

Sieyuan

**Make Electric Power Transmission
and Distribution more Safe, more
Controllable and more Efficient!**

ZF28-252 TYPE GIS

252 kV/ 50kA/ 4000A



Sieyuan

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Sieyuan Electric Co., Ltd.**
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Shanghai Sieyuan High Voltage Switchgear Co., Ltd.
Sieyuan Electric Co., Ltd.

Based on its R&D system and advanced research abilities, Sieyuan has become a well-known GIS manufacturer in China. Its GIS technology has reached the international advanced level.

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Company Profile of Shanghai Sieyuan High Voltage Switchgear Co., Ltd.

As a well-known power transmission and distribution equipment supplier and system solution provider, Sieyuan Electric Co., Ltd. was originated from 1967 and was listed in Shenzhen Stock Exchange (stock code) in 2004. Now it includes 8 subsidiaries, among which Jiangsu Rugao High Voltage Electrical Apparatus Co., Ltd. has more than 40 years' history in research, development and production of high apparatus switches. In view of the improvement of GIS production capacity and geographical superiority, Sieyuan Electric Co., Ltd. invested RMB400 million to establish Shanghai Sieyuan High Voltage Switchgear Co., Ltd. in September 2007 on the basis of GIS Business Division of Jiangsu Rugao High Voltage Electrical Apparatus Co., Ltd., to specialize in the research & development and production of (H) GIS products and tank type circuit breaker.

The main products include 72.5-550kV (H) GIS and tank type circuit breaker. The company business involves many industries at home and abroad, like electric power, metallurgy, mining and traffic.

The company covers a floor area of 63,874m² and the office building covers an area of 8,800m² and the workshops cover an area of 30,000m², in which the 100,000-level assembly workshop covers an area of 5,000m² and the 1,000,000-level assembly workshop covers an area of 8,000m². Its annual production capacity is 1,600 bays of 72.5/126/145kV, 800 bays of 252kV and 100 bays of 363/550kV. It possesses

two fully-shielded high voltage test halls of 500kV and 1,000kV and is also equipped with the impulse voltage generator and automatic measurement systems of 1,500kV and 3,000kV. Its main production equipment is imported from abroad, and its production conditions and manufacturing technology have reached the international advanced level.

With first-class research and development capability, it has established the post-doctoral research station and technology center and formed the research and development team comprised of nearly one hundred persons led by 6 personnel of doctor's degree and 26 personnel of master's degree. It insists on technological innovation and applies such advanced design concepts and methods as finite element analysis software, failure effect and mode analysis (FEMA), full process quality characteristic chain analysis and dimension chain analysis. It also has established the technology development system with proprietary intellectual property rights. The Company's main products and core technologies have been at a leading position in China.

The company products have passed the type tests by national authoritative testing institutes of China and KEMA Laboratory of Netherlands, and also have passed the authentication by China Machinery Industry Federation. The product performance has reached the international advanced level.

Company Distribution

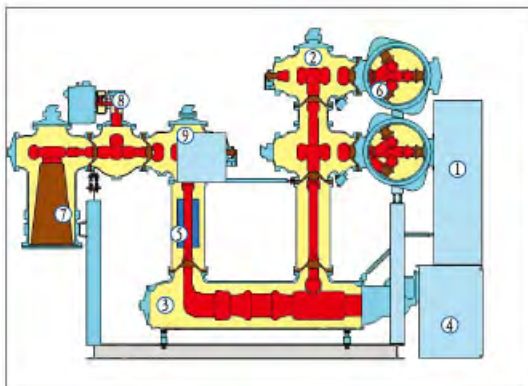


源电气股份有限公司
SIYUAN ELECTRIC CO., LTD.

Standard layout of ZF28-252 GIS



Double bus + integrated cabinet arrangement



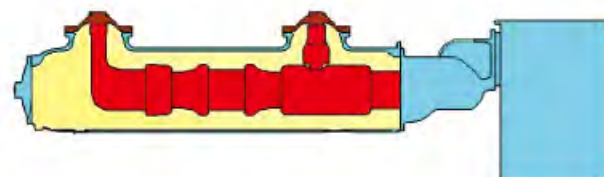
1. Local control cabinet
2. Three-position disconnect
3. Circuit breaker
4. Circuit breaker operating mechanism
5. Current transformer
6. Main bus
7. Cable termination
8. Fast earthing switch
9. Three-position disconnect and earthing switch

Advantages of ZF28-252 GIS

- Three-position DES are completely applied in GIS, and realize the simplified structure and reliable mechanical locking.
- The three-position disconnect and earthing switch and main busbar are of three-phase in one tank structure. The sealing surface and joint surface of SF₆ gas are reduced to be only 1/3 of the single phase in one tank structure, so the gas leakage rate is greatly reduced; the complex connecting rod and connecting piece between phases are removed, so the operating system is simplified; the electric field design is optimized, which is favorable for restraining partial discharge.
- The partial discharge test was performed under 80% power frequency withstand voltage (80% x 460kV = 368kV), which is far more strict than the voltage (1.2 x 252kV = 302kV) specified by IEC standard.
- According to the factory quality control requirement, all bays are subject to perform power frequency withstand voltage test, lightning impulse with stand test and partial discharge test before delivery to site, so that the quality of GIS can be assured.
- The insulators have stable and reliable quality. The casting technology of basin type insulators reaches the international advanced level and domestic leading level.
- The secondary control cabinet is provided with integrated cabinet and free standing cabinet available for users.
- The technical specifications of the GIS keep up with the highest standard in the industry and some parameters even exceed the specified value in IEC.
- The rated current reaches 4,000A, so the long-term through-current is more reliable.
- The Finite Element Analysis Software as well as advanced development tools, like full process quality characteristic chain analysis, dimension chain analysis and failure effect and mode analysis (FEMA) are used. The minimizing design is realized while ensuring the product performance safe, stable and reliable.

The circuit breaker module is the core part of GIS, which is comprised of horizontally arranged arcing chamber unit and spring operating mechanism.

