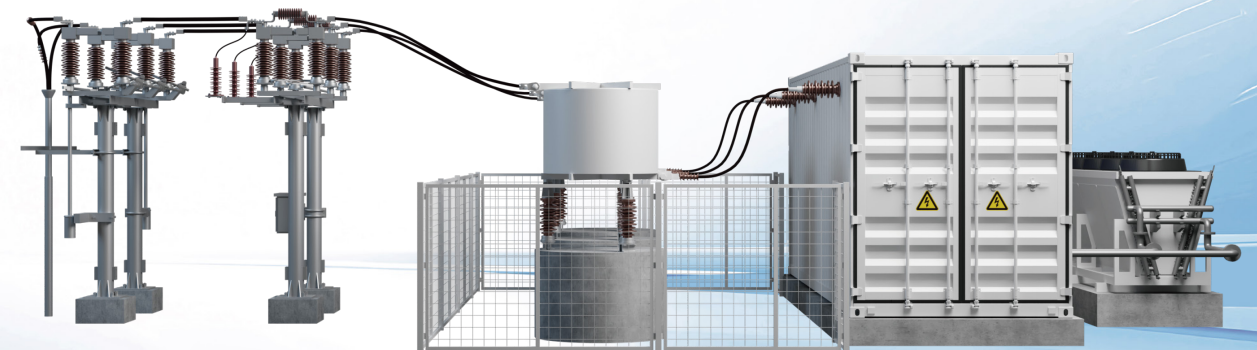


Power Quality Product Solutions



TBEA Xi'an Flexible Transmission and Distribution Co., Ltd.

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TBEA Xi'an Flexible Transmission and Distribution Co., Ltd.



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About Us

Founded in 2010, TBEA Xi'an Electric Technology Co., Ltd. is a trusted provider of high-performance energy solutions, with expertise in solar power generation, battery energy storage systems (BESS), power conversion systems (PCS), advanced power distribution, flexible HVDC transmission, and intelligent operation & maintenance (O&M) platforms. The Company emphasizes reliability, safety, and long-term value in global energy infrastructure. Its comprehensive portfolio includes grid-connected solar inverters, PCS, high-voltage STATCOM, energy routers for microgrids, flexible HVDC converter valves, and more.

In the solar sector, TBEA Xi'an Electric Technology offers a complete lineup of grid-connected inverters ranging from 8 kW to 9,000 kW, with a cumulative global installation capacity exceeding 100 GW. For energy storage, TBEA Xi'an Electric Technology has delivered BESS solutions with a total installed capacity of 5 GWh, and over 55 GVar of static var generators (SVG). As one of the pioneers in China, the Company provides integrated solutions spanning BESS, microgrids, HVDC systems, SCADA platforms, and the TB-eCloud intelligent O&M system.

TBEA Xi'an Electric Technology maintains a strong international footprint, with operations in more than 20 countries across Asia, Europe, Latin America, and the Middle East. Guided by its mission of "Green Energy for a Better Life", TBEA Xi'an Electric Technology is dedicated to driving the sustainable development of global society through intelligent, efficient, and eco-friendly energy solutions.

