hz
Rated capacity	±1Mvar~±120Mvar
Full load power loss	<0.8%
Total harmonic current distortion	≤3%, meeting GB/T 14549-1993 requirements
Total PCC harmonic voltage distortion	≤3%, meeting GB/T 14549-1993 requirements
Response time	Response time<5ms
Overload capacity	1.1 times overload, long time operation; 1.2 times overload for 1 minute, trip.
Fault treatment	Redundancy design meeting automatic N-1 operation
Operation mode	Constant reactive mode, constant voltage mode, constant power factor mode, load compensation mode, voltage reactive integrated control mode
Communication protocol	Modbus, IEC104
Monitoring method	Local/remote control
HMI	LCD touchscreen in both English and Chinese
Signal transmission	Optic fiber communication
Key technologies	Instantaneous reactive theory, SPWM theory, decoupling control technology, capacitor voltage balance control technology, 3 phase independent control technology, single pole multiple frequency technology, carrier phase-shifting SPWM technology, chain link temperature real-time monitoring technology
Power interface	380VAC, 220VDC dual circuit dual redundancy power supply
Main protection functions	Protection for overcurrent, overvoltage, drive fault, power unit overvoltage, overcurrent, overtemperature, communication fault, etc.
Wiring method	Star connection, angle connection
Cooling method	Air cooled, water cooled
Protection class	Indoor IP30/outdoor IP54
Installation method	Indoor, outdoor
Service life	Maintainable for 30 years
Operation environment	
Environment temperature	-25℃~+45℃
Storage environment temperature	-40℃~+70℃
Height above sea level	≤2000m(to be customized in case of >2000m)
Relative humidity	≤90%, no condensation, to be customized in case of high temperature or high salt mist
Pollution class	Class IV
Executive standard	DL/T 1215.1-2013, GB/T 14549-1993, GB/T 17626.2-2006, GB/T 17626.3-2006, GB/T 17626.4-2008, GB/T 17626.5-2008, GB/T 17626.11-2008



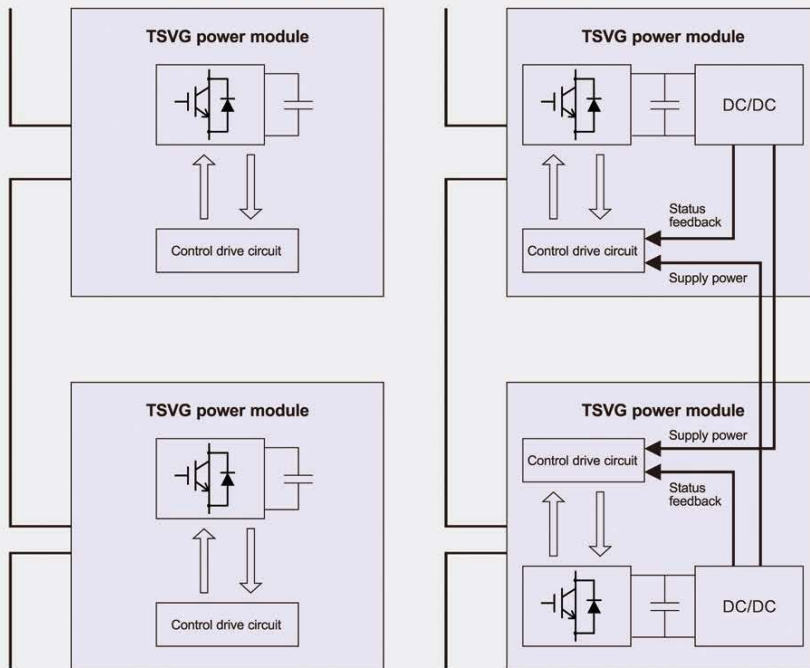
# TECHNICAL CHARACTERISTICS

## Smart redundancy control technology

(1) TSVG power model uses smart mutual power supply technology to improve operational reliability of the modules;

Functional block diagram of this scheme is shown as below. A DC bus power supply DC/DC power source is added inside the model to supply power source to neighbored module control and drive circuit. If there is any fault for power source inside the module, power source of the model will be switched to DC/DC power source inside the neighbored module automatically. At the same time, feedback of status information will be given to the control circuit, which can transfer the status information to main control equipment by photovoltaic isolation, realizing automatic and smart power supply of module. This scheme is featured with simple structure and high reliability.

