



Sun.King Power Electronics Group Limited

0580.HK  
(Stock Code)

 Sun.King Power Electronics Group Limited



# Busbars

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### Renewable Energies

Sun.King FACTS for grid connection of wind farms  
Sun.King Busbars for wind converters, solar converters and other renewable energy systems

### Electric Railways

Sun.King Busbars for traction and auxiliary converters  
Sun.King FACTS and Power Capacitors for railways electrification

### Power T&D

Sun.King Power Capacitors and Sun.King FACTS for Power T&D  
Sun.King Busbars for HVDC converters

### Telecom

Sun.King Busbars for mobile communications base stations

### Industry

Sun.King Rectifiers for high power DC supply.  
Sun.King FACTS and Capacitors for power quality and power factor correction

## Group Introduction

Sun.King Power Electronics Group is a leading manufacturer of power electronic components and equipment. The company has more than 600 employees, working at the headquarters in Beijing or at one of the company's subsidiaries in several provinces in China.

Sun.King is an independent, non-state-owned company, and its shares are traded on Hong Kong Stock Exchange.

Through the cooperation with renowned universities and the hiring of experienced engineers, the company continuously strengthens its position as a supplier of highly reliable products. At Sun.King, quality is not only a result of the right processes and rigorous testing. We believe that being a generous employer with attractive working conditions is just as important to assure best quality in everything we do.

Each of our products contributes to energy saving and therefore to a greener planet. Optimizing transmission, conversion and distribution of electric power is our passion.



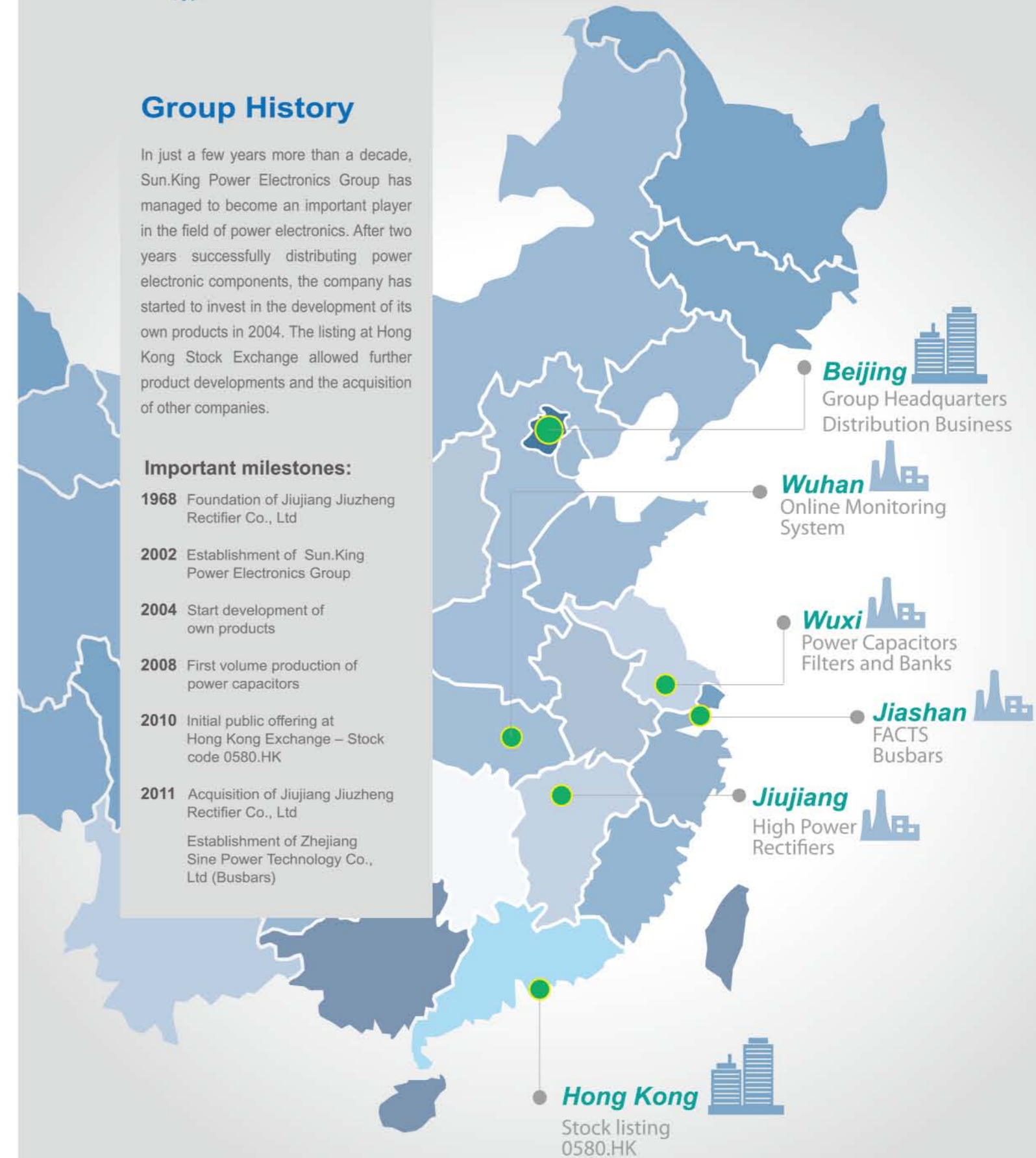
Sun.King Power Electronics Group Limited

