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GSR6-27.5 Series
Environmentally Friendly Gas-insulated
Metal-enclosed Switchgear (C-GIS)

Green and environmentally friendly concept for a clean future

Zhejiang Juhonkia Electric Company Limited

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Leading Innovation



JHK: For the Brilliant Future Await.

Established in January 2014, Zhejiang Juhonkia Electric Company Limited is a mixed-ownership high-tech enterprise focusing on 220kV and below primary and secondary power transformation and distribution equipment and specializing in the research and development, production and sales of intelligent electrical switchgear assemblies and its components. We are share-held and invested by Zhejiang Economic Construction Investment Co., Ltd. which is a wholly-owned enterprise of Zhejiang Communications Investment Group Co., Ltd., one of the world's Top 500 enterprises.

We have a registered capital of 72,368,194 yuan, building area of 30,000 square meters for plant, and more than 200 employees, including more than 40 middle and senior technical engineers. We have passed the certification of the quality, environment, occupational health and safety, intellectual property management system, energy management system, informatization and industrialization integration management system, green supply chain system, after-sales service system etc. We have obtained the Grade IV installation, repair and test licenses for electric power, general aviation license, and independent right to engage in import and export. We have been rated as a national high and new technology enterprise, an enterprise that uses special and sophisticated technologies, a star of the growth of micro and small enterprises of Zhejiang Province, the most growing enterprise of Hangzhou, a model collective of Hangzhou, an enterprise observing contract and keeping promise of Zhejiang Province, an enterprise of credit demonstration management of Zhejiang Province, and an enterprise of patent demonstration of Hangzhou. We have a provincial-level enterprise research institute, a provincial-level intelligent power distribution R&D center, Hangzhou enterprise technology center, municipal-level innovation studio and other innovation and R&D institutions, and established long-term cooperation with Zhejiang University, Hangzhou Dianzi University, Wuhan University, China Electric Power Research Institute, Zhejiang Huadian Instrument Testing Research Institute, etc. At present, we have 13 software copyrights, 81 patents; 14 products passing certification of the provincial-level industrial new products, 19 products winning the third prize of the Machinery Industry Science and Technology of Zhejiang Province, 4 products winning the second prize of the Industry Association of Zhejiang Province, 2 products winning the Outstanding Industrial Products Award of Zhejiang Province.

We are a large-scale manufacturer producing 72.5kV and below switchgear, with complete varieties in China. Over the years, we have gained much experience in electrical research and development and smart manufacturing. We mainly produce 12kV to 72.5kV SF6 gas-insulated switchgear, 12kV to 72.5kV environmental gas-insulated switchgear, integrated prefabricated substations, primary and secondary combination pole-mounted circuit breakers, primary and secondary combination ring main units etc. Among them, 10 categories of products including ring main box, ring main unit, switchgears, HV cable branch boxes, prefabricated substations, pole-mounted circuit breakers, pole-mounted load switches, integrated distribution boxes (JP cabinets), primary and secondary combination ring main units, primary and secondary combination pole-mounted circuit breakers have passed the State Grid qualification. And 10kV pole-mounted vacuum circuit-breaker automatic combined equipment, 10kV SF6 fully insulated circuit-breaker automatic combined equipment, 10kV SF6 fully insulated load switch automatic switchgear have passed the pre-qualification of China Southern Power Grid.

"We have always one ring main unit ideal for you!" JUHONKIA always engages the segment fields of ring main units, and keeps developing new products of ring main units. The series products of ring main unit have realized the full coverage of voltage level and different insulation medium products. We are one of the first batch of enterprises in China to finish simultaneously the R&D, manufacturing, network access testing and bulk supply of standardized and customized SF6 gas insulated, solid insulated, environmental gas insulated, atmospheric air-insulated ring main units and primary and secondary combination ring main units. We have excellent equipment and our products are designed with stable and reliable quality, which are highly recognized by multinational famous brands of electrical products such as ABB and Siemens, and we are authorized to cooperate in ring main units.

With our business philosophy of "Intelligent Manufacturing of High-quality Products only", we seek tirelessly improvement, strive for the best and grow rapidly. During our development, we warmly welcome friends from all kinds of fields to visit JUHONKIA, and we are looking forward to work with you to seek common development, and create a better future!

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ISO9001



ISO14001



ISO45001

Our company has passed the certifications of ISO9001 quality management system, ISO14001 environmental management system and ISO45001 occupational health and safety management system.