- The circuit breaker is of dynamic self-blast arcing chamber with double-moving design.
- Each pole is equipped with a spring operating mechanism, so as to realize the separate operation of three phases.
- The self-blast arc quenching principle and the double-moving contact system drastically reduce the operating power of mechanism and improve the operational reliability of products.
- The products have passed the strict short-circuit current test in KEMA, Netherlands.
- The application of shielding cover on the main contacts greatly improves the insulation reliability of the circuit breaker.
- E2-M2-C2-level circuit breaker reaches 20 times of electrical endurance and 10,000 times of mechanical endurance.
- The insulating cylinder and insulating rod in the arcing chamber are imported from Germany.



Short-circuit type test in KEMA.

Arc quenching principle

High current breaking (15kA ~ 40kA) Self-blast principle

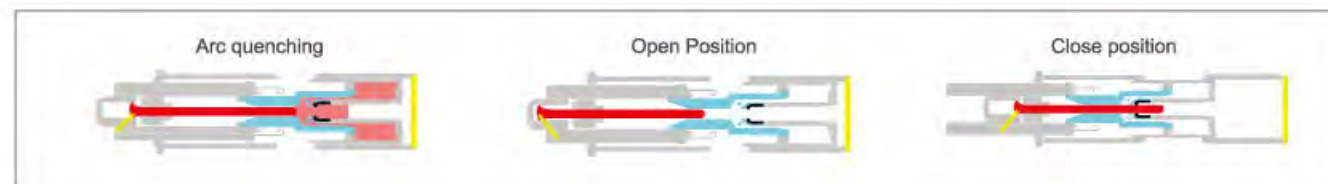
The arc combustion makes the SF6 gas in the thermal expansion chamber expand sharply and then the produced air current blows to the nozzle to quench the arc, which is to say that the arc's self-blast is used for quenching the arc. Therefore, the operating power of the operating mechanism is greatly reduced. And also the spring operating mechanism can be used.

Low current breaking (<15kA) Gas compression principle:

The SF6 gas in the gas compression chamber is compressed and the produced gas flow blows to the nozzle to quench the arc. The volume of gas compression chamber and the geometric shape of nozzle are optimally designed, so as to ensure that the arc is quenched when crossing the zero. Therefore, the operating over-voltage is greatly reduced.

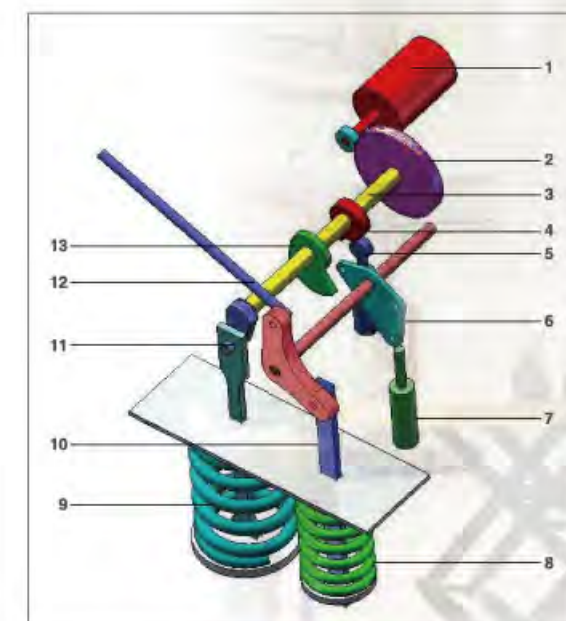


Analysis of air current field in arcing chamber



Circuit breaker operating mechanism

- The all-spring operating mechanism has a small volume and achieves 10,000 times of mechanical endurance, so as to satisfy the environmental requirements of no oil and gas.
- The GIS and AIS (air insulated switchgear) products of Sieyuan adopt the same operating mechanism. This technology platform has been widely applied in China. Our company has already had rich experience in field operation of nearly 10,000 sets, and the quality is stable and reliable.
- The operating mechanism base is made of casting aluminum alloy and is produced through the precision machining in the numerical control machining center of DMG four-shaft boring and milling imported from Germany. Because of one-step molding by clamping machining, unified standard and small machining error, the assembly accuracy of the operating mechanism can be guaranteed.
- The mechanism is closely installed with the main body and the closing spring and the opening spring are arranged at the positions convenient for observation.
- The bearing and the insulating rod are the high-quality imported parts, with high reliability.
- With powerful basic research ability, the spring is designed according to the allowable stress of Class-I spring and is also subject to the strong pressure test by the spring testing machine. During the actual operation, the amount of spring compression is lower than the testing value, so as to ensure that the variation range of P1 is lower than 1% after 10,000 times' operation and the stability of opening/closing speed will not be affected.



1. Motor
2. Gear
3. Closing main shaft
4. Small cam
5. Closing buffer
6. Transmission crank
7. Opening buffer
8. Opening spring
9. Closing spring
10. Opening rod
11. Closing rod
12. Connecting rod
13. Cam

Three-position disconnecter and earthing switch

Three-position disconnecter and earthing switch

- The disconnecter switch and maintenance earthing switch are combined with one moving contact shared. Because of the natural mechanical interlocking, the possibility that disconnecter and earthing switch are simultaneously connected in the meantime is avoided and the risk of fault operation is completely avoided.
- The mechanism is directly connected without connecting rod exposed, so as to improve the transmission efficiency and enhance the weather resistance of products.
- The bus three-position DES not only can switch the small capacitive current and small inductive current, but also can switch the bus-transfer current in the case of double-bus system.
- It reaches 5,000 times of mechanical endurance.

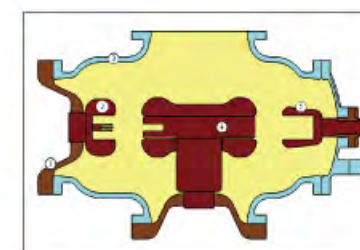


Passed the assessment of strict short-circuit type test in KEMA.



