RNSVG SERIES

LV DYNAMIC POWER QUALITY CONTROL DEVICE

PRODUCT OVERVIEW

Low-voltage RNSVG is the latest product of dynamic static var generator (short as SVG), representing the latest technology applied in the field of reactive power compensation. It uses the high-power IGBT device to replace ordinary thyristor. As an advanced reactive power compensation device of more reliability and flexibility, it plays a greater role in the field of power quality research. Its outstanding advantages are as follows: quick in response, absorption of continuous reactive power, generation of small higher harmonics, wide-ranged adjustment, low losses and noises.

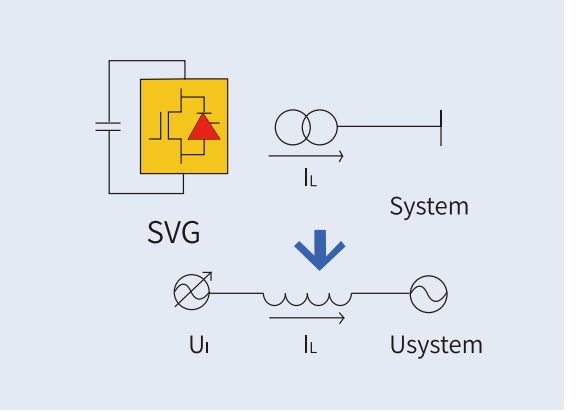
MODEL EXPLANATION

RN SVG — □ / □

- Rated voltage（kV）
- Rated capacity（kvar）
- Product code (Chain SVG device)
- Enterprise Code (RENLE)

PRINCIPLE OF OPERATION

Low-voltage RNSVG applies technologies of power electronics, computer and modern control into the electric power system. It connects the voltage source inverter (VSC) in parallel at the AC side to power grid, adopts advanced direct current control technology to flexibly and speedily control the current at the AC side directly, conducts the continuous reactive power adjustment from inductive to capacitive, meeting a demand of speed compensation on reactive power in order to suppress voltage fluctuations and enhance system stabilities. RNSVG dynamic compensates the reactive power current and harmonic current to lessen line losses, enhance the capability of active power transmission, suppress harmonics and improve power quality.



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LIST OF PRODUCT SPECIFICATION & MODEL

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System type	Structure form	Product model	Rated capacity(kvar)	W×D×H Size(mm)
Module unit	Drawer type or wall-mountable type	RNSVG-50/380-M	50	587x630x243
		RNSVG-100/380-M	100	587x650x353
		RNSVG-50/660-M	50	587x630x243
Cabinet system	Drawer cabinet type	RNSVG-100/380	100	800x1000x2200
		RNSVG-150/380	150	800x1000x2200
		RNSVG-200/380	200	800x1000x2200
		RNSVG-250/380	250	800x1000x2200
		RNSVG-300/380	300	1000x1000x2200
		RNSVG-400/380	400	1000x1000x2200
		RNSVG-500/380	500	1000x1000x2200
		RNSVG-100/660	100	800x1000x2200
		RNSVG-150/660	150	800x1000x2200
		RNSVG-200/660	200	800x1000x2200
		RNSVG-250/660	250	1000x1000x2200
		RNSVG-300/660	300	1000x1000x2200
		RNSVG-100/380	100	800x1000x2200
		RNSVG-150/380	150	800x1000x2200
		RNSVG-200/380	200	1000x1000x2200
		RNSVG-300/380	300	1000x1000x2200
	All-in-one cabinet type	RNSVG-100/660	100	800x1000x2200
		RNSVG-200/660	200	1000x1000x2200
		RNSVG-300/660	300	1000x1000x2200
		RNSVG-400/660	400	1000x1000x2200
		RNSVG-500/660	500	1000x1000x2200

Remark: 1. The above are the regular specifications, other unlisted models can be consulted;
2. If there are any changes to equipment size, please confirm and subject to the latest design.