38⁺GW

Total designed capacity of
PV and wind power

20⁺

Countries and
regions

20⁺GW

Total access of
TB-eCloud

5⁺GWh

Cumulative global shipments
of energy storage system

55⁺Gvar

Cumulative global
shipments of TSVG

100GW

Cumulative global
shipments of PV inverters

TBEA 特变电工

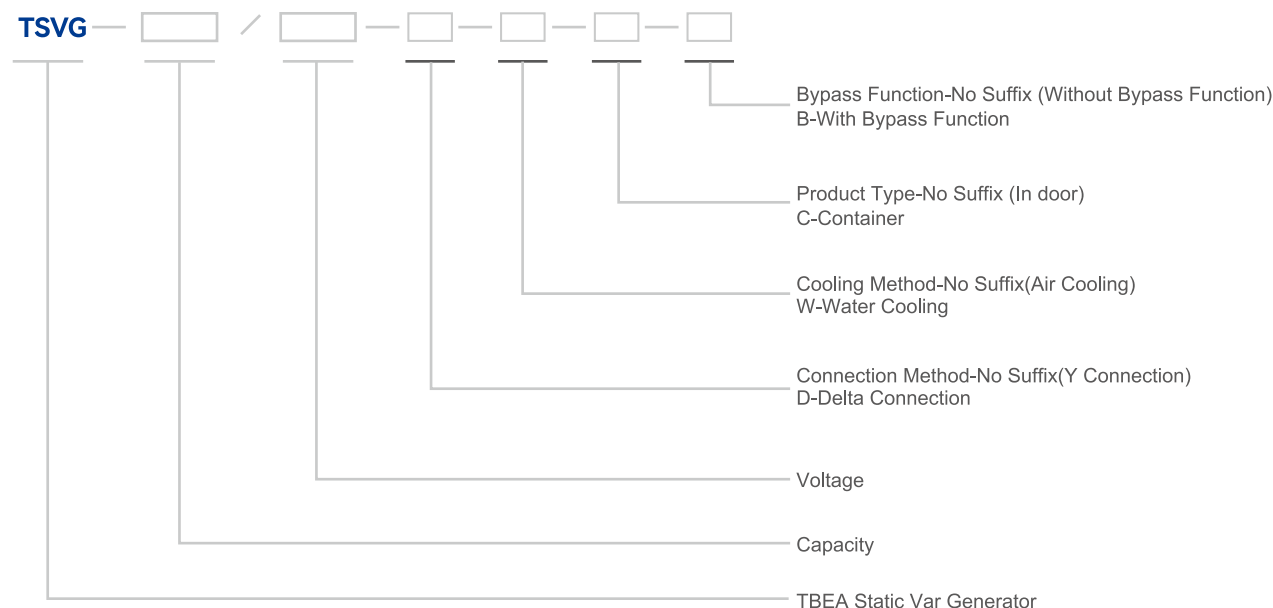
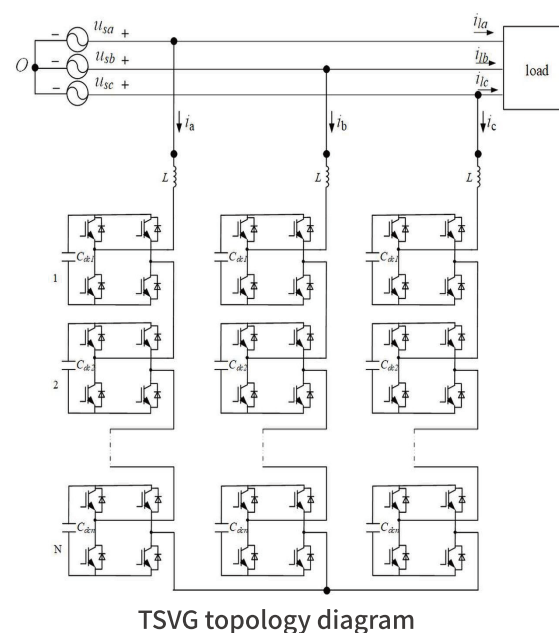
Product performance introduction

Product Overview

Static Var Generator (SVG/STATCOM), is a dynamic reactive power compensation system utilizing self-commutated power semiconductor bridge converters. As the optimal solution in reactive power control, SVG demonstrates unparalleled advantages over traditional approaches including rotary phase modifiers, capacitor/reactor banks, and thyristor-controlled reactor (TCR)-based SVC systems.

TBEA Xi'an Electric Technology High Voltage Static Var Generator (TSVG) series, covers multiple voltage levels (10kV, 35kV), air-/liquid-cooling configurations, and unit capacities ranging from 1Mvar to 150Mvar, supporting capacity expansion through parallel operation. The product features fast response, high control accuracy, and strong grid adaptability.