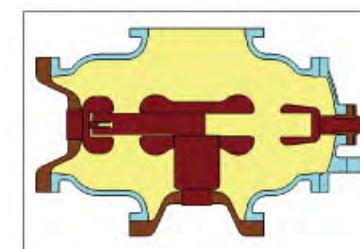
Passed the insulation test in Xi'an High Voltage Apparatus Research Institute

Three working positions of three-position disconnecter and earthing switch

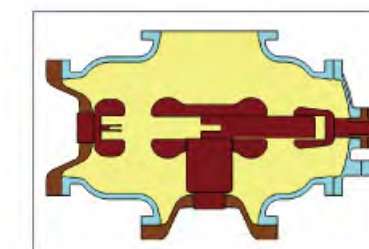


Disconnecter and earthing switch are both at open position.

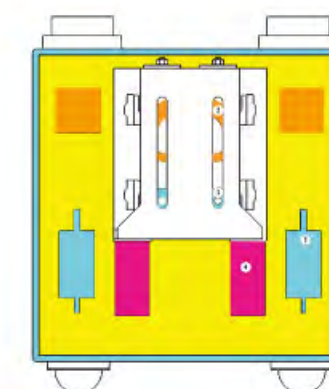
1. Basin type insulator
2. Static contact of disconnecter
3. Housing
4. Moving contact
5. Static contact of earthing switch



Disconnecter closed with earthing switch opened



Disconnecter opened with earthing switch closed



1. Housing
2. Geneva wheel
3. Screw rod
4. Motor
5. Auxiliary switch

Three-position operation mechanism

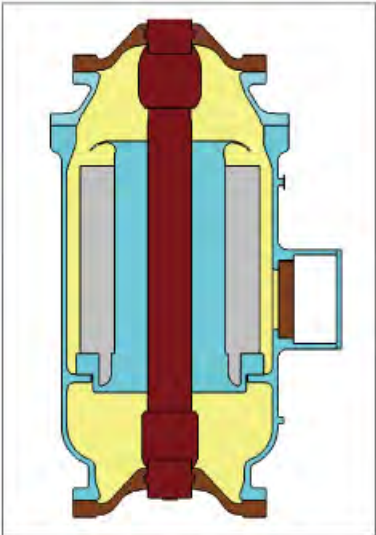
- The three-position operation mechanism is directly spliced onto the main body without connecting rod exposed, and it also has good transmission efficiency and good weather resistance.
- Driven by double motor and mechanically interlocked, it has the clutch function.

Instrument transformer

Current transformer

The current transformer is used in GIS for current measurement and system protection.

- The electromagnetic current transformer, which is of single-phase in one tank structure, is placed at the outlet side of the circuit breaker and is located in different gas chambers from the circuit breaker.
- Because the winding is concealed, four winding can be installed at each phase.
- The secondary winding is casted by saturated type epoxy resin, so its electric and mechanical strength is high and heat resistance is good.
- The winding use the polyester film with good moisture resistance as the interlayer insulating materials to strictly control the moisture.
- The secondary junction box adopts the cast aluminum structure.
- The current transformer is manufactured by the wholly owned subsidiary of Sieyuan Group-Jiangsu Sieyuan Hertz Instrument Transformer Co., Ltd., so its quality is controllable.



Solutions for intelligent GIS

Electronic combined transformer for GIS

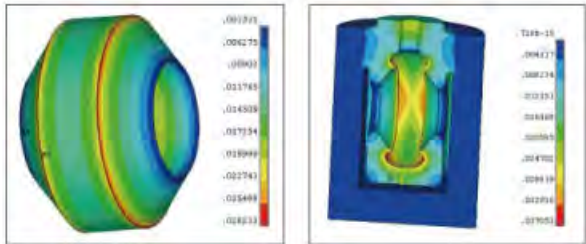
- Digital output
It meets the requirements of international standards and national standards and applies to the intelligent substation.
- Low partial discharge
The partial discharge is less than 5pC under 80% rated power frequency withstand voltage.
- High accuracy
Current measurement level: 0.2S
Current protection level: 5P or 5TPE
Voltage measurement level: 0.2
Voltage protection level: 3P
- Wide operating temperature range
Overall operating temperature range of transformer: -30℃~45℃
Operating temperature range of acquisition unit and combination unit: -40℃~85℃
- Good electromagnetic compatibility

Immunity level of voltage gradient	+20%~-20%
Immunity level of voltage sag and short supply interruption	0.1s for 50% sag and 0.05s for interruption
Immunity level of surge (impact)	Level 4
Immunity level of electrical fast transient burst	Level 4
Immunity level of oscillatory wave	Level 3
Immunity level of electrostatic discharge	Level 4
Immunity level of power frequency magnetic field	Level 5
Immunity level of pulsed magnet field	Level 5
Immunity level of damped oscillatory magnetic field	Level 5
Immunity level of radiated radiofrequency electromagnetic field	Level 3

Voltage transformer

The voltage transformer is used for voltage measurement and system protection.

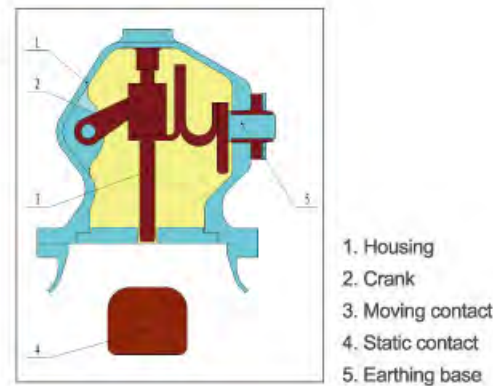
- Each voltage transformer is an independent gas chamber with independent gas monitoring.
- The housing is welded by steel plate and hot galvanized. All connecting bolts are the stainless steel parts and can be used outdoors. The base is installed with metal bursting disc. If high-energy discharge occurs in the product, the bursting disc will be fractured to release the pressure and thus improve the product safety.
- The partial discharge test is conducted at 80% power frequency withstand voltage, and the partial discharge is less than 5pC.



- The secondary junction box adopts the cast aluminum structure, and the secondary wiring board is cast by epoxy.
- The current transformer is manufactured by the wholly owned subsidiary of Sieyuan Group-Jiangsu Sieyuan Hertz Instrument Transformer Co., Ltd., so its quality is controllable.