Topological structure diagram of TSVG power module



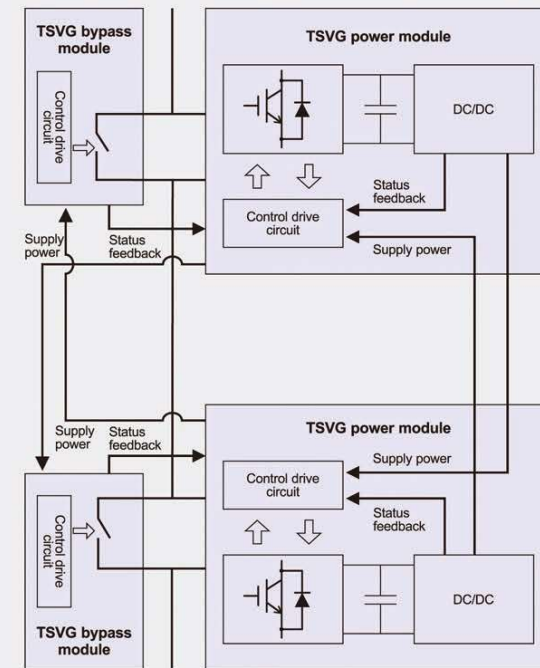
(a) Topological diagram of conventional power module

(b) Topological diagram of TSVG power module

(2) Power module is designed with redundancy design scheme and can realize automatic "N-1" or "N-2" operation by using smart and automatic bypass technology.

Based on different accessing modes, TSVG can supply different design schemes of module redundancy: the voltage-drop type applies "N+1" redundancy design and hanging type applies "N+2" redundancy design. By increasing automatic bypass of faulted module can be realized without stopping the equipment. System block diagram of bypass model is shown as below. AC side of every power module is paralleled with a bypass module, power source of which is supplied by the neighbored power model. Internal control board of power model can control bypass module automatically to realize automatic and smart bypass control of the power model under fault without stopping the system. The operational reliability of the system can be improved.

Topological structure diagram of TSVG power module



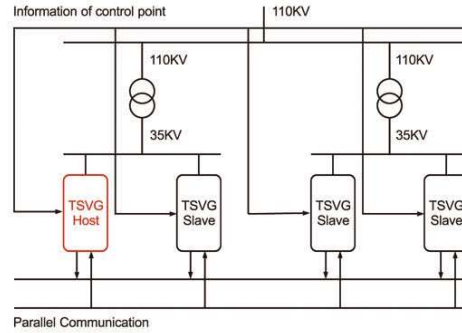
Automatic bypass system

**Parallel function of equipment**

TSVG equipment has complete function of parallel operation and capacity extension so that 2-8 SVG equipment for parallel operation can be realized. Diagram of parallel system is shown as below:

Communication among parallel systems is realized by optical fiber network, which can guarantee communication reliability within 500m. It uses three high-speed optical fiber interfaces of the main control board, and the speed can be 2.5Gbit/S.

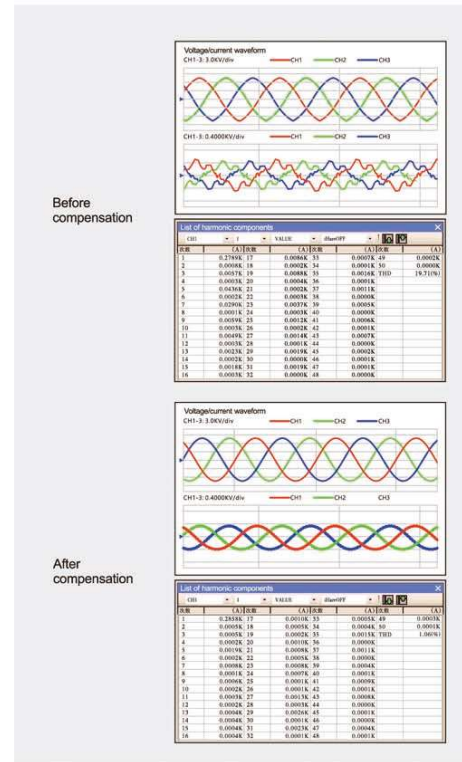
Diagram of Parallel System ▶



**Resonance damping and harmonic compensation**

Series resonance can be generated when the background harmonic voltage and parameters for power transmission line in the photovoltaic power station are matched, causing serious harmonic voltage amplification. Parallel resonance can be generated when harmonic current and parameters for power transmission line of grid in the photovoltaic are matched causing harmonic current amplification.