PRODUCT PROPERTIES

- **It is equipped with the running ability of anti-harmonic, and increases the reliability of reactive power devices.**

  As the most advanced active power generator, RNSVG' s harmonic current in system will not cause over-load damages to itself, but to considerably increase the device reliability. However, the traditional capacitor compensator shall amplify the harmonic in system, which in reverse caused a faulted capacitor by the magnified harmonics, lowering the reliability of reactive power compensator to a great amount.

- **It completely avoids the resonance and greatly enhances the safety of system running.**

  RNSVG' s property of power source avoids the possibility of a resonance in theory, which greatly enhances the running safety of the power distribution system. But the traditional passive compensator is haunted by the possibility of a series or parallel resonance, a hazard in safety operation.

- **Quick in response proves a better compensation.**

  RNSVG, an active power generator cored with a 1GBT fully controlled high power electronic device, has the fastest response in control, being less than 1ms, and in closed loop, less than 5ms. The perfection in power quality is closely related to the speed of response. A higher speed of response has better effect on voltage flicker and fluctuation.

- **A dynamic and continuous adjustment provides a refined compensation of reactive power.**

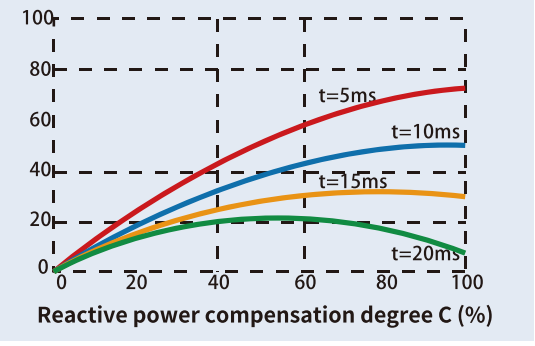
  Equivalent to a dynamic reactive power generator, RNSVG gives out the reactive power current accurately in real-time according to loads changes, enabling a stepless and continuous adjustment in reactive power output, with no occurrence of under-compensation and over-compensation, realizing a refined compensation of reactive power. Meanwhile, it lowers the loss and saves energy.

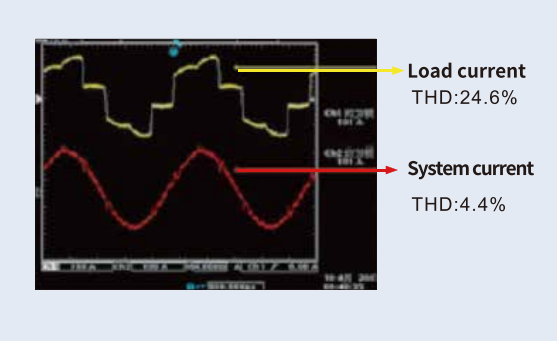
- **A two-way adjustment from inductive to capacitive makes the device automatically adapt to more working conditions.**

  RNSVG gives out both capacitive and inductive reactive power, which automatically adjusts according to different working conditions. In removing a heavy load and a sudden increase of capacitive reactance (at the capacitive power side), the problem of a surge in voltage shall be caused. Under that condition, RNSVG can automatically absorb the redundant reactive power in system to lower voltage to a normal level, ensuring the safety operation of electric equipment.

- **A capability of harmonic filter enables the clean electric power.**

  RNSVG is capable of certain harmonic filtering. At the time of providing a dynamic reactive power, the remaining capacities can filter the harmonic waves of 2 to 13 times, to the effect of electric power cleaning and pollution control.





APPLICATION OCCASION

- It is used in the reactive power compensation for AC motor, rectification, frequency conversion, medium-and-high frequency induction heating, welding and mixed loads, etc. It applies to low-voltage high-power electrolysis, electro-plating, electric arc furnace, pumping unit of oilfield, steel rolling factory, chemical engineering, intermediate frequency furnace, subway, machinery factory, wind power station, pump station, port, automobile factory, exhibition venues, office buildings, and etc.

PRODUCT SPECIFICATION

Product	RNSVG-100/0.4	RNSVG-200/0.4	RNSVG-300/0.4
Compensation capacity	±100	±200	±300
Rated voltage	380V		
Rated frequency	50/60		
Protection level	IP20 or customized at customer’ s demands		
Size (W×D×H)	800mm×800mm×2000mm		
Weight	100	180	200

Remark: above are the specifications of standard product, in case of any other needs, please contact our company.