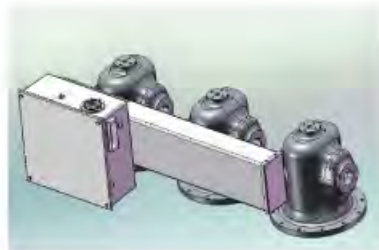
Fast earthing switch

- The fast earthing switch is installed at the line side of feeder bay.
- The single-phase in one tank structure is provided, so the mechanical linkage of three phases can be realized.
- It can reliably make the rated short-circuit current of 50kA twice.
- It shows good capability to switch the inductive current.
- It reaches 5,000 times of mechanical endurance.



Electric spring operating mechanism

- The operating mechanism for fast earthing switch is the electric operating mechanism of charging spring type. It also can be manually operated in case of an emergency.
- The transmission of energy storage process is simple, without extra intermediate link. The motor is decelerated by gear pair and is connected to the screw rod. The ball screw rod is used, so the transmission efficiency is high.
- The mechanism is directly connected without exposed connecting rod, so as to improve the transmission efficiency and enhance the weather resistance of products.



Surge arrester

As the protective element of GIS, the surge arrester is used for protecting the insulation of electrical equipment of GIS against the damage of lightning and operation impulse voltage.

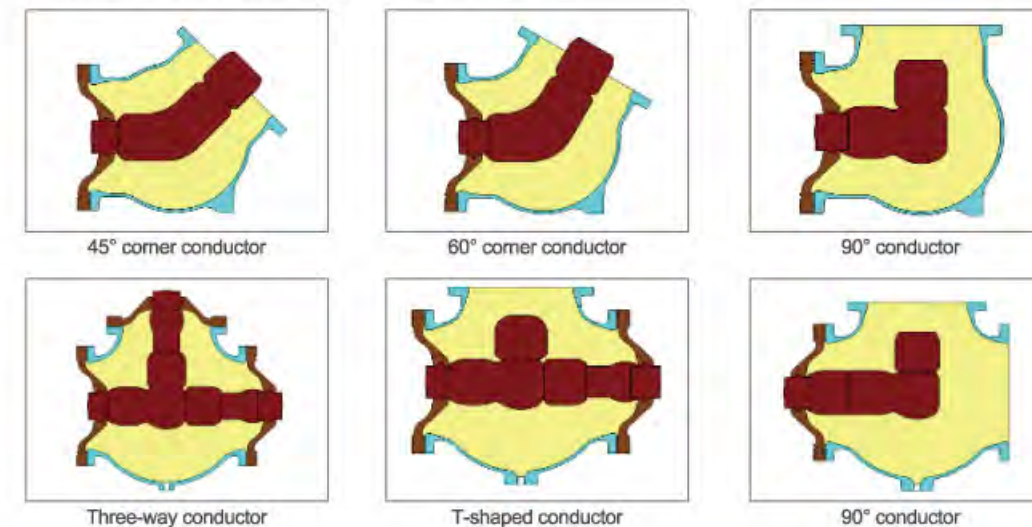


- Surge arrester is mainly composed of enclosure, basin type insulator, mounting base and core body. The core body uses the zinc oxide resistor disc as the main element, with good volt-ampere characteristics. The resistor disc is connected into a cylindrical shape in series.
- The surge arrester is insulated by SF6 gas and is connected with GIS via intermediate flange. With standard connector, it is convenient for site installation.
- Each surge arrester is equipped with online monitoring device to monitor the leakage of current and record the discharge frequency.

Transition module and bus module

Transition module

- The single-phase connection module is used for realizing the interconnection inside the bay or between the bays.
- With standard and modular design, it has good universality and interchangeability.
- The following several transition modules are available according to the space requirements for circuit design and bay arrangement.



Main bus

- It adopts the three-phase in one tank structure.
- The internal conductor structure is calculated and optimized via electric field, to adapt to the limit space.
- The rated current capability reaches 4,000A.



Main bus



Simulation analysis of main bus electric field

Branch bus and inner conductor connection

- It adopts the single-phase in one tank structure and its housing is welded from formed aluminum pipe.
- The contact adopts the spring type contact, with reliable current capability.



Cable terminal

- Through the cable terminal module of single-phase in one tank type, GIS can be connected with various types of high voltage cables. The coordination between cable terminal box and cable terminal meets the requirements of IEC 60859.



SF6/ air bushing

- The connection between GIS and air insulation equipment or overhead line is realized by a corner module and a SF6/air bushing. The air bushing is provided with traditional porcelain bushing and silicon rubber composite bushing to meet different user requirements.
- The length, umbrella form and creepage distance of bushing can be designed according to insulation matching, minimum air insulation gap and pollution level. Through calculation and experimental verification, the SF6/air bushing not only can provide best insulation ability, but also can ensure a longer service life.

Solutions for coastal and heavy industry concentration areas

- The air bushing can be used in the coastal and heavy industry concentration areas, and especially in the highly polluted areas, like thermal power plant, oil refinery, cement plant, chemical plant and coastal oil fields.
- The bushing with a high creepage distance can meet the requirement of high pollution level.
- The silicon rubber composite bushing is recommended, which has good water resistance, strong anti-pollution flashover, high safety, and explosion and cracking protection.

All auxiliary electrical equipment for bay control, monitoring and circuit protection are installed in corresponding local control cabinets.

The control cabinet is provided with free standing and integrated cabinet which can be flexibly arranged according to user's requirements and site conditions.

Excellent integrated cabinet design

- with compact structure, it can be assembled in the factory and transported together with the bay, thereby save the floor area and also reduce the site work.
- The site assembly workload is reduced. At least one month for installation is saved.
- The 2.5mm-thick cold rolled or stainless steel sheet is used, so the mechanical strength is high; the cabinet door has good rigidity and flatness without bending.
- The cabinet body adopts overall bending technology, with nice appearance, high strength and good moisture resistance.
- The internal components adopt the international well-known brands, with reliable quality.
- The mimic bus adopts the screen printing technology, with long service life and nice appearance.
- The reserved digital connector is easily intelligentized.