SVG/STATCOM finds extensive applications in renewable energy generation and industrial sectors, delivering comprehensive power quality management solutions. For high-capacity, high-voltage transmission/distribution scenarios, it employs high-power press-pack devices and system-level redundant control algorithms to enhance grid voltage stability and fault resilience. Its emergency voltage stability coordination control technology prevents grid voltage instability or collapse incidents.



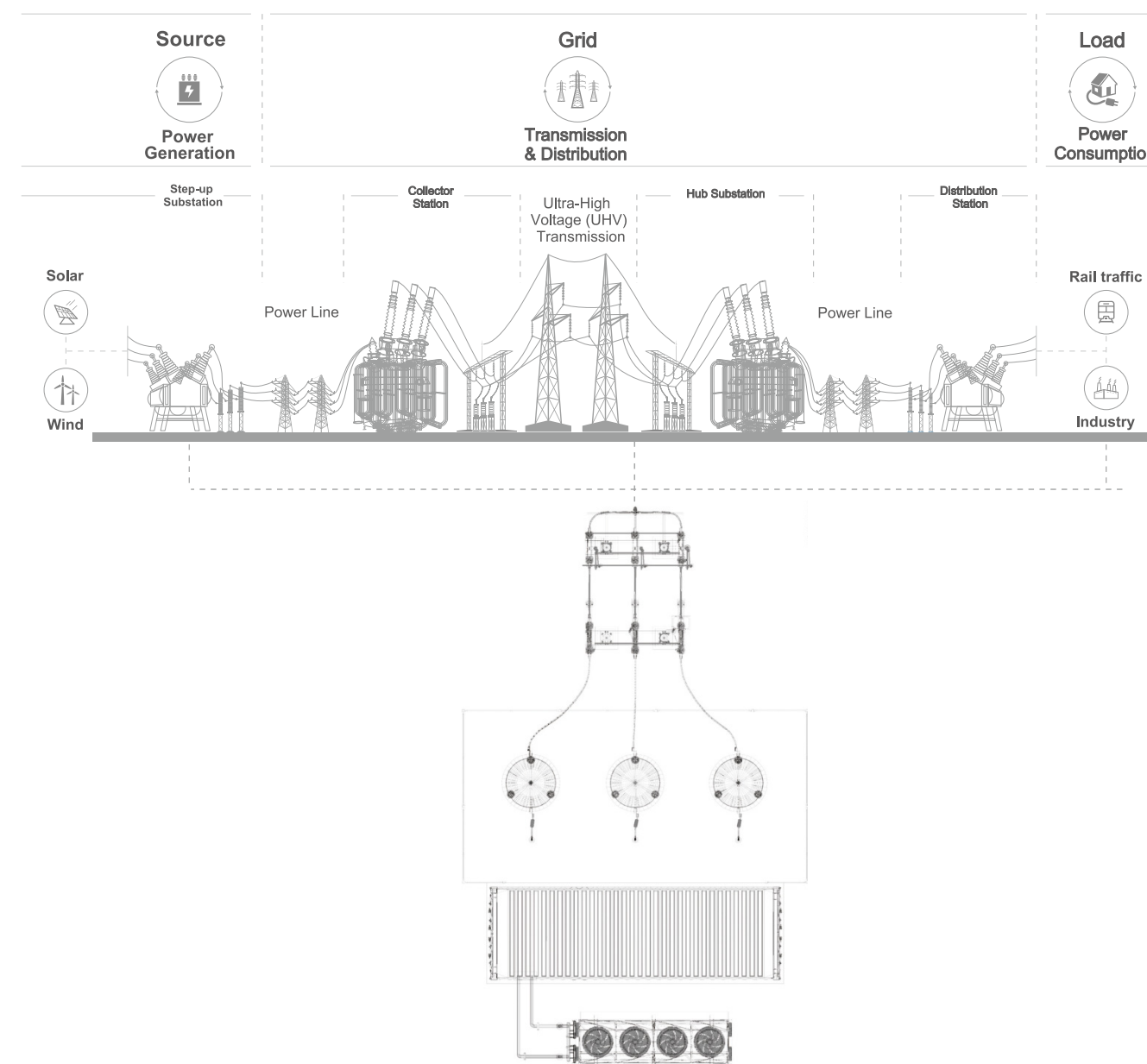
Product Model Number Description

Product Solution

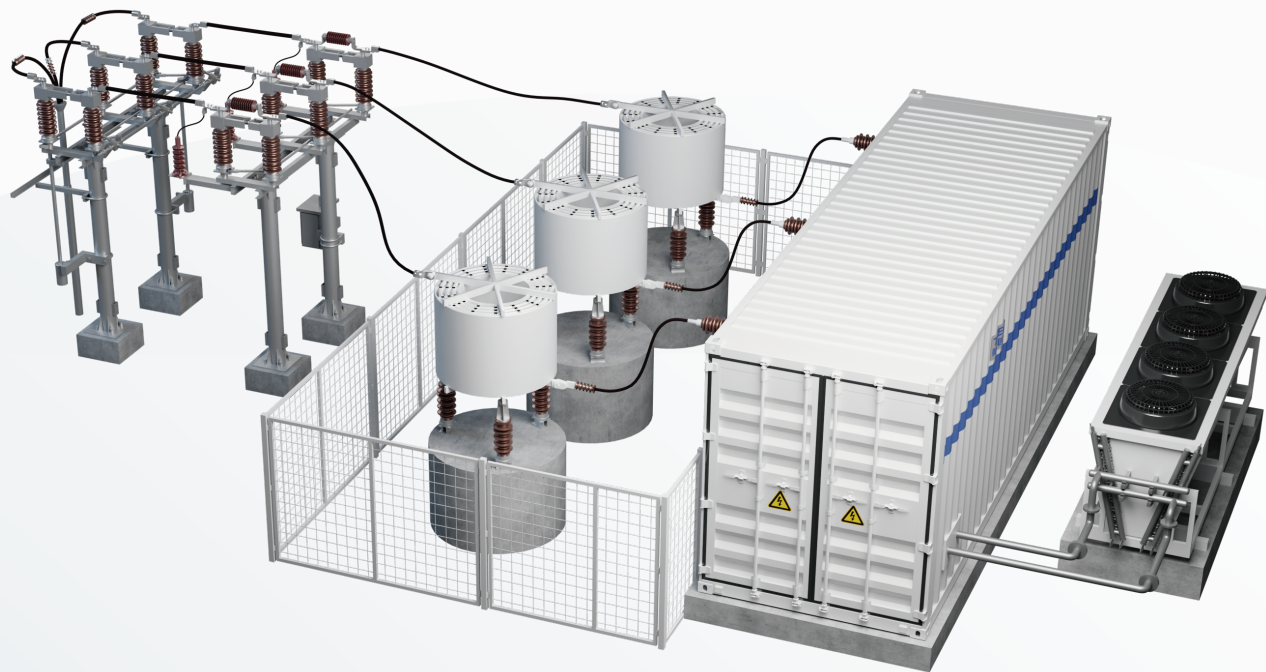
Generation Side:Mitigate voltage fluctuations causedby renewable energy generation, enhance grid integration capacity forrenewable power plants, and reduces-olar/wind power curtailment.

Grid Side:Enhance grid anti-interference capability and improve fault support resilience; Reduce line current and grid losses, release line transmission capacity, and enhance grid transmission efficiency.

Load Side:Deliver comprehensive power quality management by improving power factor, resolving three-phase imbalance and harmonic issues;Optimize equipment operational efficiency and reduce energy consumption.