- Affected by carrier modulation and dead-time effect, the photovoltaic inverter can output harmonic current when transferring fundamental harmonic energy of grid. Harmonic wave outputted from the power station is featured with high frequency and wide frequency range. The influence of line distribution parameters on such type of harmonic wave cannot be ignored, and the parallel resonance is easy to be generated so that the harmonic current is amplified.
- SVG changes the resonant frequency of resistor network composed by inverter, power transmission line, and line impedance to lower harmonics amplification coefficient, realizing resonance damping;
- The harmonic voltage and current can be detected rapidly and correctly based on harmonic detection algorithm of FPGA with high performance;
- It has harmonic compensation capacity of 21-order harmonic and below;
- Virtual harmonic impedance can be adjusted to control and restrict resonance effectively based on real-time tested load harmonic current and harmonic voltage of parallel stations.



**Fault ride-through (FRT)**

If the power station suffers high/low-voltage fault, especial the unsymmetrical fault, overvoltage or overcurrent of SVG will be caused generally, resulting in that the fault ride-through cannot be realized. TSVG can improve high/low-voltage ride-through capability under symmetrical and unsymmetrical fault of the power station effectively via below ways:

- The strategy of direct voltage feedforward control is adopted to test grid change in real-time, track rapidly, guarantee rapid response under high/low voltage fault, and inhibit the SVG overcurrent;
- The zero sequence voltage injection is adopted to realize redistribution of current among three phases to solve overvoltage and overcurrent of SVG when the voltage is unbalance;
- Any drop depth of grid voltage can be responded freely to improve 100% reactive current support rapidly;
- The D/Yn transformer is adopted to generate a central point, connection between central point of secondary side for transformer and central point of SVG Y-connection can realize three phase decoupling control of SVG with Y-connection, and solve overvoltage and overcurrent of the SVG under unbalance status;
- If the drop depth is severe, the individual phase control strategy of D-connection TSVG is used to solve overvoltage and overcurrent of SVG when the degree of unbalance is high.

**Excellent three-phase unbalance compensation ability**

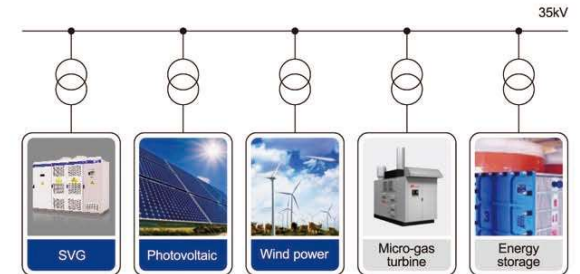
If any unbalance case occurs when the power source is supplied, unbalance three-phase load is the main form leading to three-phase unbalance degree of grid voltage is amplified. Existing SVG device can realize device protection by exiting operation or locking pulse generally. The TSVG device can realize grid-connected operation when grid voltage is unbalance and can improve degree of voltage unbalance for public connecting points within capacity range of the device.

TSVG can compensate unbalance of three-phase grid voltage in the following way:

- Targeted for unbalance of three-phase voltage for public connecting points caused by unbalance of three-phase load, TSVG adopts strategy of positive and negative sequence dual-loop voltage compensation. The positive sequence control loop can control voltage of public connecting point and DC side voltage at the specified value, and the negative sequence voltage control loop can improve degree of voltage unbalance for the public connecting point and improve power quality of the public connecting point;
- Negative sequence component detection of grid voltage is a critical link for unbalance control strategy. TSVG can detect negative sequence component of grid voltage by the secondary harmonic wave filter, realizing independent control of positive and negative component;
- Targeted for unbalance of grid voltage, TSVG adopts DDSRF-SPLL phase locking algorithm, which can detect voltage phase of positive sequence and amplitude of positive and negative sequence component of the grid correctly;
- When the grid voltage phase or grid voltage frequency changes suddenly, accuracy of phase locking will not be affected, which shows good phase and frequency adaptability. If grid voltage suffers certain harmonic wave, the phase locking can inhibit the harmonic wave well.