TECHNICAL PARAMETERS

Product features	Rated voltage	AC380±15%，AC660±15%
	Operating frequency	50±5%
	Reactive compensation	Optional mode, auto control of capacity
	Reactive power adjustment range	A continuous and stepless adjustment between the rated inductive reactive power to the rated capacitive reactive power.
	Response time	1ms
	Active power loss	＜3% under rated module power
	Overload capacity	120%
	Operation way of multi-machine	Parallel running
	Meantime between failure	⩾ 100,000 hours
Control features	Switch frequency	10kHz in average
	Control algorithm	Field screening vector compensation algorithm with self-adaptive capability
	Way of Control	Closed loop control
	Controller	Digital DSP
	Communication function	Remote communication protocol of Modbus, RS485/232 /LAN communication interface
	Control connection	Optical fiber or electrical connection
Structure features	Protection level	IP20 or customized at customer’ s demands
	Color	RAL7035 (Light grey), other colors can be provided at request.
	Way of cooling	Forced air cooling
	Overall structure	Floor stand
	Way of Installation	Indoor installation, optional methods of fastening and incoming cable wires
Environmental conditions	Environment temperature	-25°C-+40°C
	Storage temperature	-25°C-+55°C
	Relative humidity	95% at maximum, free from condensation
	Altitude	Installed at an altitude of less than 2000 meters
Electromagnetic compatibility	In conformity with GB/T7251-2005 (GB/T7261-2000), including pulse train disturbance to damping oscillation waves, electrostatic discharge disturbance, radiated electromagnetic field disturbance, fast transient disturbance, surge (impact) disturbance degree, voltage interruption disturbance resistance, electromagnetic emission test, etc.	

RNSVG SERIES

660V/1140V SPECIALIZED CHAIN DYNAMIC POWER QUALITY CONTROL DEVICE

PRODUCT OVERVIEW

660V/1140V specialized chain-typed RNSVG (Static Var Generator) is the latest generation of SVG dynamic reactive power compensation device developed independently by our company through the technology of active power filtering based on the traditional SVG (aka STATCOM in the world). As the advanced equipment with cutting-edge dynamic compensation technology, it realizes speedy reactive power tracking and dynamic compensation under the environment of high harmonic current, and actively suppresses the harmonic waves of the system.

MODEL EXPLANATION

RN SVG — □ / □

- Rated voltage（kV）
- Rated capacity（kvar）
- Product code (Chain SVG Device)
- Enterprise Code (RENLE)

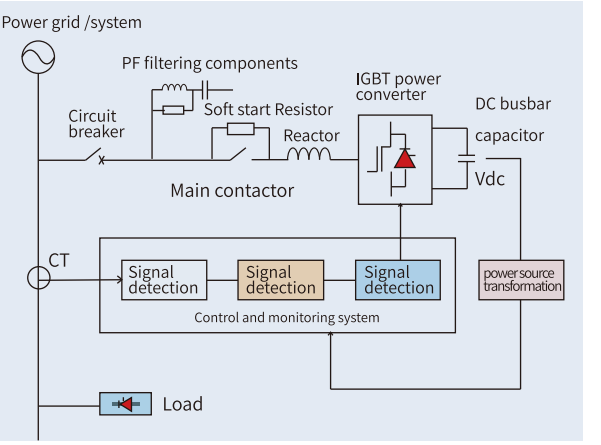
An example of product model:

- RNSVG-1200/0.66 stands for the RNSVG series chain dynamic power quality control device with a rated capacity of 1200kvar and a rated voltage of 660V.
- RNSVG-2000/1.14 stands for the RNSVG series chain dynamic power quality control device with a rated capacity of 2000kvar and a rated voltage of 1140V.