## Group History

In just a few years more than a decade, Sun.King Power Electronics Group has managed to become an important player in the field of power electronics. After two years successfully distributing power electronic components, the company has started to invest in the development of its own products in 2004. The listing at Hong Kong Stock Exchange allowed further product developments and the acquisition of other companies.

### Important milestones:

- 1968** Foundation of Jiujiang Jiuzheng Rectifier Co., Ltd
- 2002** Establishment of Sun.King Power Electronics Group
- 2004** Start development of own products
- 2008** First volume production of power capacitors
- 2010** Initial public offering at Hong Kong Exchange – Stock code 0580.HK
- 2011** Acquisition of Jiujiang Jiuzheng Rectifier Co., Ltd  
Establishment of Zhejiang Sine Power Technology Co., Ltd (Busbars)





# About Sun.King Busbars

Sun.King Busbars are produced by Zhejiang Sine Power Electric Co., Ltd., a subsidiary of Sun.King Power Electronics Group Limited. The company offers customized busbar solutions and a wide range of related services. The products are manufactured in Jiashan, Zhejiang Province, one hour away from Shanghai Airport.

The proven quality of our products is based on internationally leading design and manufacturing concepts, combined with state-of-the-art production equipment. Our talented engineers have many years of experience in producing busbars. Whether our customers wish to develop a completely new solution, optimize a design or just produce their existing design under optimized conditions, we are your dedicated partner for laminated busbars.

Our products have been qualified by important players in traction, power T&D, wind power, industrial drives and other industries. Leading companies like CNR and Fuji Electric rely on our quality and experience.



## Fields of Application

We offer our innovative solutions to customers in the fields of railway transportation, power systems, new energy, vessel propulsion, telecom, industrial drives, and other sectors with demand for laminated busbars.



## Major customers at a glance

| Customer             | Product Type Number                            | Project   |
|----------------------|--|---|
| CNR                  | SY0024/25/26/30/31<br>SY0032/33/34/35/36/37    | 7200kW electric locomotive power module and converter busbars |
|                      | SY0048/49/50/51/52<br>SY0059/61                | 9600KW electric locomotive power module and converter busbars |
|                      | SY0139/140/141/142<br>SY0143/144               | EMU CRH-3A  |
|                      | SY0146/147/148/149<br>SY0150/SY0151            | EMU CRH-3X  |
| CEPRI                | SY0014/SY0015                                  | DC power transmission flexible                                |
| Beijing Hiconics     | SY0038/39/45/46/47<br>SY0065/66/67/69/70/71/72 | Industrial frequency converter                                |
| XJ Group, State Grid | SY0053/54/55/56/57/58                          | DC power transmission flexible                                |