**Application when frequency is out of limitation**

Frequency fluctuation range of micro grid or weak grid system is  $\pm 2.5\text{Hz}$  under normal condition, the maximal frequency fluctuation range can be  $\pm 5\text{Hz}$ , under which condition the normal SVG cannot operate normally. Based on improved bisynchronous decoupling phase locking technology and control strategy of switch frequency self-adaption, TSVG can support maximal frequency fluctuation range for  $\pm 10\text{Hz}$ , which can satisfy application of micro grid and weak grid fully.

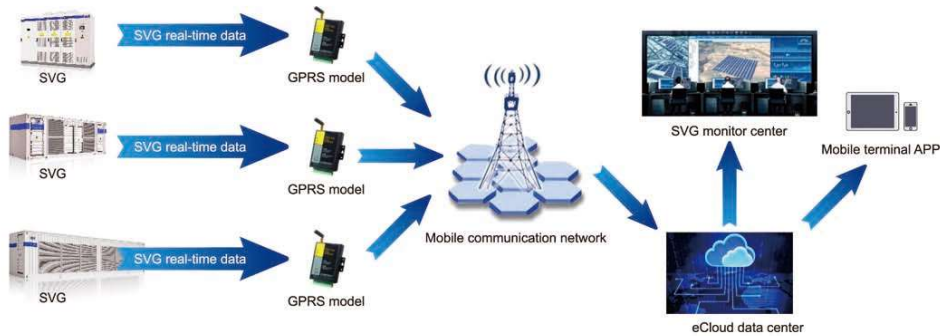


### TSVG remote monitor – eCloud platform

TSVG remote monitor – eCloud platform can access all TSVGs in the site into network via GPRS module to take real-time monitor for operation data of every TSVG. If there is any fault, it can take fault analysis soonest based on fault recording and SOE, position the fault rapidly, and judge if the operation can be realized again.

TDU remote monitor system can realize automatically remote monitor of high-voltage SVG equipment in the site via GPRS wireless internet transmission. The whole system is composed by monitor terminal, server management software, and website software.

The remote monitor terminal can realize communication with SVG via RS485, collecting operation status, event information, and recording data of the equipment, and then send it to targeted server via transmission terminal of internal GPRS wireless data. The server software can record the terminal data after analysis in matching database for user management, equipment allocation, and message alarm. The website server supports website browse, by which the equipment map, operational status of equipment, parameter query, maintenance log, historical event, curve, and equipment photo, etc can be checked.



As shown in the Figure, SVG real-time data is transferred to mobile communication network via GPRS module. It can realize data transmission if there are 2G signals of three operators in the site. The data can access to eCloud data center via public network. The company's expert team can get TSVG operation data in every site in TSVG monitor center or mobile terminal APP. By large data analysis, the TSVG health monitor, fault treatment, and remote operation guidance can be realized to predict the stable operation risk.

### Support accessing AVC system

#### (1) Multipal interfaces

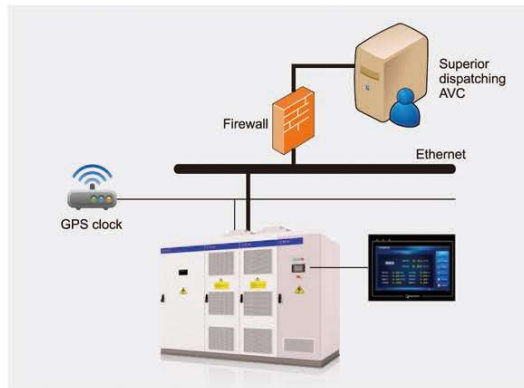
TSVG series high-voltage static var generator has 3 RS485 interfaces and 2 Ethernet interfaces.

#### (2) Multipal communication protocols

RS485 interface supports MODBUS host and slave protocol and allocates based on actual access condition.

The Ethernet interface supports IEC60870-5-104 standard.

(3) It can access AVC/dispatching system via Ethernet interface.



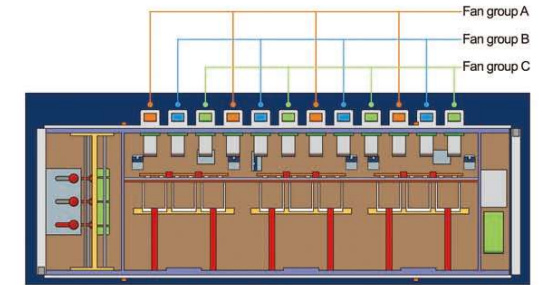
### Unique effective and power-saving operation technique

TSVG can realize effective operation of the system, saving operational cost, via smart fan control system.