TECHNICAL PARAMETERS

Principle of Reactive Compensation

In accordance with the reactive power current given by the real-time testing system, RNSVG realizes the dynamic reactive power compensation through the capacitive or inductive compensating current generated by the IGBT power converter. The target value of the reactive power compensation can be set through the RNSVG operation panel. The reactive compensating current of RNSVG changes dynamically according to the requirements of the system reactive power, thus no over-compensation shall occur for flexible reactive power compensation causing no surge impacts.



Principle of filtering

RNSVG collects the real-time current signals through external CT inductor, separates the harmonic part through internal testing currents, and realizes lowering harmonics through the compensating current, with an equal amount to system harmonic but with opposite phase, generated by the IGBT power converter and PF filtering components. RNSVG adopts the self-mixing filtering algorithm independently developed by our company and a patent technique of PF filtering to ensure its stable operation under a high harmonic environment of 660V, and an actively suppression of system harmonics.

TECHNICAL FEATURES POWER ADVANTAGE

- **Advanced control strategy and algorithm**

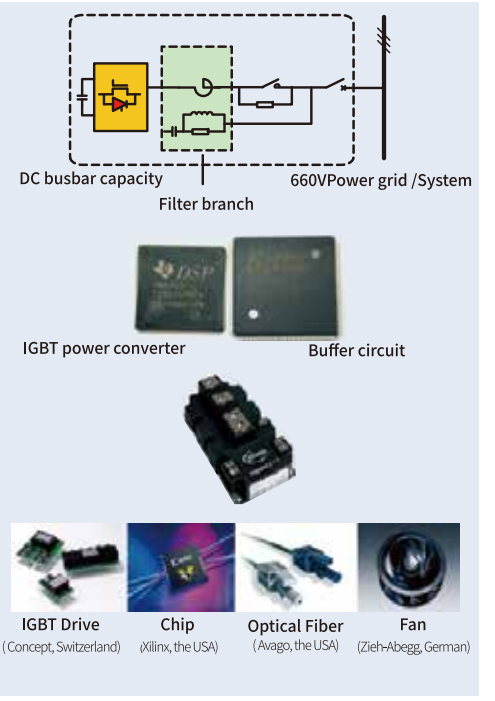
  Featured as high accuracy in control and fast in response, RNSVG adopts the closed loop control strategy and the algorithm of direct current control, to have a better compensation effect on a rapidly changing load of impact. Its total response time of the closed loop shall be less than 10ms.

- **An unique self-mixing filtering technique**

  The unique self-mixing filtering technique based on the topological structure of L+LC filtering current it adopted causes large amount of low-order harmonics for filtering by a specialized PF filtering components. And the high-order harmonics shall be actively filtered and eliminated by the 1GB power converter and an internal reactor. Thus, due to a better effect on filtering, it applies to any sites with electric network impedance for no resonances and its own safety.

- **Control chip with military standards**

  It adopts the control technique of DSP+FPGA+CPLD, and parallel operation of dual DSP. Thus its computing speed is way higher than the one adopts single DSP control way, and it has a smaller delay in communication, and is faster in response speed, beneficial to adopting a more advanced control algorithm, which makes RNSVG have a better compensating effect. Once after FPGA and CPLD are recorded in program, its operation reliability gets higher for a hardware circuit has no running programs.