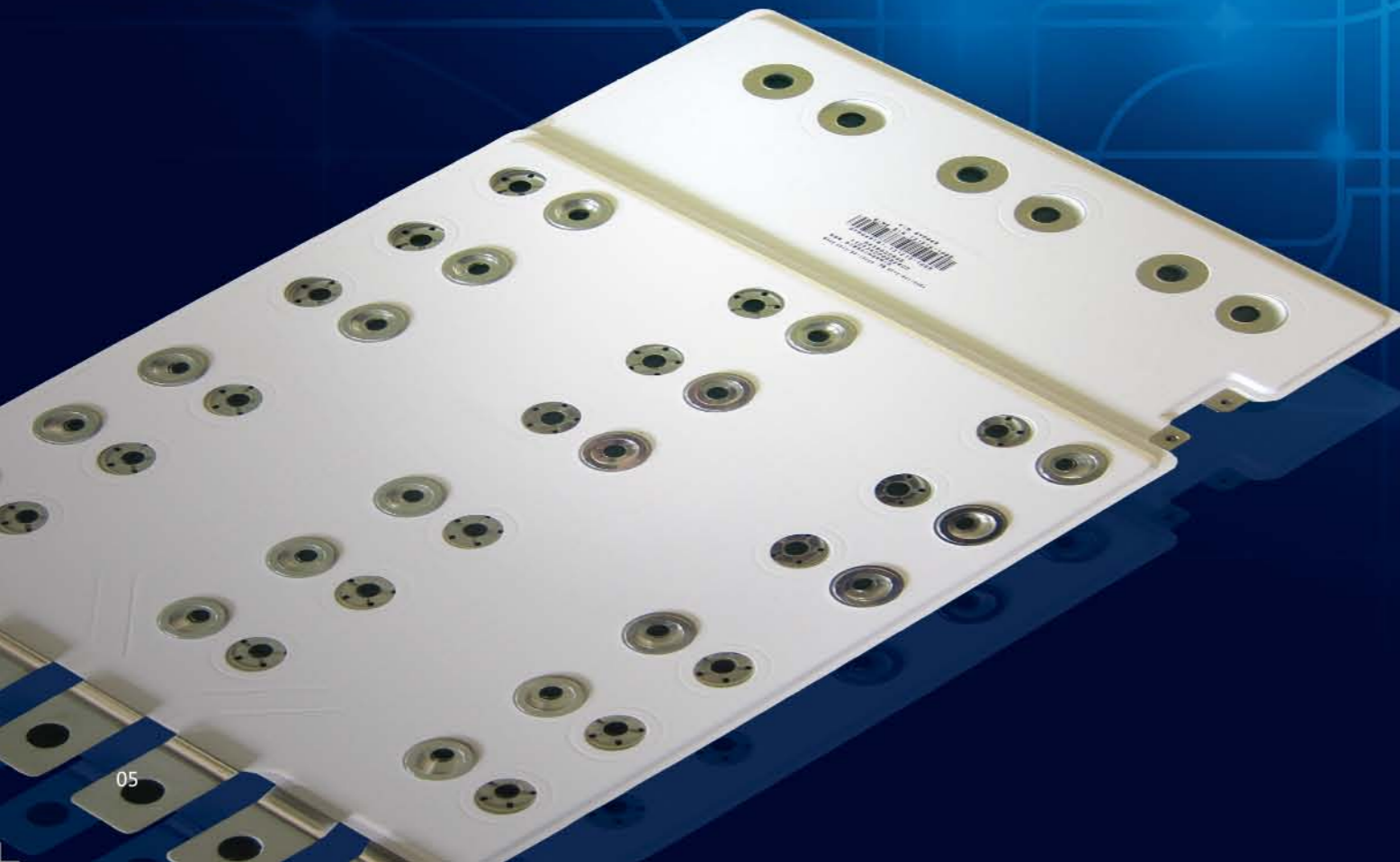
| Customer   | Product Type Number                    | Project                                       |
|--|--|---|
| The Third Research Institute, China Aerospace Science and Technology Corporation | SY0042/43/44<br>SY0122/123/124/125/126 | Special HV frequency converter                |
| Huazhong University of Science and Technology                                    | SY0008/9<br>SY0102/103/104             | Power electronic converter                    |
| No. 14th Research Institute, China Electronics Technology Group Corporation      | SY0085                                 | Traction converter for railway transportation |
| NR Electric  | SY0094/95/96 SY0137/138                | Wind power frequency converter                |
| Shanghai Shuangdian Electric Co., Ltd  | SY0079/80/81/82                        | Active power filter (APF)                     |
| Shanghai Envision Energy Co., Ltd  | SY0127/128/152/153                     | Wind power converter                          |
| Anshan Naheng Power Electronics  | SY0129/130                             | SVC/SVG                                       |
| Fuji Electric  | SY0117                                 | HV frequency converter                        |