Static Var Generator (SVG/STATCOM)



Technical Parameters

Model	Static Var Generator (SVG/STATCOM)
Input	
Rated Voltage	10~66 kV
Rated Capacity	1~150 Mvar
Steady State Voltage	0.8~1.2 pu.
Ambient Temperatue	-40℃~55℃
Storage Temperature	-40℃~70℃
Altitude	2000m, >2000m customized
Relative Humidity	≤95%, No condensation
Connection mode	Y-Connection/Delta-Connection
Cooling Method	Water Cooling/Air Cooling
Intallation Method	In door/Container
Perfor mance	
H/L Voltage Ride Through	0~1.3pu
Frequency	50/60Hz
Reactive Power Regulation Range	Continuous adjustable from rated inductive to rated capacitive
Avg. Losses	<0.8%
Total Harmonic Distortion (THD)	≤3%
Response speed	<5ms
Overload Ability	1.1 times continuous operation; 1.2 times for 1 minute
Redundant Design	N-2
Protection	
System Protection	Overvoltage, undervoltage, phase loss, open circuit, short circuit, overcurrent, overload, overfrequency, underfrequency, power supply failure, cooling failure, communication failure, five-prevention failure, switch failure, environmental temperature and humidity failure, etc.
Unit Protection	Overvoltage, undervoltage, overtemperature, Vce fault, power supply failure, drive failure, bypass failure, communication failure, etc.
Others	
Operating Mode	Constant reactive power, constant voltage, constant power factor, load compensation Integrated voltage and reactive power control, multi-unit parallel coordination control.
Controlling Mode	Local/Remote/AVC
Communication Interface/Protocol	6 Ethernet ports, supports IEC61850, IEC60870-5-104, Modbus Protocol 4 RS485 ports, supports Modbus, IEC60870-5-101 Protocol 1 IRIG-B code Time Synchronizationport 2 CAN ports Fiber communication interface Customized(PRP redundant communication RSTP communication etc.)
Human-Machine Interface(HMI)	Chinese&English LCD touch screen;Upper computer
Power Supply Mode	Supports dual power supply
Power Of Control	380/400/415VAC, 110/125/220VDC
IP Class	Container IP54 (55/56 customized);In door IP3X
Anti-conrrsion Class	C3, (C4/C5 customized)
Container Size	40-feet standard container 12192*2438*2896mm 20-feet standard container 6058*2438*2896mm

Product Advantages



Technical Parameters

- **Hierarchical Protection**

Optimizes protection strategy to minimize trip triggers, enhancing availability and stability, except for severe faults like overcurrent or overvoltage.

- **Full-Load Testing**

Conducts rigorous module and system-level full-load tests before delivery to ensure optimal performance and reliability.

- **Redundant Design**

Features module redundancy, control system redundancy, and communication system redundancy with dual hot backup; Enables rapid and reliable automatic bypass for faulty modules.



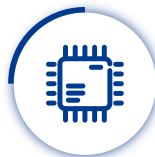
Low power loss

- **Frequency adaptive**

Real-time adjustment of IGBT switching frequency, employing fully enclosed water-cooling for heat dissipation, reducing IGBT losses; average loss less than 0.8%.

- **"Zero" Power Operation**

Utilizes an instantaneous reactive power control algorithm to respond to grid reactive power demands, maintaining 1% low-current grid connection to reduce self-loss and save electricity costs.



Intelligence

- **Intelligent O&M**

Enhance internal sensors and monitoring points, optimize equipment operation interfaces and functions, and leverage data analysis and fault recording to enable integrated online-offline intelligent operations. Real-time status and fault data are uploaded to PPC and SCADA systems.