- **All key components and parts are imported with original packaging**

  1.IGBT module- imported with original packaging from Infineon, German

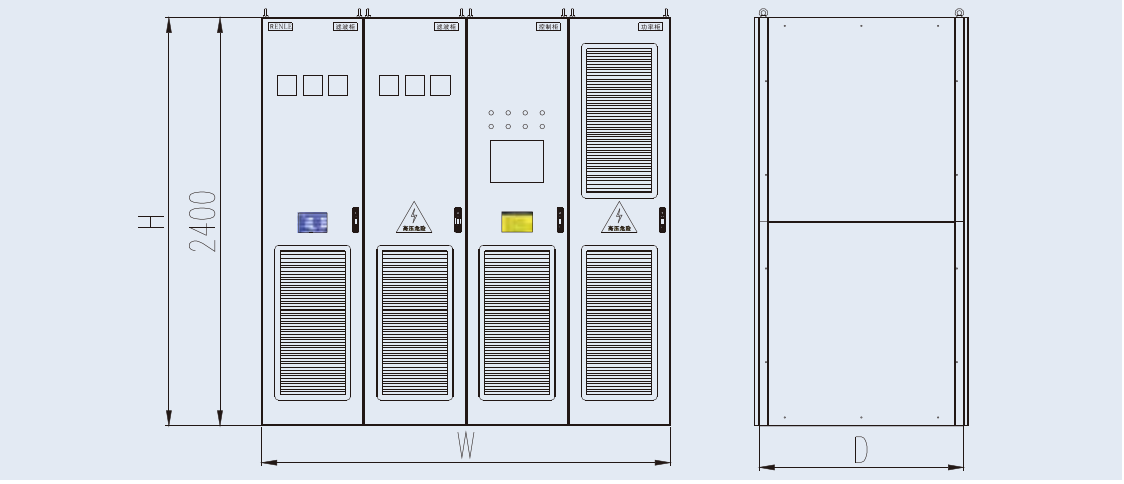
  (1)Fourth generation of the latest IGBT technology

  (2)A significantly decrease in switch and conduction losses

  (3)A considerable increase in temperature and power cycles, prolonging the service life

  2.Other key parts

OUTLINE DIAGRAM OF RNSVG SERIES CHAIN DYNAMIC POWER QUALITY CONTROL DEVICE



Voltage level	Rated capacity	Compensation capacity	Standard size of cabinet body HxWxD(mm)	Way of Incoming Lines
660V (-20%~+15%)	600	600	1200x1200x2400	Incoming lines from top or bottom
	800	800	1800x1200x2400	
	1000	1000	1800x1200x2400	
	1200	1200	1800x1200x2400	
	1600	1600	2400x1200x2400	
	2000	2000	2400x1200x2400	
1140V (-20%~+15%)	1000	1000	3000x1200x2400	Incoming lines from top or bottom
	1200	1200	3600x1200x2400	
	1600	1600	3600x1200x2400	

APPLICATION OCCASION

RNSVG series 660V/1140V specialized chain-typed dynamic power quality control device realizes dynamic reactive power compensation and harmonic treatment for power distribution system on non-liner loads in the industries of rubber, coal, petrochemical engineering, metallurgy and port, etc. In above industries, where large amount of high-power frequency inverter, intermediate frequency furnace, rolling mill, DC speed regulation and others are used, severely pollutes the power grid for harmonics generated due to frequent load changes and low power factors.





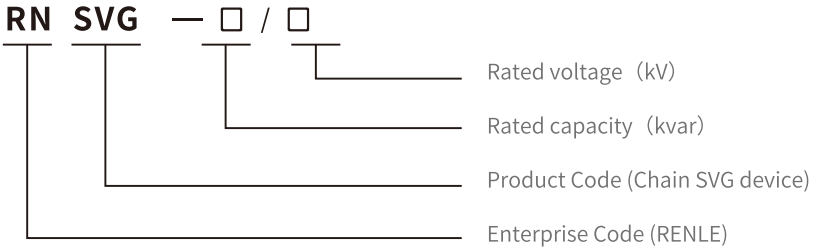
RNSVG SERIES

HV CHAIN DYNAMIC POWER QUALITY CONTROL DEVICE

PRODUCT OVERVIEW

Chain typed RNSVG (Static Var Generator) is the latest generation of dynamic reactive power compensation device based the IGBT, also known as the STATCOM (Static Compensator) in the world. As the advanced equipment with cutting-edge dynamic compensation technology, it is the third generation of dynamic reactive power compensator after the static reactive power compensator controlled by mechanical switching capacitor and thyristor.