Reliable and flexible control and protection system

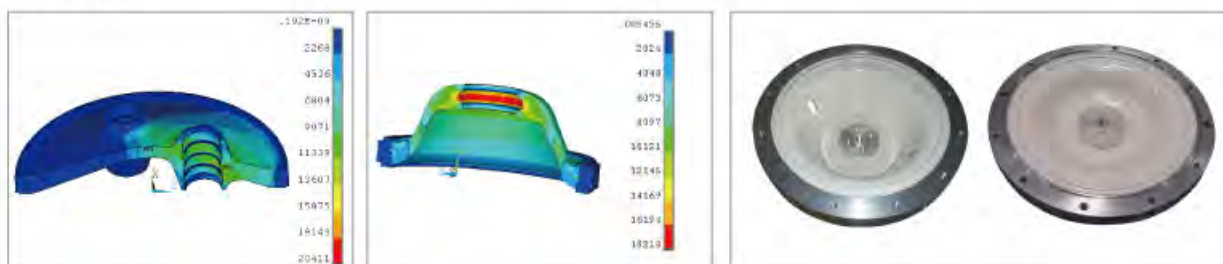
- The complete local operation interlocking and position indication device is equipped with key type local/remote interlocking/ unlocking change-over switch.
- The signals required for operation and monitoring as well as measured values of current, voltage and power in digital or analog form are displayed.
- All auxiliary circuits and voltage transformer circuit are equipped with miniature circuit breaker for protection.

Basin Type Insulator and SF6 gas system

Basin Type Insulator

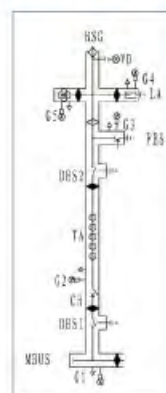
Metal flange structure, double-seal design

- Prevent the cracking of basin due to stress concentration of epoxy parts.
- Effectively prevent the aging of insulating materials due to ultraviolet rays and corrosive gases, etc., and prolong the service life of basin.
- Reduce the leakage of electromagnetic wave through overall shielding and reduce the radio interference.
- Prevent the moisture from entering into the housing with outer sealing ring. Prevent the leakage of SF6 gas with inner sealing ring the annual average gas leakage rate is lower than 0.3%.
- The insulator has excellent insulation level and small partial discharge. We are the only company in the industry that makes the partial discharge of insulators less than 3pC under 80% power frequency withstand voltage ($80\% \times 460\text{kV} = 368\text{kV}$). Moreover, the partial discharge of insulators is less than 3pC under 1.1 times of phase voltage which is higher than the standard requirement ($1.1 \times 252/\sqrt{3} = 160\text{kV}$).
- The grading ring is arranged to optimize the distribution of electric field.



Basin Type Insulator

SF6 gas system



Typical Gas Chamber Diagram

The design of SF6 gas system is to abide by the execution functions of all equipment components.

- The basin type insulator is used for separating the GIS gas chamber.
- Each gas chamber is equipped with independent gas monitoring device, the annual leakage rate of SF6 lower than 0.3%.
- Each density relay is equipped with non-return valve, so the relay can be checked without disassembly.

Insulator casting and curing technology

International advanced level and domestic leading level

- The mold filling is conducted in the purification workshop with 100,000-level cleanliness.
- The insulators, like basin type insulator, DES insulating rod, ES/ FES earthing base and CT secondary patching panel, are cast by the Hübers vacuum mixing epoxy casting equipment imported from Germany. The raw material of epoxy resin is imported from Switzerland.
- The precise temperature controlled roller type curing furnace group cures the insulators according to certain temperature curve, controls the constant temperature and constant humidity of the control room where the equipment is located and ensures the measurement accuracy of equipment.
- The company has formed a set of strict production process which is composed of such links as vacuum casting, X-ray flaw detection, helium mass spectrometer leak detection, high/low temperature test, hydraulic test, partial discharge measurement and power frequency withstand voltage test, so as to ensure the excellent performance of the produced insulators.



Hübers vacuum mixing epoxy casting equipment



Precise temperature controlled roller type curing furnace group



Curing furnace control room



X-ray nondestructive testing equipment



Helium mass spectrometer leak detector



High/low-temperature (alternating) humidity test chamber



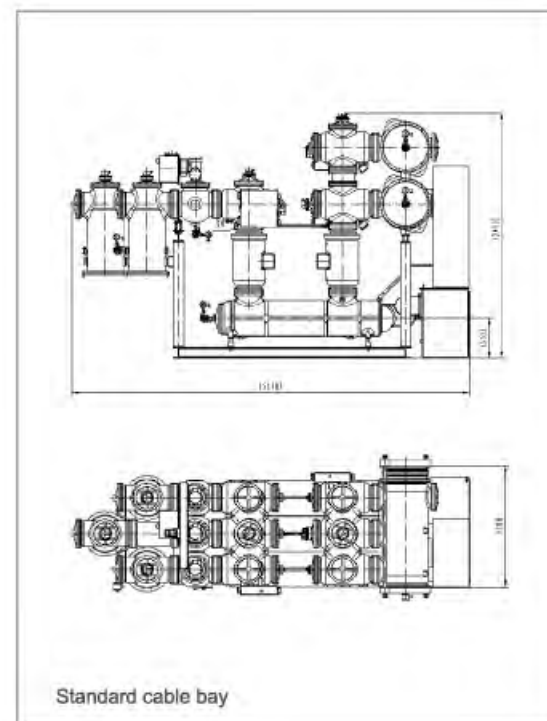
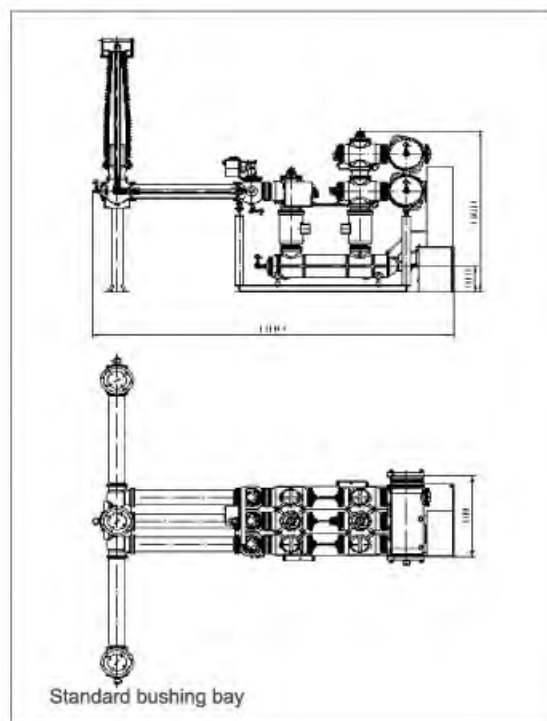
Insulator testing fixture

Typical layout

For the urban concentration areas and populated areas, complex industrial areas and areas under harsh environmental conditions, GIS has unique superiority.