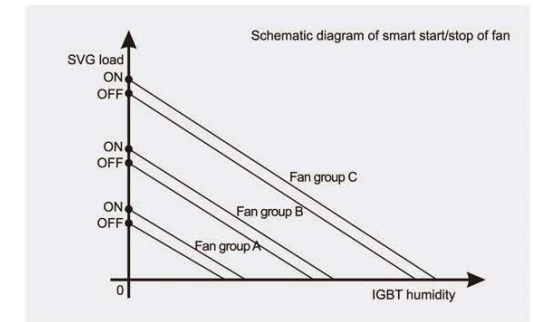
Operating loss of the SVG cooling fan dominates total loss of the system. The commonly method is that the operation will be continued no matter whether it is required by the cooling system after SVG connection, which will cause great energy waste in winter for most northwest area.

Based on development experience of power and electronic products for many years and careful research on IGBT temperature rise, TSVG can get function relationship between IGBT temperature rise, load, and ambient temperature via whole machine experiment of thermal simulation incubator. Based on such function relationship, we can calculate required air quantity under certain load and ambient temperature correctly, realizing operation on demand of the fan. In this way, loss of cooling system is lowered, SVG's noise is reduced, the service life and reliability is improved due to that the fan is not necessary to operate long time under full load.

After normal grid connection and operation of TSVG, air quantity required by the equipment under current working condition can be calculated based on external environment temperature and temperature of IGBT internal core. High-effective operation of the system can be realized by starting and stopping cooling fan group by group, as shown in below figure. All groups of fan operate in turn. After comparison of theoretical calculation and actual measurement, the smart air speed control system can save more 44% power than control system of conventional non-grouped fan. In addition, its service life and reliability can be improved greatly due to that the fan is not necessary to operate long time under full load.



Start/stop diagram of fan group



### Solution of container SVG

In order to reduce container volume and overall cost, power module is installed in horizontal series way, which can reduce overall volume of container with clear and beautiful structure.

- The container room made by cold-roll steel sheets is used, its external appearance is welded, treated by abrasive blasting, painted with epoxy zinc rich primer, penguard midcoat, and finishing coat, so its service life can be 25 years.
- Internal and external surface of container is treated with thermal insulation, so it can guarantee that the equipment can operate reliably when outdoor temperature is high.
- Outer corrugated sheet is produced by welding technology with reliable strength, and strong earthquake above 8 degree can be resisted.
- The air vent is designed with louver structure, neighbored louver structures are arranged and positioned in order, and the IP degree can satisfy IP54 required by the design.



**Easy maintenance**



The controller part is selected as subrack of frame series satisfying 19" international standard, realizing rapid plug and replacement of single board. The power part adopts H bridge cascade structure, every power unit is designed with drawer-type structure, and double handles operate jointly to realize direct connection of power and signal so that it is easy to draw out, move and change on the machine rack. All power units can be switched mutually, so the maintenance is easy and convenient.

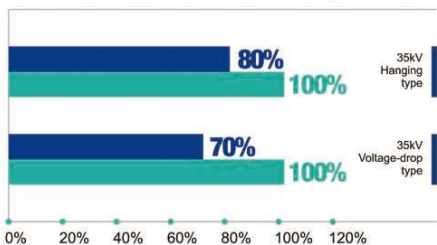
**SVG with minimal flooring area**

With high-power density power module design and compact high-voltage insulation structure design, TSVG can realize SVG with minimal flooring area under the same compensation capacity.

**Indoor type:**

SVG flooring area comparison (indoor type)

■ TSVG ■ SVG Minimal SVG in this industry



**35KV voltage-drop type:**

TSVG's flooring area is less than 20% and above than minimal SVG flooring area in this industry;

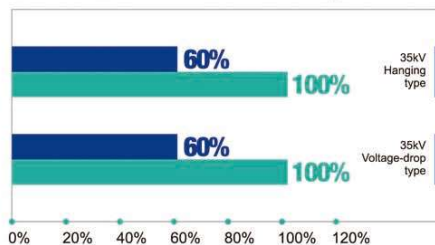
**35KV hanging type:**

TSVG's flooring area is less than 30% and above than minimal SVG flooring area in this industry.