MODEL EXPLANATION



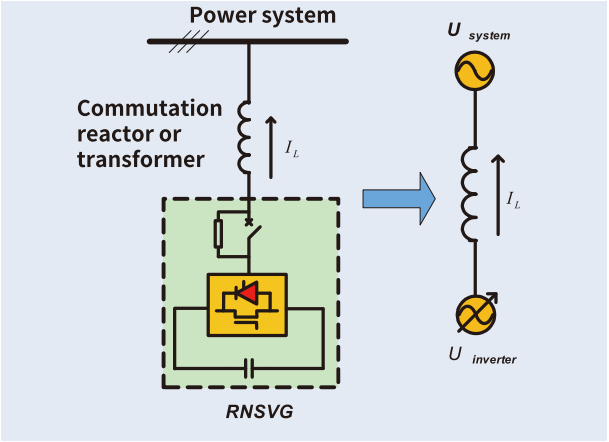
An example of product model:

- RNSVG-6000/10 represents the RNSVG series chain-typed dynamic power quality control device with a rated capacity of 6000kvar and a rate voltage of 10kV.

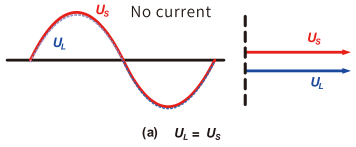
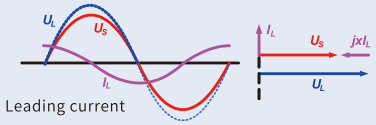
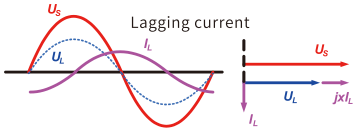
PRINCIPLE OF OPERATION

A self-commutated bridge circuit with a high power core of IGBT shall be connected in parallel to the power grid by commutation reactor (or transformer), then adjust the amplitude and phase position of output voltage from above bridge circuit in the AC side, or directly control the current in the AC side to absorb or give out the reactive power current in needs to realize the dynamic reactive power compensation.

Basic principle of chain RNSVG device



THREE MODE OF OPERATION

Operation mode	Waveform and Vector Diagram	Statement
No load operation mode	 (a) $U_L = U_S$	$U_L = U_S, I_L = 0$ RNSVG no reactive power output.
Capacitive operation mode	 (b) $U_L > U_S$	$U_L = U_S, I_L$ is the leading current RNSVG generates continuous and adjustable capacitive reactive power.
Inductive operation mode	 (c) $U_L < U_S$	$U_L < U_S, I_L$ is the lagging current RNSVG generates continuous and adjustable inductive reactive power.

PRODUCT CONFIGURATION

Configuration form of 6kV chain-typed dynamic power quality control device (includes no reactor size)

Product model	Capacity	Voltage	Overall size (includes the fan size on top of power cabinet)		
			W(mm)	D(mm)	H(mm)
RNSVG-1200 / 6	1200	6	4200	1200	2772
RNSVG-1800 / 6	1800	6	4200	1200	2772
RNSVG-2400 / 6	2400	6	4200	1200	2772
RNSVG-3000 / 6	3000	6	5400	1200	2772
RNSVG-3600 / 6	3600	6	5400	1200	2772
RNSVG-4800 / 6	4800	6	6600	1200	2772
RNSVG-6000 / 6	6000	6	6600	1200	2772
RNSVG-7200 / 6	7200	6	6600	1200	2772

Note: the above list of sizes is for reference, and you can consult the manufacturer for unlisted model.

Configuration form of 10kV chain-typed dynamic power quality control device (includes no reactor size)

Product model	Capacity	Voltage	Overall size (includes the fan size on top of power cabinet)		
			W(mm)	D(mm)	H(mm)
RNSVG-1000/10	1000	10	3000	1200	2772
RNSVG-2000/10	2000	10	4600	1200	2772
RNSVG-3000/10	3000	10	4600	1200	2772
RNSVG-4000/10	4000	10	5400	1200	2772
RNSVG-5000/10	5000	10	6600	1200	2772
RNSVG-6000/10	6000	10	7600	1200	2772
RNSVG-8000/10	8000	10	8600	1200	2772
RNSVG-10000/10	10000	10	10200	1200	2772
RNSVG-12000/10	12000	10	11800	1200	2772

Note: the above list of sizes is for reference, and you can consult the manufacturer for unlisted model.

SYSTEM CONFIGURATION

RNSVG device is composed of commutation reactor, battery cabinet, power cabinet, control cabinet, filter cabinet and etc. Its main configuration and schematic diagram are as follows: