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ZG-dSVG

ZG-dSVG Dynamic Reactive Power Compensation Device Product manual

Guangzhou Zhiguang Electric Technology Co., Ltd.

Integrated Energy Technology & Service Provider

Contents

一、公司简介

2002 2 002169

SVG

HAPF PCS UPS

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Company Profile

Guangzhou Zhiguang Electric Technology Co., Ltd., established in 2002 with a registered capital of 200 million yuan, is a wholly-owned subsidiary of Guangzhou Zhiguang Electric Co., Ltd. [stock code: 002169, hereinafter referred to as Zhiguang]. It is a core member company of Zhiguang, which is specializing in flexible power technology research in the direction of integrated energy technology and service strategy development.

Since its establishment, the company has been focusing on the research of electrical control equipment technology with high-power electronics as its core technology, and conducting technical research and industrial applications in the fields of smart grid, distributed micro-grid, energy storage, motor control and energy conservation, power quality control, advanced power technology, etc. The main products include Distribution network neutral point grounding device, High-voltage variable frequency converting system , Energy storage power conversion system, Static Var generator(SVG), Intelligent high and low voltage shore power system, Low-voltage power quality management and Large industrial intelligent UPS.

The company's products have achieved regional coverage in the country and are exported to dozens of overseas countries and regions, contributing to the global energy conservation and emission reduction and green energy industry. The company uses the private cloud platform and big data as its technical means to give full play to the advantages of the Internet + and establishes a marketing and service platform centered on key industries, key regions and major customers, providing products, technologies and comprehensive technical solutions to thousands of customers in the power, building materials, metallurgy, chemical, coal, port, municipal, and new energy industries. Typical customers include China State Grid Corporation, China Southern Power Grid, Five Major Power Generation Groups, China General Nuclear Power Group, China National Building Materials Group Corporation, Sinopec, Petro China and Baowu Iron and Steel Group.

二、ZG-dSVG简介
ZG-dSVG Introduction

2.1 产品简介 Product Introduction

ZG-dSVG

ZG-dSVG no longer uses large-capacity capacitors and inductors, but realises the conversion of reactive energy through the high-frequency switching of power electronic devices, which has the incomparable advantages of traditional reactive power compensation equipment in terms of technical indexes such as compensation e ect, power density and operation e ciency, and it is the best solution for the comprehensive management of power quality at present, which can e ectively improve the transient stability of the grid voltage, inhibit the flicker of the bus voltage, compensate the imbalance current, filter out the harmonics, and improve the power factor.

2.2 应用场景 Application Scenario

SVG

ZG-dSVG series products can be widely used in petrochemical industry, new energy industry, coal industry, metallurgy, electrified railway, urban construction and other electric power industries to provide high-quality and reliable reactive power compensation solutions for various motors, lighting equipment, generators, welding machines, rolling mills, resistance furnaces and other equipment.

石油、化工、矿山、码头、重型工业
Petroleum, chemical, mining, dock, heavy industry




Stabilisation of supply voltage;

Centralised compensation in substations supplying power to a larger number of medium and low voltage motors;

local dynamic compensation of reactive power for large motors;

Centralised compensation of reactive power of relevant power-using equipment;

Reduction of reactive power fluctuations and harmonics in traction drives.

钢铁、冶金
Steel, metallurgy




Stabilise busbar voltage;

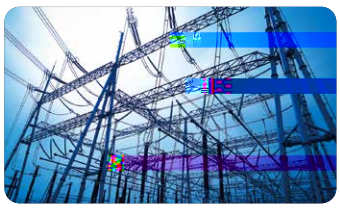
Improve power factor to reduce reactive power loss;

Reduce voltage fluctuation, inhibit flicker, improve production e ciency;

Filter out harmonics and ensure equipment safety;

Balance negative sequence.