Reasonable compact products

- With modular design and standard connector, the product has good interchangeability between modules and is easy for extension.
- With all aluminum alloy housing. The product has low vortex loss, with no magnetization, no magnetic hysteresis loss and low temperature rise. The standard bay is only 8.5t and is light in weight, so it is convenient for transportation and site installation. The civil cost is low.
- The standard bay is 1,700mm wide. The depth of the plant building required is generally 6.5m and the indoor height is generally 6.5m. The installation and the future operating maintenance can be smoothly completed by using hoist or embedded hook.

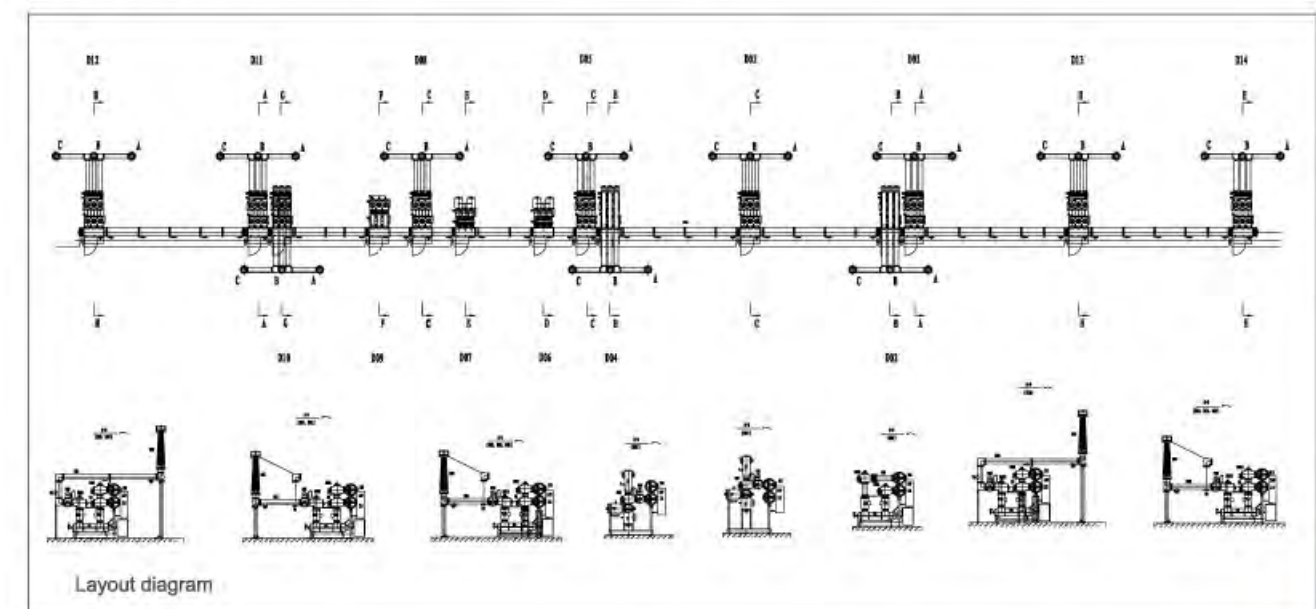
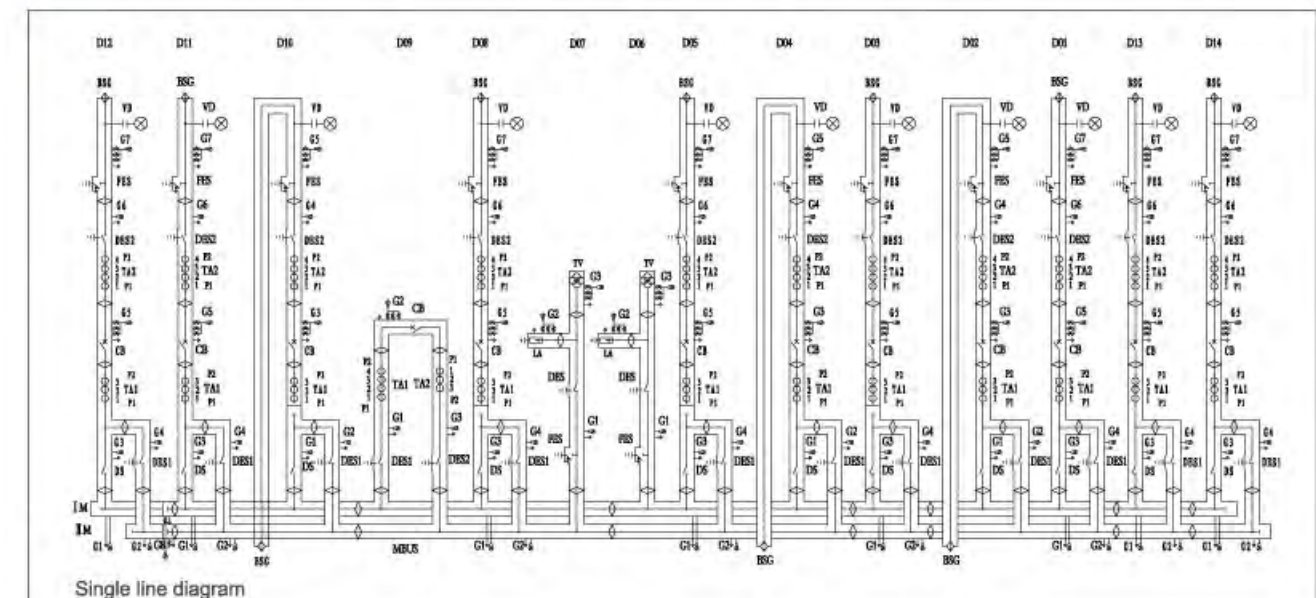


Be applicable to various substation connection modes.