Overview

As the country's electrified railways have put forward new and higher requirements for switchgear such as miniaturization, intelligence, maintenance-free and full working conditions, our company independently developed the high-performance and high-quality GSR6-27.5 series environmentally friendly gas-insulated metal-enclosed switchgear (C-GIS) which uses dry air (D-air) as the insulating medium. It is a new generation of MV equipment assemblies integrating vacuum arc extinguishing technology, APG solid insulation technology, gas insulation technology and interface insulation technology. The product has passed the type test verification and new product technical appraisal of the national authoritative testing agency, and has obtained a number of national invention patents and utility model patents. It has independent intellectual property rights. The product solution is mainly suitable for electrified railway systems with single-phase or two-phase, rated voltage 27.5kV and a maximum voltage of 31.5kV, such as high-speed railways, passenger dedicated lines and other high-level railway fields.

The product has a modular design, and the solution can be flexibly combined according to the needs of railway users. The products are provided with a sealed pressure system. All the HV live parts of the main circuit are sealed in the stainless-steel gas tank, which is not affected by the environment. The products have the characteristics of intelligence, reliable operation, small size and maintenance-free.



Implementation standard

GB/T 28428-2012	27.5 kV and 2×27.5 kV AC metal-enclosed switchgear and controlgear for electrification railway
GB/T 1984-2014	High-voltage alternating-current circuit-breakers
GB/T 1985-2014	High-voltage alternating-current disconnectors and earthing switches
GB/T 3906-2020	Alternating-current metal-enclosed switchgear and controlgear for rated voltages above 3.6 kV and up to and including 40.5 kV
GB/T 11022-2020	Common specifications for high-voltage alternating-current switchgear and controlgear standards
GB/T 4208-2017	Degrees of protection provided by enclosure (IP code)
GB/T 9969-2008	General principles for preparation of instructions for use of industrial products
GB/T 7354	Partial discharge measurements
GB/T 13384-2008	General specifications for packing of mechanical and electrical product
GB/T 191-2008	Packaging - Pictorial marking for handling of goods
GB/T 311.1-2012	Insulation coordination of high-voltage power transmission and distribution equipment
GB/T 13540-2009	Seismic qualification for high-voltage switchgear and controlgear

Attention to detail

Design

- Specially designed for electrified high-speed railway traction systems
- Single busbar design, single-phase single-wire, single-phase two-wire system
- Laser welded stainless steel box
- Modular design solution
- The busbar connection adopts plug-in technology and does not require gas operation
- With pressure relief channel
- No. 2/3 inner cone cable plugging system
- Flexible extension method, can connect solid insulated busbar

Advantages:

Maximize safety

- Functional chambers are completely isolated
- HV parts are completely sealed and not affected by the external environment
- The site altitude has no effect on the insulation strength

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- Using dry air insulation, non-toxic, harmless and environmentally friendly
- Isolation inflation pressure $\leq 0.04\text{Mpa}$

Economy

- Provide maximum usability to operators
- Maximizing the service life of the environmental isolation system
- Less maintenance requirements, maximum operating cost savings

Metal armored and gas sealing

- The gas tank is filled with dry air for insulation
- Separate airtight busbar chamber
- Separate airtight circuit breaker chamber
- 27.5kV
- Maximum 2500A, 31.5kA

Usage environment

- Altitude $\leq 4000\text{m}$ (when the equipment operating altitude exceeds 1000m, special instructions are required).
- The maximum ambient temperature is $+40^{\circ}\text{C}$, the minimum temperature is -25°C and the 24h average temperature is $\leq 35^{\circ}\text{C}$.
- The ambient humidity: Average 24h relative humidity is $\leq 95\%$ and the average monthly relative humidity is $\leq 90\%$.
- Electromagnetic interference: The amplitude of electromagnetic interference induced in the secondary system is $\leq 1.6\text{Kv}$.
- Installation environment: There are no explosive and corrosive gases in the surrounding air and there are no frequent severe vibrations or impacts in the installation site.

Note: If the above usage environment conditions are exceeded, please contact us.

Product features

- Adopt internationally advanced concepts, world-class production, testing methods, laser welding, laser cutting, helium leak detection and other equipment.
- The primary component of the product adopts a fully sealed design, which is completely sealed in a sealed gas tank welded by stainless steel plates and filled with a certain pressure of dry air (D-air) insulating medium. The protection level reaches IP67, completely avoiding the impact of the external environment and climate on the switchgear. It can operate reliably in harsh environments such as basements, plateaus, frozen soil, coastal areas and humidity, achieving maintenance-free operation.
- The product can be operated manually or electrically. The operating mechanism is mature and reliable and it has complete mechanical and electrical interlocking, which can effectively prevent personal injury and equipment damage caused by mis operation.
- The product design has a compact structure. Compared with the traditional air insulated switchgear, the volume is significantly reduced and the floor area is reduced by 30%-70%, which improves space utilization and effectively reduces the overall project cost.
- Microprocessor-based protection and system technology integrates protection, control, metering, detection and communication functions to achieve distribution network automation and digitalization requirements and can be completely unattended.