城市配网及农网供电
Power supply to urban distribution networks and agricultural networks




K R L

Cd IGBT

udes the inlet cabinet, the starting cabinet and the power cabinet. The inlet cabinet is equipped with isolation switch, and pre-charging current limiting resistor R, connecting reactor L, and the power cabinet is equipped with a current co his is achieved by cascading identical power units, which contain the DC support capacitor Cd and the commutator circuit com BTs.

IGBT

limiting resistor R e ectively limits the current before the device starts, protecting the IGBTs and DC support great thermal capacity and can withstand repeated inrush currents for a short period of time.

L

	6kV	6~8
	10kV	10~12
	35kV	36~48

nected to the grid through the connecting reactor L. This reactor converts the output voltage of the converter n into the grid, smoothing the ripple generated by the converter chain. The reactor is designed with high netic density, featuring high linearity, low loss and harmonic resistance.

The main controller consists of various functional boards to complete AC signal acquisition, switching control, PWM pulse distribution, status detection and system protection.

The power unit driver board is installed in the power unit and is connected to the main controller via optical fibre to convert the control signals into drive signals for the IGBTs and to provide feedback on the status of the power unit.

ZG-dSVG adopts LCD touch screen with complete data display (table, curvv ablec] s ts 9 oe l' cpts p

三、规格和技术参数
Specifications and Technical Features

3.1 型号说明 Model Description

The products are categorised as follows:

· Y , W

· 35 35kV 10 10kV 35/10 35kV 10kV 06 6kV 35/6 35kV 6kV

· kVar

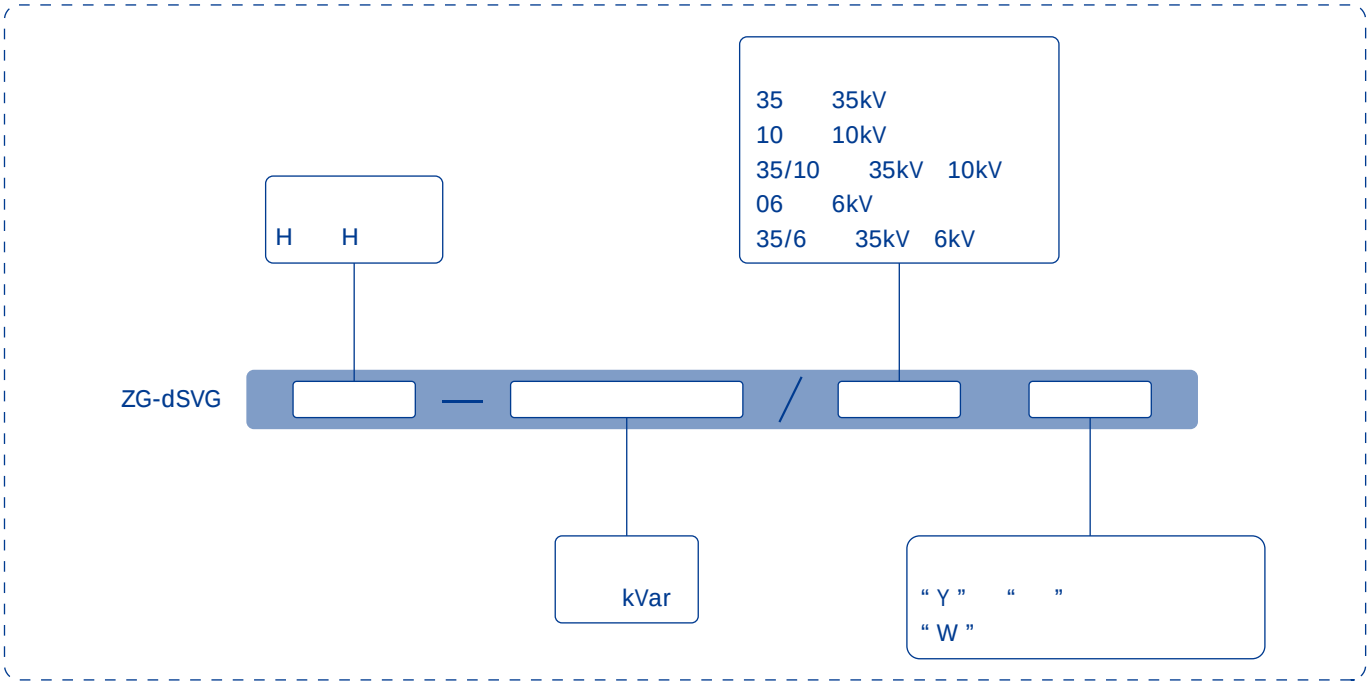
· H H

·Installation form: "Y" for indoor installation in "one" arrangement, "W" for outdoor installation.

·Voltage level: 35 means 35kV series, 10 means 10kV series; 35/10 means 35kV step-down 10kV series, 06 means 6kV series; 35/6 means 35kV step-down 6kV series.

·Rated capacity: unit kVar

·Product structure form: H for H-bridge cascade



10kV ± 10000kVar H

ZG-dSVG-H 10000/10Y

Example: A system with rated voltage of 10kV, rated compensation capacity of ±10,000kVar, H-bridge cascade topology, and "one" type arrangement for indoor installation, the model number can be expressed as ZG-dSVG-H 10000/10Y.

3.2 技术参数 Technical Parameter

Technical Indicators	Technical Parameter
rated voltage	6~35kV
compensation capacity	0.3~150Mvar
Adjustable range	Continuously and infinitely adjustable from rated inductive reactive power to rated capacitive reactive power
rated frequency	50Hz
response time	<4ms
overload capacity	1.1 3 1.1x duration 3 minutes
harmonic characteristic	2% Output harmonic current total distortion rate is less than 2%
Cooling method	/ / Air-cooled/water-cooled
operating mode	/ / / / / constant power factor/constant reactive power/constant voltage/constant current/ voltage reactive power synthesis/load compensation
Installation	Indoor cabinet, outdoor container
environmental temperature	-40 ~45
altitude	<3500m

3.3 技术特点 Technical Features

Fast response time and high voltage flicker suppression capability

ZG-dSVG ≤ 4ms

ZG-dSVG response time: ≤ 4ms, can complete the mutual conversion of rated capacitive to rated inductive reactive power in a very short time, which can satisfy the compensation of inrush loads, e ectively inhibit the voltage flicker, and prevent grid accidents.

High operating e ciency and excellent harmonic characteristics

ZG-dSVG ≥ 99

<2%

Cascaded ZG-dSVG adopts low-loss fully-controlled power devices, combined with special control algorithms to ensure performance and low loss, and the e ciency of the device is ≥ 99%;It can e ectively inhibit high-frequency harmonic injection, and the output current distortion rate is <2% when compensating reactive power.Under the condition of su cient capacity, it also has the functions of suppressing low harmonics and compensating unbalance.

High heat dissipation capacity

ZG-dSVG

ZG-dSVG air-cooled cooling system adopts intermediate air duct design with patented technology, and the cabinet top fan adopts long-life, maintenance-free external rotor motor and centrifugal fan with low-noise design, which ensures the safety and reliability of the overall system.

High fault detection and protection capability

ZG-dSVG

With Hall detection and unit self-test function in standby, and self-test and protection function in voltage, current and temperature after the system is running, faults can be detected in time and isolated automatically to ensure that the system will not a ect the power grid and the equipment at the load side.

In addition, ZG-dSVG products with bypass function can maintain stable operation during fault isolation.

Diversified system functions

ZG-dSVG

ZG-dSVG has constant voltage compensation mode in addition to the conventional constant power factor compensation and constant reactive power compensation functions, and high and low voltage traversing functions to cope with new energy power generation; High-voltage self-checking and self-starting function to cope with extremely unstable power grid;

Possessing multiple parallel operation technology to cope with the site of super-large capacity as well as multiple busbars and multiple systems, and obtaining the patented technology. (Optional functions)

四、应用案例
Application Cases

4.1 部分项目业绩表 Part of the Project Performance Table

NO.	项目名称 project name	容量 capacity kVar	电压 volotage kV	套数 set	应用场景 application scenario
	1200+ New Energy Industry Cumulative 1200+ units in operation				
1	2023 2023 Huaneng Collective ProcurementHuaneng Hainan Branch Lingao O shore Wind Farm Project	60000 Large-capacity parallel connection 180MVar--+180MVar	35	3	O shore Wind Power
2	Guodian Investment Centralized Procurement of Guangxi Agricultural Photovoltaic Complementary Power Generation Project	54000	35	1	Onshore Wind Power
	Jingtai Wind			1	Onshore Wind Power

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NO.	项目名称 project name	capacity kVar	volotage kV	套数 set	应用场景 application scenario

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NO.	项目名称 project name	容量 capacity kVar	电压 volotage kV	套数 set	应用场景 application scenario
9	35kV Shaanxi Coal Tongchuan Mining (Bureau) Co., Ltd. Huajing Hougou Wind Shaft Substation 35kV Substation	5000	10	1	Coal
10	35kV SVG Shaanxi Coal Hancheng Xipeng 35kV Substation SVG Project	SVG 2000 FC 2000	6	2	Coal
11	EPC EPC general contracting project of Phase II of surface production system of Hongshazhuan open-pit coal mine of Xinjiang Company	1200	10	4	Coal
12	110kV Ruoqiang Zhicun Washixia Mining Co., Ltd. ore dressing plant 110kV substation project	15000	10	1	Mining
13	EPC EPC General Contracting Project for Raw Coal Transportation System Rehabilitation Project of East Open Pit Mine	3000	10	2	open-pit coal mine
14	Zijin High and Low Voltage Distribution System Compensation and Energy Saving Technology Reform Project	2000	10	2	Mining production
15	10kVSVG Yunnan Tin Industry Co., Ltd. tin branch 10kVSVG project	1500	10	2	Tin production
16	35kV Fugu County Honghua Coal Mine Co., Ltd. 35kV substation new construction	3000	10	2	Coal
17	10kV SVG Yushen Coal Yushuwan Coal Mine 10kV high-voltage SVG reactive power compensation device	3000	10	2	Coal
18	SVG SVG Project of Ground Power Station of Ping Coal Five Mines	4000	6	1	Coal
	Semiconductor manufacturing				
1	4.8 Inner Mongolia Dongli Photovoltaic Annual Output of 48,000 tonnes of Silicon Material Project	35000	35	2	semiconductor manufacturing Silicon production
2		23000	35	2	
3		12000	10	2	
4	20GW Annual output of 20GW monocrystalline silicon rod production line project of Kunming Dongchuan Yuzhe Semiconductor Co.	8000	10	8	
5	24 8 Zhejiang Wangrong Semiconductor annual output of 240,000 pieces of 8-inch power device semiconductor project	1200	10	2	semiconductor manufacturing
6	35kV SVG Ningxia Dunyuan Juxin Semiconductor Co. 35kV Station High Voltage SVG Project	5000	10	2	semiconductor manufacturing
	200+ Petrochemical industry accumulated 200 + sets of operation				
1	SVG Liaoning Zhende Chemical Liaodong Bay Company SVG Retrofit Project	2000	10	2	fine chemicals
2	5.3 Anhui Tiantie Li-power new energy with an annual output of 53,000 tons of lithium battery chemicals and ancillary products project	1000	10	1	Lithium chemical
3	150 SVG 1.5 million tons SVG project of Xinjiang Xinji Energy Chemical Co.	1500	10	8	coal chemical