**Outdoor type**

SVG flooring area comparison (outdoor type)

■ TSVG ■ SVG Minimal SVG in this industry



**35KV voltage-drop type:**

TSVG's flooring area is less than 40% and above than minimal SVG flooring area in this industry;

**35KV hanging type:**

TSVG's flooring area is less than 40% than minimal SVG flooring area in this industry.

# SOME APPLICATION PERFORMANCES



## Some Application Performances

Project Name	The Owner Name	Project Site	SVG Model	SVG Capacity (Mvar)	Property
Jiangzi 20MWp photovoltaic power generation project of China Resources Power Investment Co., Ltd. reactive compensation device for plateau use (voltage-drop type)	China Resource Power Investment Co., Ltd.	Jiangzi in Tibet	TSVG-12/35	±12	For plateau use Altitude is 4500m
Sitandong 220KV collection station project in Hami in Xinjiang(hanging type)	Hami Xinte Energy Co., Ltd.	Hami in Xijiang	TSVG-30/35*4	±120	35KV hanging type 4 parallel equipment Total capacity is 120MVar
Subujing 200MW wind power project in Yanchi of Guohua(voltage-drop type)	Guohua (Ningxia) New Energy Co., Ltd.	Yanchi in Ningxia	TSVG-12/35*4	±48	35KV voltage-drop type 4 parallel equipment Total capacity is 48MVar
Yangjing wind power booster station project of Huaneng in Dingbian (hanging type)	Huaneng (Dingbian) New Energy Power Generation Co., Ltd.	Dingbian in Shaanxi	TSVG-27/35 TSVG-31/35 TSVG-33/35	±91	35KV hanging type, 3 parallel equipment, Total capacity is 91M
49.5MWp wind power plant project for Jeminay phase I (voltage-drop type)	Urunchi Xinte Wind Energy Power Generation LLC	Jeminay in Xinjiang	TSVG-10/35	±10	Wind power plant in extremely cold area, Running for above one year
50MWp photovoltaic power generation project in Ganzi of Sichuan (voltage-drop type, outdoor integrated container)	Xinhe Huaguang Power Generation LLC	Ganzi in Sichuan	TSVG-24/35	±8	High altitude, Serious high-frequency resonance
The first batch of collective purchasing in Santang Lake in Hami of CLP in 2015 for the third wind power plant project (hanging type)	CLP Supplies and Equipment Group Company	Hami in Xinjiang	TSVG-08/35-C	±24	Large-area wind power plant, solve subsynchronous vibration
100MW wind power project 35kV dynamic reactive compensation device	Materials and Equipment Branch of China Power Investment Corporation	Guyang in Hebei	TSVG-15/35 TSVG-30/35	±45	35KV hanging-type ,2 parallel equipment
Wind power base phase II project in Hami of Xinjiang Area B in the 6th wind power plant of Jingxia	Hami Fengshang Power Generation LLC	Hami in Xinjiang	TSVG-24/35C*2	±48	35KV hanging-type container, 2 parallel equipment , Total capacity is 48M
Wind power base phase II project in Hami of Xinjiang 200MW engineering project in area A in the 6th wind power plant of Jingxia	Hami Fengshang Power Generation LLC	Hami in Xinjiang	TSVG-24/35*2	±48	35KV hanging-type container, 2 parallel equipment , Total capacity is 48M
Wind power project for Hongxing Meadow of Agriculture 13th division in Xinjiang (hanging type)	Hami Xinte Energy LLC	Hami in Xinjiang	TSVG-24/35	±24	35KV hanging type, Severe sandstorm weather
Leping Cormorant (40MWp+30MWp) of CLP reactive compensation complete equipment of agricultural light mutual-compensation photovoltaic power station project	Materials and Equipment Branch of China Power Investment Corporation	Leping in Jiangxi	TSVG-14/35 +7Mvar FC	±14	FC+SVG Wet and rainy in the south
50MWp agricultural greenhouse Photovoltaic power generation project of Tangyin 100MW project phase I	Henan Yuxin Solar Application Engineering Co., Ltd.	Tangyin in Henan	TSVG-10/35*2	±20	Agricultural light mutual-compensation