## RAILWAY TRANSPORTATION

### Electric Locomotive Power Module Busbar

- Size: 639×422mm
- Copper plates, thickness of 3mm/4mm, with > 5μm tin-plated surface
- Dielectric strength: AC 5.6kV 60s no flicker and no breakdown
- Partial discharge: AC 2300V <10pC



### Electric Locomotive Auxiliary Converter Chopper Busbar

- Size: 559×241mm
- Red copper plates, thickness of 2.0mm, with > 10μm tin-plated surface
- Rated voltage: 2700V
- Dielectric strength: AC 5.8kV/50Hz, 60s, no flicker and no breakdown
- Partial discharge: AC 2.3kV/50Hz <5pC



### Electric Locomotive Auxiliary Converter Charging Busbar

- Size: 270×160mm
- Copper plates, thickness of 1.0mm, with 10μm tin-plated surface
- Rated voltage: 1500V
- Dielectric strength: AC 4.0kV/50Hz, 60s, no flicker and no breakdown
- Partial discharge: AC 1.0kV/50Hz <5pC



### EMU Traction Busbar

- Size: 314×257mm
- Red copper plates thickness of 3.0mm with > 5μm tin-plated surface
- Rated voltage 2800Vdc, rated current 320A
- Dielectric strength: DC 7.6kV, 60s, no flicker and no breakdown
- Partial discharge: AC 4200V <10pC







### Electric Locomotive Converter Connecting Busbar

- Size: 1420×280mm
- Copper plates, thickness of 4mm, with > 5μm tin-plated surface
- Dielectric strength: AC 8kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2.8kV <10pC

## RAILWAY TRANSPORTATION



### Electric Locomotive Converter Busbar

- Size: 494×207mm
- Copper plates, thickness of 2mm, with > 5μm tin-plated surface
- Dielectric strength: AC 8kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2.8kV <10pC



### Electric Locomotive Converter Busbar

- Size: 478×423mm
- Copper plates, thickness of 6mm, with > 5μm tin-plated surface
- Dielectric strength: AC 8kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2.8kV <10pC

## RAILWAY TRANSPORTATION

### EMU CRH Module Busbar

- Size: 503×324mm
- Red copper plates, thickness of 3.0mm, with > 5μm tin-plated surface
- Rated voltage 2800Vac, rated current 800A
- Dielectric strength: AC 7.6kV, 60s, no flicker and no breakdown
- Partial discharge: AC 3.1kV <10pC



### EMU Converter Module Busbar

- Size: 503×324mm
- Red copper plates, thickness of 3.0/4.0mm, with > 5μm tin-plated surface
- Rated voltage 2800Vac, rated current 600A
- Dielectric strength: AC 7.6kV, 60s, no flicker and no breakdown
- Partial discharge: AC 3.1kV <10pC



### EMU Auxiliary Converter Module Busbar

- Size: 423×324mm
- Red copper plates, thickness of 3.0/4.0mm, with > 5μm tin-plated surface
- Rated voltage 2800Vac, rated current 800A
- Dielectric strength: AC 7.6kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2.8kV <10pC







**Wind Power 1.6MW Frequency Converter Module Busbar**

- Size: 416×261mm
- Red copper plates, thickness of 1.5mm, with > 10µm tin-plated surface
- Rated voltage 1200V, rated current 800A
- Dielectric strength: AC 3.5kV/50Hz 60s no flicker and no breakdown
- Partial discharge: 1200Vac ≤10pC



**Wind Power 1.6MW Connecting Busbar**

- Size: 1068×146mm
- Red copper plates, thickness of 3.0mm, with ≥ 5µm tin-plated surface
- Rated voltage 1200Vdc, rated current 800A
- Dielectric strength: AC 3.5kV/50Hz 60s no flicker and no breakdown
- Partial discharge: AC 1.2kV/50Hz <10pC



**Wind Power 1.6MW Connecting Busbar**

- Size: 1068×146mm
- Red copper plates, thickness of 3.0mm, with ≥ 5µm tin-plated surface
- Rated voltage 1200Vdc, rated current 800A
- Dielectric strength: AC 3.5kV/50Hz, 60s, no flicker and no breakdown
- Partial discharge: AC 1.2kV/50Hz <10pC



**PV 500KW Inverter Busbar**

- Size: 569×376mm
- Red copper plates, thickness of 2.0mm, with > 5µm tin-plated surface
- Rated voltage 1000Vdc, rated current 800A
- Dielectric strength: AC 3.5kV/50Hz, 60s, no flicker and no breakdown

**PV 250KW Inverter Module Busbar**

- Size: 604×344mm
- Red copper plates thickness of 1.5mm, with > 5µm tin-plated surface
- Rated voltage 1000Vdc, rated current 1200A
- Dielectric strength: DC4000V, 60s, no flicker and no breakdown



**Active Power Filter (APF) Connecting Busbar**

- Size: 222×110mm
- Red copper plates, thickness of 1.5mm, with ≥5µm tin-plated surface
- Rated voltage 1100V, rated current 200A
- Dielectric strength: DC5000V, 60s no flicker and no breakdown



**APF Capacitor Busbar**

- Size: 378×81mm
- Red copper plates, thickness of 1.5mm, with ≥5µm tin-plated surface
- Rated voltage 1100V, rated current 200A
- Dielectric strength: DC5000V, 60s, no flicker and no breakdown







### Explosion-proof Frequency Converter Module Busbar

- Size: 880×270mm
- Red copper plates, thickness of 2.0mm, with  $\geq 5\mu\text{m}$  nickel-plated surface
- Rated voltage 6000Vdc, rated current 500A
- Dielectric strength: DC 10kV/50Hz, 60s, no flicker and no breakdown
- Partial discharge: AC 3.0kV/50Hz  $< 10\text{pC}$



### Explosion-proof Frequency Converter Capacitor Busbar

- Size: 548×174mm
- Red copper plates, thickness of 2.0mm, with  $\geq 5\mu\text{m}$  nickel-plated surface
- Rated voltage 6000Vdc, rated current 500A
- Dielectric strength: DC 10kV/50Hz, 60s, no flicker and no breakdown
- Partial discharge: AC 3.0kV/50Hz  $< 10\text{pC}$

## INDUSTRIAL



### HV Frequency Converter Rectifier Busbar

- Size: 1112×223mm
- Red copper plates, thickness of 1.5mm, with  $\geq 5\mu\text{m}$  nickel-plated surface
- Rated voltage 6000Vdc, rated current 500A
- Dielectric strength: DC 10kV/50Hz, 60s, no flicker and no breakdown
- Partial discharge: AC 3.0kV/50Hz  $< 10\text{pC}$



### HV Frequency Converter Rectifier Busbar

- Size: 823×488mm
- Red copper plates, thickness of 2mm, with  $\geq 5\mu\text{m}$  tin-plated surface
- Rated voltage 2600Vdc, rated current 240A
- Dielectric strength: AC 9.3kV, 60s no flicker and no breakdown

## POWER TRANSMISSION AND DISTRIBUTION

### Busbar for HVDC Flexible Power Transmission Valves

- Size: 312×310mm
- Red copper plates, thickness of 2.0mm, with  $\geq 5\mu\text{m}$  nickel-plated surface
- Rated voltage 3kV, rated current 250A
- Dielectric strength: AC 5kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2kV  $< 10\text{pC}$



### Busbar for HVDC Flexible Power Transmission Modules

- Size: 724×436mm
- Red copper plates, thickness of 2.0mm, with  $\geq 5\mu\text{m}$  nickel-plated surface
- Rated voltage 3.5kV, rated current 700A
- Dielectric strength: AC 7kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2.8kV  $< 10\text{pC}$



### Busbar for HVDC Flexible Power Transmission Modules

- Size: 434×296mm
- Red copper plates, thickness of 3.0mm, with  $\geq 5\mu\text{m}$  nickel-plated surface
- Rated voltage 3.5kV, rated current 700A
- Dielectric strength: AC 7kV, 60s, no flicker and no breakdown
- Partial discharge: AC 2.8kV  $< 10\text{pC}$





## MANUFACTURING

Our factory with advanced manufacturing equipment can make standard or highly customized products

- We provide busbars in almost any imaginable shape and a size of up to 2000x1000mm for conventional types. Even larger types are available upon request.
- Sheet metal production: stamping through tooling, engraving
- Surface processing: plating of tin, nickel and silver plating
- Epoxy encapsulation
- Insulation powder spray



DC bending machine: for bending of busbars



Hot press machine: for lamination of busbars



Engraving machine: for processing of copper plates and tooling



DC lathe: for processing of busbar terminals

## EXPERTISE

Depending on the individual requirements of our customers, we generally co-operate in one of the following three ways.

- We manufacture an already existing design
- We optimize and produce an existing design
- We create a completely new design

With our experienced engineers and our optimized production process, we help the customer improve their own products on both, the technical and the commercial side.

## TESTING

### Testing capabilities:

- Dielectric strength
- Partial discharge
- Dimension measurement
- Measurement of plating thickness
- Inductance testing
- Temperature rise



Fluorescence X-ray gauge  
(Precision:  $\pm 5\%$ )



Digital electric bridge  
(Inductance testing)



PD and dielectric strength test bench: (Testing range: 0-20kVac/dc)



Strong current generator  
(Testing of temperature rise, range: 0-3000A)



To ensure stability, quality and lifespan of our busbars, we only select raw materials from renowned Chinese and international suppliers. All insulation materials are sourced from internationally well-known producers.



Red copper plates: famous brand in China



PET: imported



GPO-3: imported



FR4: famous brand in China

## QUALITY

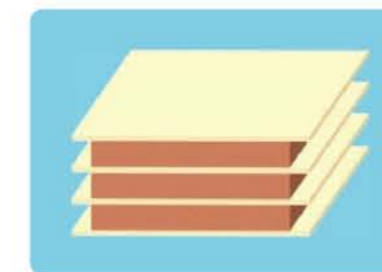


The fast development of China's economy has created a large demand for high quality products, able to withstand the challenging and harsh environment of modern China. China's railway and power transmission infrastructure is today the most advanced in the world. As a preferred supplier of busbars to the main players in both fields, Sun.King has been qualified through most stringent quality evaluation tests.

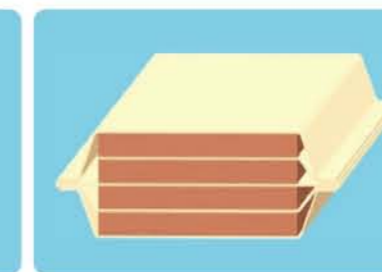
For each and every busbar we produce, quality is given highest priority throughout the entire process, from design and development, material selection, to production and testing. Our quality process allows us to recognize the smallest deviation from our quality standards and continuously improve our quality level.

As all Sun.King factories, we are ISO9001 certified. Our quality management system has been evaluated and qualified by companies like Fuji Electric, CNR and China State Grid.