- **Adaptive Grid Connection**

Advanced adaptive control algorithms enable the SVG to automatically adjust compensation strategies and output current in response to grid variations, achieving high-precision reactive power compensation while enhancing system efficiency and stability.



grid-friendly

- **Weak Grid Adaptability**

TSVG ensures stable and reliable operation in weak grid conditions of high-renewable power systems, particularly with PCC short-circuit ratios below 3;

- **Multi-Dimensional Compensation**

Capable of compensating odd/even harmonics up to the 25th order, with wide-band oscillation damping functionality.

- **Zero-Voltage Ride-Through**

TSVG maintains grid connection for at least 150ms during zero-voltage faults at the point of interconnection.



environmentally Adapted

- **Extreme Environment Customization**

Offers mature, customized, and systematic design solutions for harsh conditions including high-temperature/sandstorm, high-humidity/salt-spray, high-altitude, and extreme-cold regions. Through component customization, control system optimization, and tailored protection levels, ensures long-term reliability in extreme heat/cold, high humidity, strong UV, and heavy dust environments

- **High-Efficiency Modular Design**

Simplified modular structure with no mechanical wear parts, reducing installation and maintenance efforts. Features high power density for space savings, eco-friendly materials/coatings, and optimized thermal design for energy efficiency.



On-site Service & Support

Installation & Commissioning

- **Equipment Assembly**

Assist in assembling various components of the equipment, ensuring connections are secure and accurate.
Electrical Wiring: Assist in completing the electrical wiring of the equipment, including power supply connection and grounding protection setup.

- **protection setup.**

System Debugging: Conduct pre-power-on debugging of all equipment functions, checking whether operational parameters are normal until the equipment reaches its optimal operating state.

Fault Diagnosis and Repair

- **Rapid Response**

When a customer reports equipment failure, the service team will respond online within 2 hours and arrive on-site within 24 hours to understand the fault symptoms and on-site operating conditions.

- **On-site Diagnosis**

Technicians will carry professional testing tools and instruments to conduct comprehensive inspections and tests on the faulty equipment. By analyzing equipment operation logs, alarm information, fault recordings, and other data, they will accurately determine the cause of the fault.

- **Fault Repair**

For common and simple faults, immediate on-site rectification will be performed. For relatively complex faults or cases requiring replacement of faulty components, technicians will source parts from the nearest spare parts inventory to ensure the equipment resumes normal operation in the shortest possible time.

Preventive Maintenance

- **Regular Inspections**

Conduct periodic inspections according to the established maintenance plan. The scope of inspections includes equipment appearance checks, electrical performance tests, operational parameter monitoring, and software system updates.

- **Performance Optimization**

Based on inspection results, equipment operating conditions, and actual needs, customize performance optimization measures. These may include parameter adjustments, software upgrades, component upgrades, or replacements.

Localized Operation and Maintenance Services

With a total of **20** technical support centers worldwide, **200** O&M staff, and multiple spare parts warehouses, we can quickly respond to on-site operation and maintenance requirements for projects.

Technical Training

- **Customer Training**

Provide operational training for station technicians or maintenance personnel to familiarize them with the basic operational procedures of the equipment, the use of functional buttons, and the handling of common simple faults. This ensures that users can operate the equipment correctly and safely.

- **Maintenance Staff Training**

Offer more in-depth technical training for customer-side personnel responsible for daily equipment maintenance. This includes training on equipment principles, structure, fault diagnosis methods, and maintenance techniques, enabling the customer to independently handle common faults to some extent and reduce repair time after equipment failures.

Typical Application Cases

Xizang High-Altitude Hydro-Solar Hybrid Project



Voltage: 35kV

Capacity: 10Mvar

Characteristics: Altitude of 5,000 meters

Solution:Optimized cable/busbar design with customized thermal solutions to address heat dissipation challenges. Enhanced electrical clearance and creepage distance ensure reliable switching device performance.

Saudi High-Temperature & Sandy PV Project



Voltage: 33kV

Capacity: 15Mvar

Characteristics: Maximum ambient temperature of 60°C, frequent sandstorms

Solution: Adopted an IP65 design with C4 anti-corrosion level, UV-resistant surface coating, and optimized heat dissipation component selection.