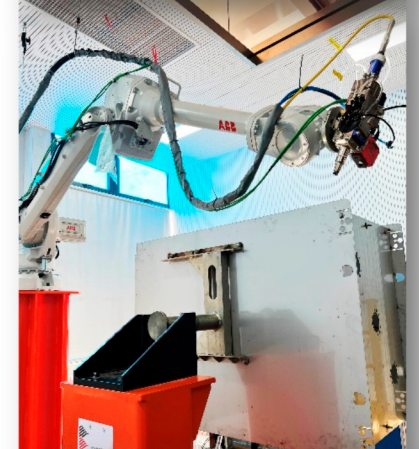


Table 1 Technical parameters of switchgear

Name		Unit	Parameter	
Rated voltage		kV	1×31.5	2×31.5
Rated frequency		Hz	50	
Lightning impulse withstand voltage	Pole to ground, circuit breaker between contacts	kV	200	200
	Between poles		/	325
	Isolating contacts		220	220
Main circuit power frequency withstand voltage (1min)	Pole to ground, circuit breaker between contacts	kV	95	95
	Between poles		/	140
	Isolating contacts		118	118
Insulating medium			Dry air	
Gas filled compartment zero gauge pressure 5min power frequency withstand pressure			1.3Ur	
Rated current of the main busbar/feeder line		A	1250, 1600, 2000, 2500	
Rated short-time withstand current/duration		kA/s	31.5/4	
Rated peak withstand current/grounding switch closing current		kA	80	
Internal arc withstand capability AFL		kA/s	31.5/1	
Level of protection	gas compartment box		IP65	
	Switchgear shell		IP54	
Rated gas filling pressure (20°C gauge pressure)		MPa		
Annual gas leakage rate		%	≤0.1	
Overall dimensions	Width	mm	600/900	
	Height	mm	2600	
	Depth	mm	1900	

Table 2 Technical parameters of operation mechanism

Name	Unit	Parameter
Rated operation sequence	/	O-0.3s-CO-180s-CO
Mechanical life	Time (s)	10000
Rated voltage of Energy storage motor	V	DC110, DC220
Energy storage time	s	<15
Rated voltage of Control power supply	V	DC110, DC220

Product structure

The product is designed as a modular assembled structure, consisting of modules (compartments) with independent functions, namely the cabinet bottom unit, integrated inflatable unit, comprehensive protection control unit, operation mechanism chamber, pressure relief channel and other parts, which are assembled as a whole while maintenance is flexible and efficient.

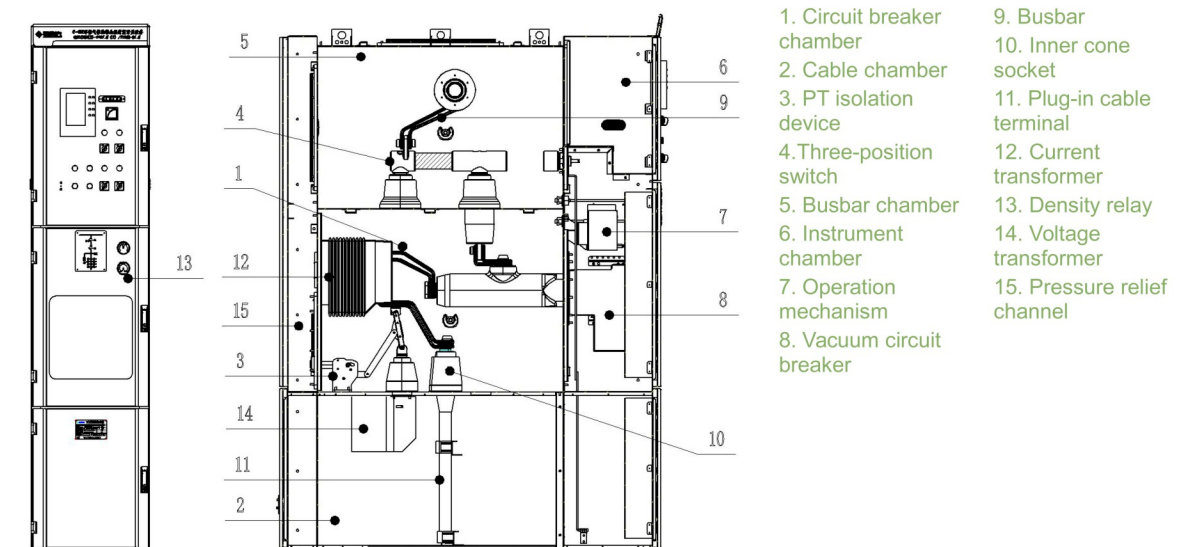


Figure 1. 1×27.5kV vacuum circuit breaker cabinet (≤1250A)

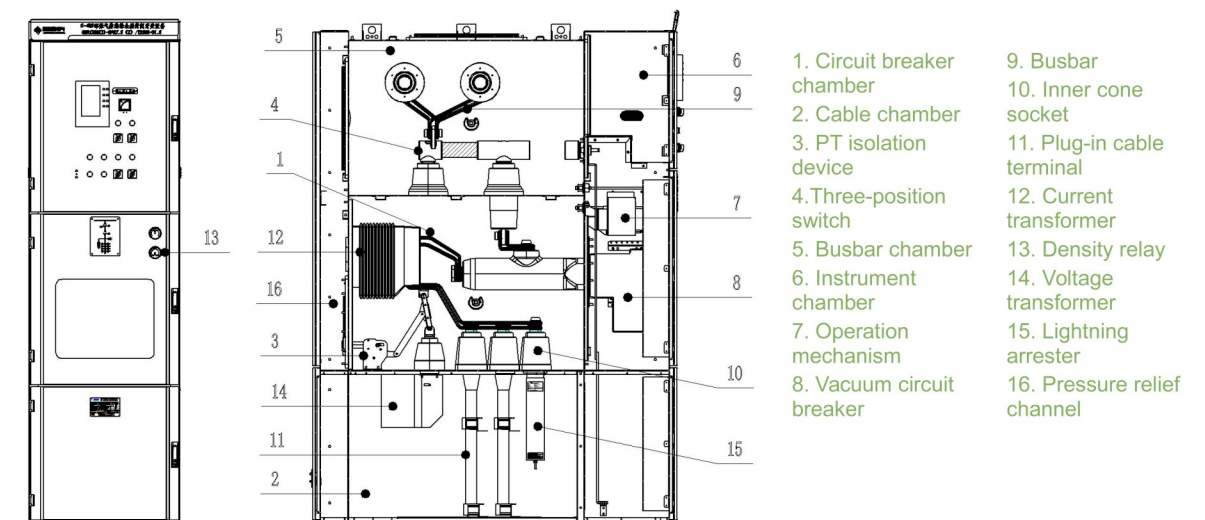


Figure 2. 2×27.5kV vacuum circuit breaker cabinet (1250~2500A)

The general dimensions of the equipment are shown in the table below:

Specification	Rated current (A)	Width (mm)	Depth (mm)	Height (mm)	Notes:
Single pole/double poles	≤1250	600	1900	2600	The specific cabinet depth is designed according to the solution
	1250~2500	900	1900	2600	

Product solution

Products can be selected from different solutions based on single/double-phase busbars and can be flexibly combined according to actual projects. The 1×27.5kV single/double-phase bus Single Line Diagram is shown in (Table 1/2) and the 2×27.5kV Single Line Diagram is shown in (Table 3).

1×27.5kV single-phase busbar Single Line Diagram:

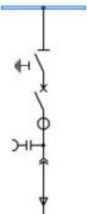
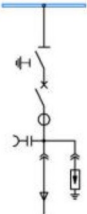
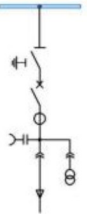
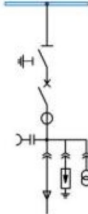
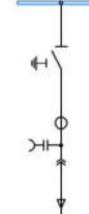
Solution No.		01	02	03	04	05	06
Single Line Diagram							
Main electrical components	Vacuum circuit breaker	1	1	1	1		
	Three-position switch	1	1	1	1	1	1
	Current transformer (CT)	1	1	1	1	1	1
	Voltage transformer (PT)			1	1		
	Plug-in arrester		1		1		1
Cabinet type solution		Incoming and outgoing lines	Incoming and outgoing lines+BL	Incoming and outgoing lines+YH	Incoming and outgoing lines+BL+YH	Cable connection	Cable connection+BL

Table 1

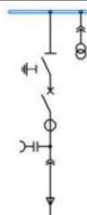
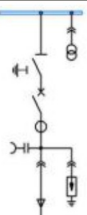
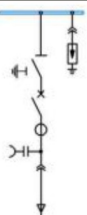
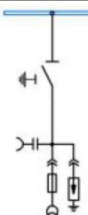
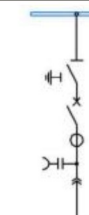
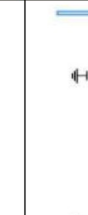
Solution No.		07	08	09	10	11	12
Single Line Diagram							
Main electrical components	Vacuum circuit breaker	1	1	1		1	
	Three-position switch	1	1	1	1	1	1
	Current transformer (CT)	1	1				
	Voltage transformer (PT)	1	1		1		
	Plug-in lightning arrester		1	1	1		
Cabinet type solution		Cable connection	Incoming and outgoing lines+YH	Incoming and outgoing lines+BL	BL+YH	Interconnection	Isolation

Table 1 (continued)

1×27.5kV double-phase busbar Single Line Diagram:

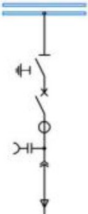
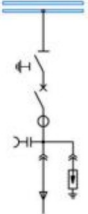
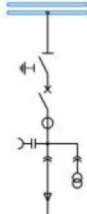
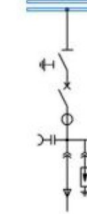
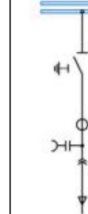
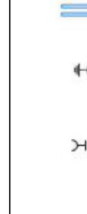
Solution No.		201	202	203	204	205	206
Single Line Diagram							
Main electrical components	Vacuum circuit breaker	1	1	1	1		
	Three-position switch	1	1	1	1	1	1
	Current transformer (CT)					1	1
	Voltage transformer (PT)			1	1		
	Plug-in lightning arrester						1
Cabinet type solution		Incoming and outgoing lines	Incoming and outgoing lines+BL	Incoming and outgoing lines+YH	Incoming and outgoing lines+BL+YH	Cable connection	Cable connection+BL

Table 2

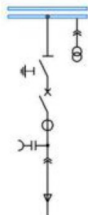
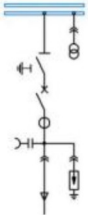
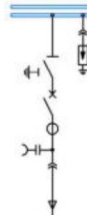
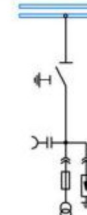
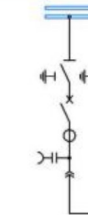
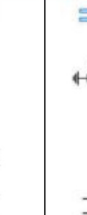
Solution No.		207	208	209	210	211	212
Single Line Diagram							
Main electrical components	Vacuum circuit breaker			1		1 (two-pole)	
	Three-position switch	1	1	1	1	1 (two-pole)	1 (two-pole)
	Current transformer (CT)	1	1	1	1	2	
	Voltage transformer (PT)				1		
	Plug-in lightning arrester		1	1	1		
Cabinet type solution		Cable connection	Cable connection+BL	Incoming and outgoing lines+BL	BL+YH	Interconnection	Isolation

Table 2 (continued)

2×27.5kV Single Line Diagram:

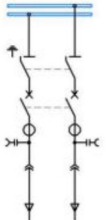
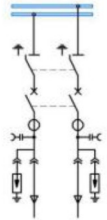
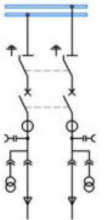
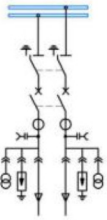
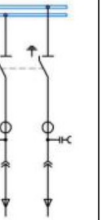
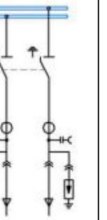
Solution No.		301	302	303	304	305	306
Single Line Diagram							
Main electrical components	Vacuum circuit breaker	1	1	1	1		
	Three-position switch	1	1	1	1	1	1
	Current transformer (CT)	2	2	2	2	2	2
	Voltage transformer (PT)			2	2		
	Plug-in lightning arrester		2		2		2
Cabinet type solution		Incoming and outgoing lines	Incoming and outgoing lines+BL	Incoming and outgoing lines+YH	Incoming and outgoing lines+BL+YH	Cable connection	Cable connection+BL

Table 3

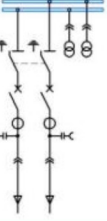
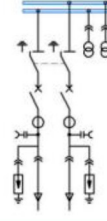
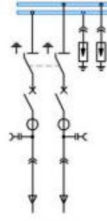
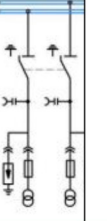
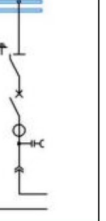
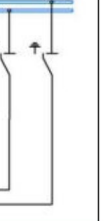
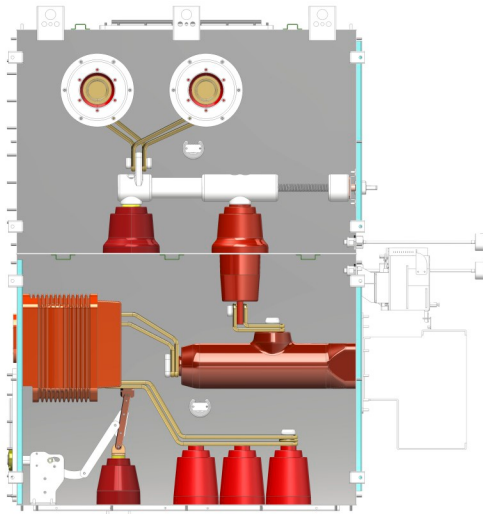
Solution No.		307	308	309	310	311	312
Single Line Diagram							
Main electrical components	Vacuum circuit breaker	1	1	1		1	
	Three-position switch	1	1	1	1	1	
	Current transformer (CT)	2	2	2		2	
	Voltage transformer (PT)	2	2		2		
	Plug-in lightning arrester		2	2	2		
Cabinet type solution		Cable connection	Cable connection+BL	Incoming and outgoing lines+BL	BL+YH	Interconnection	Isolation

Table 3 (continued)

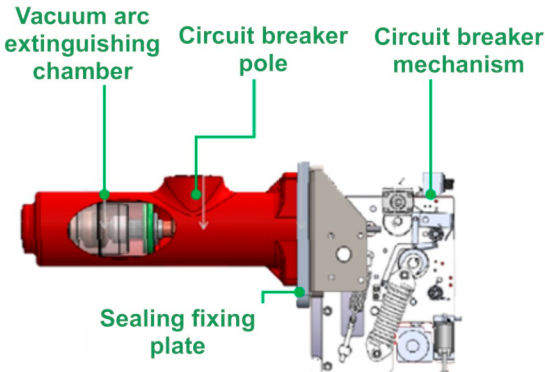
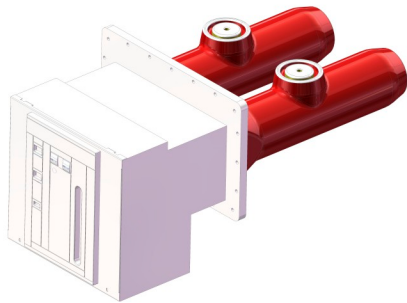
Remarks: Rated current ≤1250A, cabinet width is 600mm.

Gas tank structural features

The product is designed as a modular assembled structure, consisting of modules (compartments) with independent functions, namely the cabinet bottom unit, integrated inflatable unit, comprehensive protection control unit, operation mechanism chamber, pressure relief channel and other parts, which are assembled as a whole meanwhile maintenance is flexible and efficient.

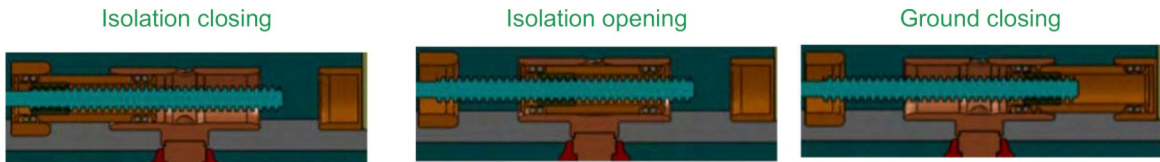


Vacuum circuit breaker features



- The solid-insulation-embedded pole of the circuit breaker are arranged horizontally and fixedly installed in the sealed gas tank, requiring no maintenance.
- Using vacuum arc extinguishing technology, switching does not affect the insulation strength of the gas in the gas tank.
- Metal bellows are used between the poles and the mechanisms to achieve internal and external connection and transmission of the gas tank. The air leakage rate is extremely low and the reliability is high.
- It has more reliable rated current closing and breaking performance.
- It can be operated frequently and has low fault rate.

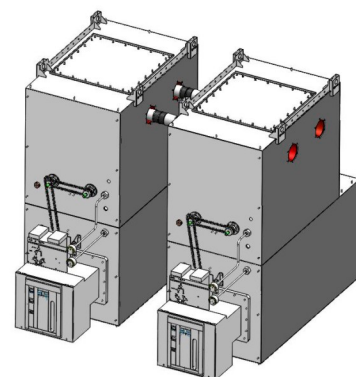
Three-position switch features



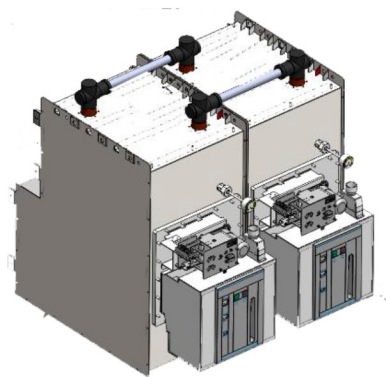
Direct-acting three-position switch

- The three-position switch can be used as a busbar isolating switch and feeder line grounding switch to realize closing, isolation and grounding functions and interlocking.
- When the three-position switch is used as a line-side grounding switch, the quick grounding function is realized through the circuit breaker.
- Cylindrical electrode, uniform electric field and superior insulation performance.
- The operation mechanism is driven by magnetic hydrodynamic sealing technology. By rotating the insulating screw rod and driving the conductive rod, the three-position linkage is realized while the interlocking is reliable and there is no possibility of mis operation.
- The switch position can be detected by a sensor or auxiliary switch, with mechanical position indication.

Extended features



Side extension



Top extension

The product can be flexibly selected in side extension or top extension cabinet connection mode and the corresponding extension bushing connection is selected according to the parameter specifications to avoid direct contact with live objects and each extension port adopts a standard interface, which can realize the connection of various insulation medium cabinet types to achieve product interchange and interoperability.

Switchgear mechanism features

- The spring operation mechanism is reasonably designed with fewer mechanical parts, balanced energy output and reliable action.
- Reliable double interlocking device of mechanical interlocking and electrical interlocking can prevent mis operation.
- It has automatic reclosing function and is installed on the outside of the gas tank through a sealing fixing plate, which facilitates disassembly and maintenance without affecting the sealing performance of the gas tank.
- Interlocked with the circuit breaker to ensure that it can only be closed when the three-position switch is in the correct position, with reliable performance.
- The switch position can be detected by a sensor or auxiliary switch, with mechanical position indication.
- Adopt manual double-hole operation, the isolation operation hole and the grounding operation hole are interlocked and the locking electromagnet or mechanical lock hole can be prefabricated.
- The mechanism drive controller has a built-in rectifier and the corresponding AC power supply or DC power supply can be selected.
- Manual operation with limiting device, the crank handle can only be removed when the operation is in place.



Circuit breaker mechanism

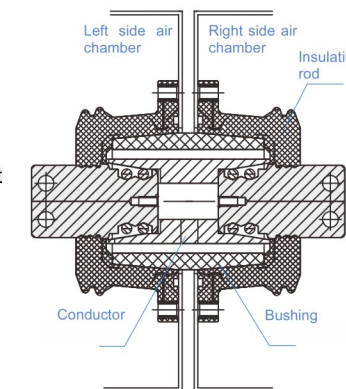


Isolation mechanism

Accessory selection and introduction

Side parallel busbar connection system

The extension between cabinets is connected by insulated busbars and the busbar connectors are closely matched with the bushings on the side of the switchgear. The layout is compact and there is no insulating gas filling and discharging operation involved when putting together cabinets on site. It is not affected by dust and condensation and is easy to install.



Top extension busbar connection system

The extension between cabinets is assembled using F-type tees, F/C-type four-way and solid busbars, which are closely matched with the top bushing of the switchgear. The busbar combination is flexible, cabinet connection is easy, the surface is fully shielded, the shielding layer is reliably grounded, the insulation design margin is large (110kV/min) and the liquid glue material is used to resist high and low temperatures and has a long service life.



Shielded front plug

Features:

The installation conditions are not affected by harsh environments, anti-condensation, anti-pollution and maintenance-free. It has a high level of partial discharge and is a fully insulated, fully sealed and fully shielded product. Can be used in 12~40.5kV voltage systems.



Plug-in lightning arrester

Features: Metal shell structure, the shell is reliably grounded and touchable, installed in the inner cone socket of the gas tank. The plug-in structure makes maintenance and replacement more convenient and can be connected to discharge counters and online leakage current detectors; according to requirements, it can be installed on the line side or busbar side, or in an independent PT.