The optimal scheme design provides the combination form with highest cost performance for users.

Double-busbar

- The double-busbar connection can shorten the power outage time, and make power supply more safe and reliable.



Certificates and reports

- The products have passed type tests in the international authoritative testing institutes, like KEMA, Netherlands and China National Quality Supervision and Test Centre for High Voltage Electrical Apparatus.
- Our company has accepted the low temperature test strictly according to the IEC standard.
- Our company gets the aseismic performance analysis report in the seismic region with 9-degree seismic intensity from China National Research Institute of Mechanical Engineering.



KEMA Test Certificate
(GIS Circuit Breaker)



KEMA Test Certificate
(GIS Disconnector Switch)



KEMA Test Certificate
(GIS Earthing Switch)



Inspection Certificate



Test Report of Xi'an High
Voltage Apparatus
Research Institute (GIS)



Test Report of Xi'an High
Voltage Apparatus Research
Institute (GIS Circuit Breaker)



Test Report of Xi'an High
Voltage Apparatus Research
Institute (LCP)



Test Report of Shenyang
High Voltage Apparatus
Research Institute (GIS)



Test Report of Nine-degree
Aseismic Intensity



ISO9001 Certificate

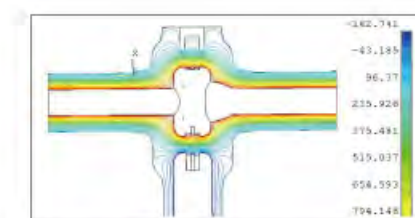


Patent Certificate

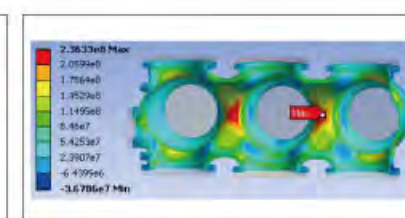


Basic research ability

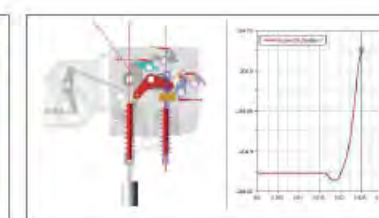
- The analysis of electric field, mechanical strength, dynamic simulation, temperature field and gas/fluid for products ensures the design reasonable and reliable.
- The accurate finite element analysis achieves the excellent technical performance of circuit breaker.
- The accurate simulation analysis of three-dimensional electric field and mechanical strength ensures the big safety margin and low manufacturing cost of compact products.



Analysis of three-dimensional electric field



Analysis of mechanical strength of housing



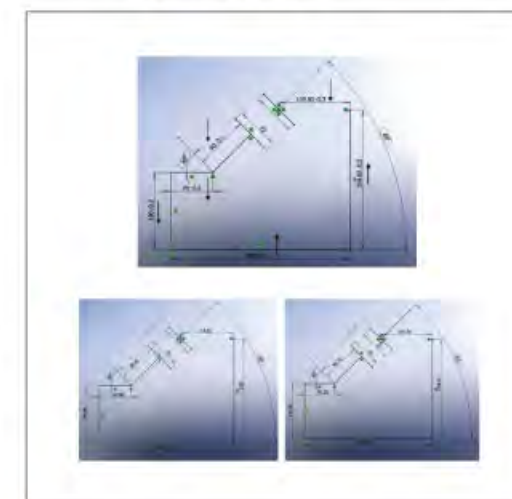
Simulation analysis of mechanism motion
process of breaker

PROCESS									
NO.	NAME	DATE	STATUS	DESIGNER	CHECKER	APPROVER	REVISION	REMARKS	DATE
1	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
2	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
3	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
4	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
5	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
6	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
7	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
8	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
9	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
10	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10

The full process quality characteristic chain realizes the quality control over the full production process of products from design, manufacturing and inspection to site.

FMEA									
NO.	NAME	DATE	STATUS	DESIGNER	CHECKER	APPROVER	REVISION	REMARKS	DATE
1	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
2	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
3	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
4	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
5	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
6	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
7	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
8	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
9	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10
10	DESIGN	2010.10.10	1	WANG	LIU	WANG	1	DESIGN	2010.10.10

Failure mode and effect analysis (FMEA)



Dimension chain analysis: Check the feasibility of drawing dimension, improve the assembly feasibility of products, reduce the influence of accumulative dimension deviation on product performance, improve the success ratio of primary development of products and standardize the drawing tolerance design.

Production Capacity

■ The advanced surface coating technology enhances the anti-corrosion ability of the GIS.



Purification workshop with million-level cleanliness



Machining line



Insulator casting line



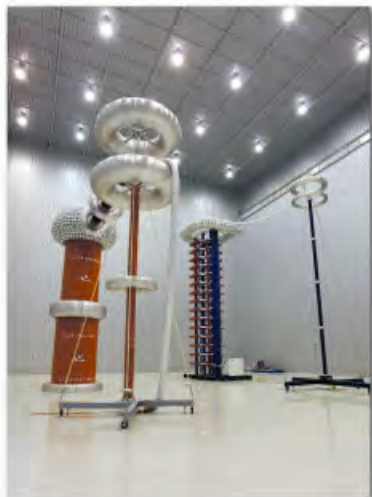
Surface painting line



Automatic silver plating line

Test capability

Test Hall	Length (m)	Width (m)	Height (m)
550kV Test Hall	40	28	21
220kV Test Hall	15	12.5	10



3,000kV impulse voltage generator and 1,000kV power frequency withstand voltage and partial discharge test system