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NO.	项目名称 project name	容量 capacity kVar	电压 volotage kV	套数 set	应用场景 application scenario
4	SVG Procurement of SVG Equipment for Fracturing in Jiangsu Oilfield	2500	10	1	oilfield production
5	2#6kV Henan Kaixiang Fine Chemical Co., Ltd. 2#6kV reactive power compensation device technical reform project	5000	6	2	fine chemicals
6	SVG New substation reactive power compensation SVG project of Xinpangnan Coking Co.	12600	10	2	Coking coal to coke, coke oven gas and others
7	23 SVG Kailuan Chemical 23rd year the first batch of coal mine conversion SVG procurement	10000	6	4	Chemical
8	10 SVG Procurement of SVG equipment for 100,000-ton carbon utilization R&D platform	1500	10	1	Chemical
9	17-2/23-6 Ushi 17-2/23-6 Oilfield Cluster Joint Development Project	4000	35	1	oil exploration
10	Ground Engineering for Baimiao Shallow Gas Storage Project in Zhongyuan Oilfield	5000	10	2	oil exploration
	10kV Hunan Erkang Pharmaceutical 10kV Power Distribution Project	4000	10	1	pharmaceutic
	SVG China Coal Xuyang Chemical SVG Retrofit Project	4000	10	1	Chemical
	Power Station of Longhua Coal Industry Urea Comprehensive Utilization Project			2	coalchemical

ng transmission and substation project, the constru

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0Y high-voltage dynamic re ctive power comp sation device independently c

Guangdong Power Grid substa on.This sub ation has two 240MVA main trans

l 24 110kV bus outlets, of which one ecti of 110kV bus outlets leads to the urba

ailway is used to start the large reactive power shock easily caused by bus volta

nd bus voltage fluctuations.The pro t instals a set of 8MVar ZG-dSVG dynamic reac

e of the substation main transfo r, which e ively improves the transient stabilit

4.3 新能源发电的应用 Application of New Energy Power Generation

华电集团某风电场动态无功补偿项目
Huadian Group Wind Farm Dynamic Reactive Power Compensation Project

35kV ±8MVar 7MVar FC
49.5MW 33 1500kW 3500 FC
SVG

Zhiguang's self-developed 35kV direct-hanging ±8MVar high-voltage dynamic reactive power compensation device and 7MVar FC inductive reactive power compensation device were formally put into operation at the wind farm of Huadian Group.The construction scale of this wind farm is 49.5MW, with 33 wind turbines of 1500kW capacity, and the wind farm is at an altitude of 3500 metres above sea level.

On the one hand, the fixed inductive reactive power is compensated by the FC inductive reactive power compensation device, and on the other hand, the residual reactive power of the SVG grid is dynamically compensated, which meets the demand for reactive power compensation at the site and stabilises the power factor, and saves the cost of larger capacity reactive power compensation device, site and related construction costs.

华能集团某风电场水冷高压动态无功补偿项目
Huaneng Group Water-cooled High Voltage Dynamic Reactive Power Compensation Project for Wind Farms

35kV 40MVar SVG 100MW
35kV ZG-dSVG

Zhiguang's self-developed 35kV direct-mounted 40MVar water-cooled high-voltage dynamic reactive power compensation device SVG was o cially put into operation at Huaneng Group's 100MW wind farm. Wind power generation projects are a ected by the weather, with large fluctuations in voltage drop amplitude and low power factor. The project installed ZG-dSVG water-cooled reactive power compensation device on the 35kV bus side according to the actual situation of the site to suppress voltage fluctuation and improve the bus power factor.

宁夏某光伏电站多套高压动态无功补偿装置并联运行项目
Ningxia photovoltaic power station multiple sets of high-voltage dynamic reactive power compensation device parallel operation project

6 35kV 24MVar SVG 220kV
2 360MVA 35kV 35kV 3
ZG-dSVG 3 SVG

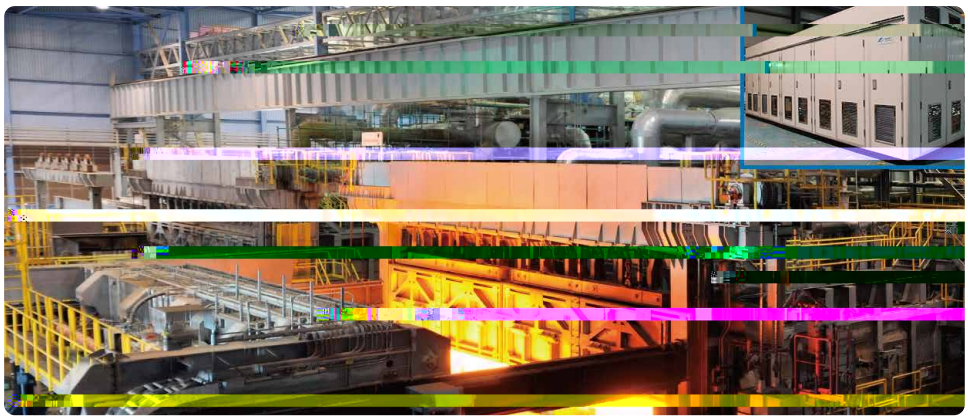
Six sets of 35kV direct-mounted 24MVar water-cooled SVGs with multiple parallel operation developed by Zhiguang were o cially put into operation at a Ningxia PV power station.The 220kV photovoltaic booster station is installed with two 360MVA main transformers and two 35kV busbars. According to the situation of large grid-connected capacity and two sections of buses, three sets of water-cooled dynamic reactive power compensation devices are installed on the side of each section of 35kV buses, and at the same time, the centre screen is used to calculate the reactive power of the buses at the grid end, so as to realize the synchronous operation of three sets of SVGs, which can satisfy the requirements of suppressing voltage fluctuation and improving the power factor of buses at the site.

4.4 工业负荷的应用 Application of Industrial Load

河北某钢铁热轧系统动态无功补偿项目
Hebei Iron & Steel Hot Rolling System Dynamic Reactive Power Compensation Project

10kV ±6MVar SVG 6MVar FC
FC SVG

Zhiguang's self-developed 10kV direct-hanging ±6MVar SVG and 6MVar FC filtering device was formally put into operation at Hebei Iron and Steel Hot Rolling Mill. The site has large load shocks, large voltage dips, low power factor, and many harmonics exceeding the standard. The FC compensates for many harmonics in the bus, and the SVG compensates for grid reactive power and capacitive reactive power during harmonic compensation, e ectively suppressing voltage fluctuations brought about by the steel hot rolling process and stabilising the power factor on the bus side.



淮南矿业动态无功补偿项目
Huainan Mining Industry Dynamic Reactive Power Compensation Project

10kV ± 7MVar SVG 3MVar FC
FC SVG

Zhiguang independently developed 10kV ± 7MVar SVG and 3MVar FC filtering device was put into operation in Huainan Mining Industry.The site has large load shocks, large voltage dips, low power factor, and many harmonic exceedances. FC compensates for many harmonics at the busbar, and SVG compensates for grid reactive power as well as capacitive reactive power during harmonic compensation, e ectively suppressing voltage fluctuations and stabilising the power factor at the busbar side.

山西某钢铁优钢35kV变电站动态无功补偿项目
Shanxi Iron & Steel 35KV Substation Dynamic Reactive Power Compensation Project

35kV 2 10Mvar 10kV

The new construction of 35kV substation of Shanxi Steel adopts two sets of 10Mvar 10kV dynamic reactive power compensation devices. The site voltage fluctuation is large, harmonic pollution is serious, three-phase imbalance and other problems lead to the overall power factor is low. Therefore, the dynamic reactive power compensation device e ectively reduces voltage fluctuation, stabilises bus voltage, improves power factor and reduces reactive power loss.

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