CGN Brazil 195MW PV Project



Voltage: 34.5kV

Capacity: 35Mvar

Characteristics:Long-distance shipping requirements,high anti-corrosion rating

Solutions:Full equipment C5 anti-corrosion treatment,component packaging designed for long-haul maritime transport.

Jiangsu Redundant System Project



Voltage: 10kV

Capacity: 3Mvar

Characteristics: Redundant Design for Modules and Protection-Control Systems

Solution: Redundant controllers, algorithms, and control protection systems, with modules featuring online automatic bypass functionality.

Hebei High-Capacity Wind Power Project



Voltage: 35kV

Capacity: 70Mvar

Characteristics: Single-unit capacity of 70Mvar

Solution: Utilized newly specified IGBTs, customized water-cooling pipelines and heat dissipation solutions, high-power density design, and optimized integrated control functions.

Hubei Industry Project



Voltage: 35kV

Capacity: 85Mvar

Characteristics: Harmonic over-limit, voltage fluctuations, flicker

Solution: Adopted a comprehensive reactive power + harmonic control solution, with the PCC point as the control target, achieving precise suppression.

Saudi Red Sea Off-Grid Project



Voltage: 33kV

Capacity: 10/20Mvar

Characteristics: Off-grid energy storage, multiple loads, highly volatile grid

Solution: Adopted continuous voltage control and Droop control strategies to quickly follow voltage and output reactive power under various operating conditions without oscillation.

Hebei Distributed PV Project



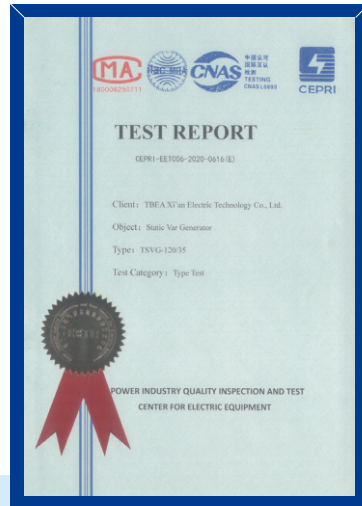
Voltage: 10kV

Capacity: 2Mvar

Characteristics: Limited site area, challenging on-site construction

Solution: Outdoor equipment integrated into containers; water-cooling units placed on top to reduce on-site installation workload

Product Certification & Test Reports



35kV 120Mvar NB/T41005
Type Test Report



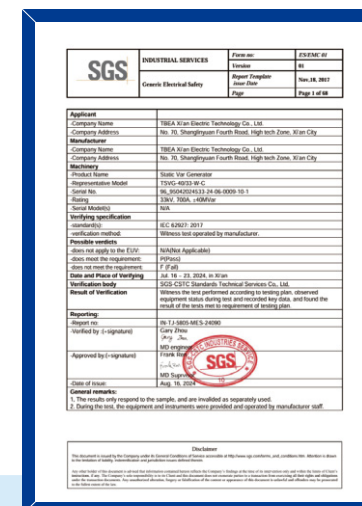
35kV 60Mvar IEC62927
Type Test Report



35kV 60Mvar
NB/T 42043&GB/T 12326
Type Test Report



CEA 30~60M Report



IEC62927 40M Report



IEC62927 60M Report



35kV 10-20Mvar
GBT20297 GBT20298



35kV 21-30Mvar
GBT20297 GBT20298



10kV 06-10Mvar
GBT20297 GBT20298



IP55 Certificate



IP55 40 Feet Report



IP55 20 Feet Report

Global Achievements

Global Project Distribution Map and Delivery Volume



With a total delivery of **55Gvar** across more than **20** countries and regions, we continue to innovate and promote the widespread adoption of clean energy worldwide, further advancing the development of the global green energy industry.