Test transformer, coupling capacitor and impulse voltage lead-in bushing and 1,500kV impulse voltage generator



Main technical parameters

Service condition

Ambient air temperature	Maximum	℃	+ 40
	Minimum	℃	-30
	Maximum daily range of temperature	k	30
Altitude	m		1000/2500
Solar radiation	W/cm2		0.1
Pollution class			III/IV
Ice coating	mm		20
Wind speed/wind pressure	(m/s) /Pa		34/700
Humidity	Mean daily relative humidity	%	95
	Mean monthly relative humidity	%	90
	Mean daily outdoor humidity (condensation and rainfall)	kPa	100
Seismic	Horizontal acceleration	g	0.3
	Sine resonance wave	g	0.15
Common-mode voltage amplitude inducted by the subsidiary and control loops in the opening and closing operations of main loop		kV	1.6

Technical parameters

Rated voltage			252kV
Rated frequency			50Hz/60Hz
Rated current			2500A/3150A/4000A
Rated short-circuit breaking current			50kA
Rated short-circuit making current			125kA
Rated short-circuit withstand current (RMS)			50kA
Rated duration of short-circuit			3s
Rated peak withstand current (peak value)			125kA
Rated lightning impulse withstand voltage (peak value)	Phase-to-earth and between phases		1050kV
	Across the isolating distance		1050kV+145kV
Rated power frequency 1 min withstand voltage (RMS)	Phase-to-earth and between phases		460kV
	Across the isolating distance		460kV+145kV
Rated SF ₆ gas pressure (20℃)	Circuit breaker		0.72MPa
	Others		0.68MPa
SF ₆ gas leakage rate			≤0.3% per year
Moisture content of SF ₆ gas	Circuit breaker compartment	Commissioning	≤150 μ L/L
		Operation	≤300 μ L/L
	Other compartments	Commissioning	≤250 μ L/L
		Operation	≤500 μ L/L
Partial discharge	Test voltage		80%X460kV
	Whole bay		5pC
	Insulator		3pC
Service life			≥30 years
Maintenance Cycle			≥20 years
Standard Dimension(Width x Depth x Height)			1700x5510x3425mm

Main technical parameters

Circuit breaker

Arrangement type	Horizontal type	
Breaker number	1	
Rated voltage	252kV	
Rated current	4000A	
Rated frequency	50Hz/60Hz	
First-pole-to-clear factor	1.3	
Rated short-circuit breaking current	50kA	
Rated short-time withstand current (RMS)	50kA	
Rated duration of short-time	3s	
Rated peak withstand current (peak value)	125kA	
Rated short-circuit making current (peak value)	125kA	
Rated lightning impulse withstand voltage (peak value)	Phase-to-earth and between phases	1050kV
	Across breaker	1050kV+206kV
Rated 1min power frequency withstand voltage (RMS)	Phase-to-earth and between phases	460kV
	Across breaker	460kV+145kV
Short-line breaking current	45kA/37.5kA	
Rated out of phase breaking current	12.5kA	
Rated line-charging breaking current	200A	
Rated cable-charging breaking current	250A	
Breaking time	60ms~100ms	
Rated operating sequence	O-0.3s-CO-180s-CO	
Operation method	level operation	
Mechanical life	10000 times	
Breaking times of rated short-circuit current	20 times	
SF ₆ gas pressure (20℃)	Rated pressure	0.72 MPa
	alarm pressure	0.68 MPa
	Blocking pressure of circuit breaker	0.65 MPa

Three-position disconnecter and earthing switch

Rated voltage	252kV	
Rated current	4000A	
Rated frequency	50Hz/60Hz	
Rated short-time withstand current (RMS)	50kA	
Rated duration of short-time	3s	
Rated peak withstand current (peak value)	125kA	
SF ₆ gas pressure (20℃)	Rated pressure	0.68MPa
	Alarm pressure	0.63MPa
Rated lightning impulse withstand voltage (peak value)	Phase-to-earth and between phases	1050kV
	Across the isolating distance	1050kV+206kV
Rated power frequency 1 min withstand voltage (RMS)	Phase-to-earth and between phases	460kV
	Across the isolating distance	460kV+145kV
Opening and closing time	≤2s	
Mechanical life	5000 times	
Rated capacitive current	2A	
Rated inductive current	2A	
Switching bus-transfer current	Transfer current	1600A
	Transfer voltage	100V
	Transfer times	100 times

Fast earthing switch

Rated voltage	252kV
Rated frequency	50Hz/60Hz
Rated short-time withstand current (RMS)	50kA
Rated duration of short-time	3s
Rated peak withstand current (peak value)	125kA
Rated short-circuit making current	125kA
Minimum operating voltage	85%Ur
Making times of rated short-circuit current	≥ 2 times
Opening and closing time	1.5s ~ 3.0s
Mechanical life	5000 times
Rated inductive current	160A
Rated capacitive current	10A

Meet the customer requirements to the best extent and provide excellent services for customers.

Transportation

- N2 or SF6 is filled into the bay under transportation pressure, and the whole bay is transported together in waterproof, rustproof and anti-corrosion packaging.
- Our company was the first to conduct the transportation test in the industry, so the products can bear the vibration and impact under severe road conditions and the products finally delivered to the user's site are qualified.
- With standardized transportation route and controlled transportation speed, our company has established long-term cooperative relations with the transportation company.



Installation and maintenance

- The transportation units are fully assembled and tested in the factory, so the site installation cost is low.
- With simple working procedures, detailed installation training and few special tools, the installation work strictly abides by the provisions of "instructions for field operation" and is carried out rapidly and effectively under the guidance of after-sales service engineers who have rich electrical experience in Sieyuan.



Service

Quality management of full process and full life cycle

- Establish the archives of product installation and maintenance and perform the spare parts management of full life cycle.
- Professional services: standardized work and trained service team.
- Establish the emergency service barrier-free channel, so as to ensure the contact channel smooth and effective and make the acceptance of customer service demand more rapid and more convenient. Periodically pay a return visit to customers, understand the customer demand.
- The service personnel communicate with the company in real time, so the service operation can get real-time guidance from the company.