## Some Application Performances

Project Name	The Owner Name	Project Site	SVG Model	SVG Capacity (Mvar)
20MW photovoltaic power generation project of Hami alkali industry of CLP 35kV dynamic reactive compensation device (voltage-drop type)	Materials and Equipment Branch of China Power Investment Corporation	Xinjiang	TSVG-2/35	±2
150MW parallel photovoltaic power station project in Southeast area of Hami (voltage-drop type, outdoor integrated container)	Hami Huafeng New Energy Power Generation Co., Ltd	Hami in Xinjiang	TSVG-10/35-C	±10
50MW photovoltaic power station project of CEC in Hami	China New Times International Engineering Corporation	Hami in Xinjiang	TSVG-12/35-C	±12
Purchase of reactive compensation equipment of 50MWp photovoltaic power generation project of Huaneng in Hami of Xinjiang	Huaneng New Energy Inc.	Hami in Xinjiang	TSVG-10/35	±10
50MWp photovoltaic power generation project of Zhihuang New Energy Development Co., Ltd in Jingbian	Zhonglian Northwest Engineering Design Research Institute Co., Ltd.	Jingbian in Shaanxi	TSVG-10/35	±10
100MW photovoltaic project of CEC 11th Institute in Liangzhou of Gansu (hanging type)	Scientific Engineering Inc. of Information Industry Electronic 11th Design Institute	Liangzhou in Gansu	TSVG-15/35	±15
30MW photovoltaic project for Saiwei 14th division in Hetian of Xinjiang	Urunchi Xinte Wind Energy Power Generation LLC	Hetian in Xinjiang	TSVG-08/35-C TSVG-12/35-C	±20
Feilongding 49.5MW wind power project of Hebei Construction Investment in Xinyang (voltage-drop type)	Xinyang Xintian Wind Energy Co., Ltd.	Xinyang in Hebei	TSVG-13/35	±13
50MWp wind power project of Huaneng in Dabancheng (voltage-drop type)	Hami Xinte Energy LLC	Dabancheng in Xinjiang	TSVG-12/35	±12
Phase I of 20MWp photovoltaic power generation project in Chaxian (voltage-drop type, outdoor integrated container)	Chabuchar Huaguang Power Generation LLC	Chaxian in Xinjiang	TSVG-12/35-C	±12
20MWp parallel photovoltaic power generation project for phase II in Mulei (voltage-drop type, outdoor integrated container)	Mulei Xinte Photovoltaic Energy LLC	Mulei in Xinjiang	TSVG-02/35-C	±2
60MWp parallel photovoltaic power generation project for phase I in Aktao (voltage-drop type)	Aktao Xinte Photovoltaic Power Generation LLC	Aktao in Xinjiang	TSVG-12/10-C	±12
49.5MW wind power project in Laojun Temple in Mulei (voltage-drop type)	Mulei Xinte Huineng Power Generation LLC	Mulei in Xinjiang	TSVG-12/35	±12
30MW parallel photovoltaic power generation project for phase III in Avati (voltage-drop type)	Moyu Xinte Huineng Photovoltaic LLC	Avati in Xinjiang	TSVG-10/10	±10
49.5MW wind power project in Haba River (voltage-drop type)	Hami Shisanjianfang Xinte Wind Energy LLC	Haba River in Xinjiang	TSVG-15/35	±15
30MW photovoltaic power generation project in Zhiwei of Aixa	Xinwei Solar Power Engineering (Suzhou) Co., Ltd.	Aixa in Mongolia	TSVG-06/35	±6
30MW photovoltaic power generation project in Urho of Karamay (voltage-drop type, outdoor integrated container)	Karamay Xinte Huaguang Power Generation LLC	Karamay in Xinjiang	TSVG-06/35-C	±6
Phase II of 130 MW photovoltaic grid-connection power generation project of Xinhua hydraulic in Hetian Moyu reactive compensation device and grounding transformer complete equipment	Jianghe Mechanical and Electrical Equipment Engineering Co., Ltd.	Hetian in Xinjiang	TSVG-12/35-C TSVG-16/35-C	±28
Song Lake Photovoltaic Power Generation Station project in Jiangxi 35kV static var generator compensation complete equipment (voltage-drop type)	Materials and Equipment Branch of China Power Investment Corporation	Xinjiang in Jiangxi	TSVG-14/35	±14
20MWp photovoltaic power generation engineering SVG in Liugou of Chengde County	Materials and Equipment Branch of China Power Investment Corporation	Chengde in Hebei	TSVG-4/35	±4
Phase VI and V of photovoltaic grid-connection power generation project in Keping of CLP 35kV dynamic reactive compensation device (voltage-drop type)	Materials and Equipment Branch of China Power Investment Corporation	Xinjiang	TSVG-2.5/35*2	±5