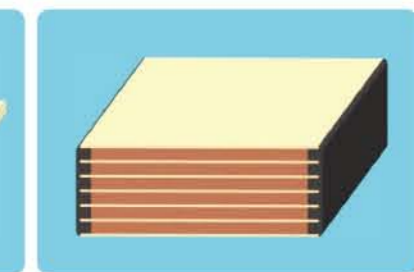
Three different edge types for different requirements are available:



Open edge type



Sealed edge type



Insulated edge type

Not every customer requires busbars with insulated edges. Open edge and sealed edge types are more cost-efficient and sufficient for many applications.

| Limiting factor   | Open edge type |               | Sealed edge type |               | Insulated edge type |               |
|-------------------|----------------|---------------|------------------|---------------|---------------------|---------------|
|                   | Suggested      | Not suggested | Suggested        | Not suggested | Suggested           | Not suggested |
| Clean environment | X              |               | X                |               | X                   |               |
| Dirty environment |                | X             | X                |               | X                   |               |
| Creepage distance |                | X             | X                |               | X                   |               |
| Electrical gap    |                | X             | X                |               | X                   |               |
| Edge size         |                | X             |                  | X             | X                   |               |
| Stability         |                | X             |                  | X             | X                   |               |
| Space             | X              |               |                  | X             | X                   |               |
| Cost              | X              |               | X                |               |                     | X             |



## ● Current Density

The cross section of the conductor is determined by the allowed current density, which is directly related to the temperature rise caused by the current. We suggest it to be in the range of 3-5 Ampere per square millimeter. Under most circumstances, the temperature rise will not exceed 30°C.

## ● Capacitance and Inductance Calculation

|   | Capacitance (pF)       | Inductance (nH)    |
|---|------------------------|--------------------|
| L: length of conductor<br>W: width of conductor<br>A: thickness of dielectric layer<br>Er: dielectric constant<br>(Unit for L, W and A: inch) | $\frac{0.2225LwEr}{A}$ | $\frac{31.9LA}{w}$ |

## ● Insulation Material Selection

| Material                 | Continuous working temperature | Dielectric strength | Dielectric constant | Flame retardant rating | Heat conductivity | Basic characteristics   | Cost   |
|--------------------------|--------------------------------|---------------------|---------------------|------------------------|-------------------|---|--------|
| Epoxy resin              | 155                            | 15.7 kV/mm          | 3.5-4.0             | 94V-0                  | 0.18              | Chemical stability, low moisture absorption, flame retardant  | Low    |
| PI (Polyimide)           | 260                            | 13.8 kVac(3mil)     | 3.70                | 94V-0                  | 0.094             | Excellent heat resistance, good electrical properties, flame retardant  | High   |
| PET                      | 150                            | 10.0 kVac(3mil)     | 3.30                | 94V-0                  | 0.128             | Good electrical properties, resistance to chemical corrosion  | Low    |
| NOMEX                    | 220                            | 1.6 kVac(3mil)      | 1.60                | 94V-0                  | 0.143             | Excellent fire and heat resistance, good resistance to chemical corrosion, flame retardant                    | High   |
| Polyvinyl fluoride (PVF) | 260                            | 4.2 kVac(2mil)      | 11.0                | 94V-0                  | 0.12              | Excellent mechanical properties; chemical stability, not easy to melt   | High   |
| NMN                      | 155                            | 14 kV/mm            | 2.4                 | 94V-1                  | 0.136             | Good electrical properties, good mechanical properties, resistance to breakdown and overload, flame retardant | Medium |
| DMD                      | 155                            | 11 kV/mm            | 4.3                 | 94V-1                  | 0.129             | Higher heat resistance, good electrical properties, good mechanical properties                                | Low    |
| NHN                      | 155                            | 8 kV/mm             | 4.8                 | 94V-0                  | 0.141             | Excellent electrical properties, resistance to breakdown and overload, flame retardant                        | High   |

### Russia

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Customers in other countries and regions please contact Sun.King in China directly.