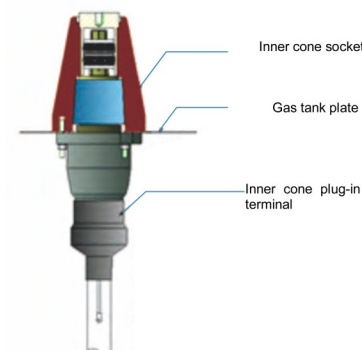


Special structure, integral molding, no air gaps, good sealing performance, moisture-proof and explosion-proof; large creepage distance, good hydrophobicity, strong stain resistance, stable performance, reduced operation and maintenance; unique formula of zinc oxide resistor, high capacity, low leakage. Can be used in 12~40.5kV voltage systems.



Inner cone plug-in cable terminal

The HV primary cable adopts an inner cone plug-in structure, is connected to an inner cone cable socket and is installed above and below the air chamber. Cable plugs are supplied with sockets. Each phase can connect up to 4 single-core cables. 3# inner cone plug-in terminals are recommended. The cable cross-section is recommended to be 50mm²~300mm²



Voltage transformer

Features: The product is an epoxy cast dry-type voltage transformer with a metal layer on the outside that can be directly grounded. The transformer has a rectangular (or C-shaped) iron core, with the primary and secondary windings coaxially wound on the frame. The instrument body is fully sealed with epoxy resin and cast in an aluminum shell. There are mounting holes on the bottom plate for users to install. The connection method to the high-voltage is cable plug-in type and the product comes with a fuse.



Current transformer

Features: The current transformer adopts the cable core type. Its ring-shaped iron core and secondary winding are vacuum-casted with high-quality epoxy resin in a flame-retardant stainless steel shell. It has stable performance and requires no maintenance. Flexible configuration of specifications: The inner diameter of the core-type current transformer varies according to the cable specifications and the span is optional from 50 to 60 mm.



Intelligent integrated control unit

The intelligent control and protection unit integrates protection, control, measurement, monitoring, communication and alarm functions to meet comprehensive automation requirements and can be completely unattended.



Operation procedures

Power supply operation:

Operate the circuit breaker to open → operate the three-position switch from the grounding position to the isolation position → operate the three-position switch from the isolation position to the closing position → operate the circuit breaker to close

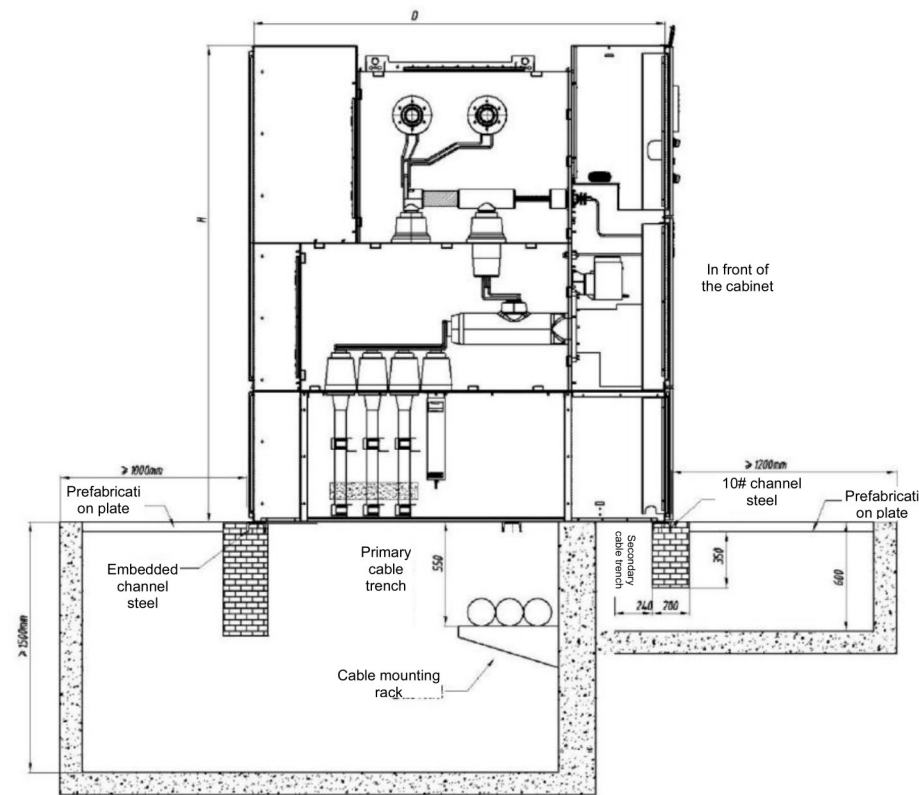
Power outage operation:

Operate the circuit breaker to open → operate the three-position switch from the closing position to the isolation position → operate the three-position switch from the isolation position to the grounding position → detect that the cable side circuit is in a power-off state → operate the circuit breaker to close

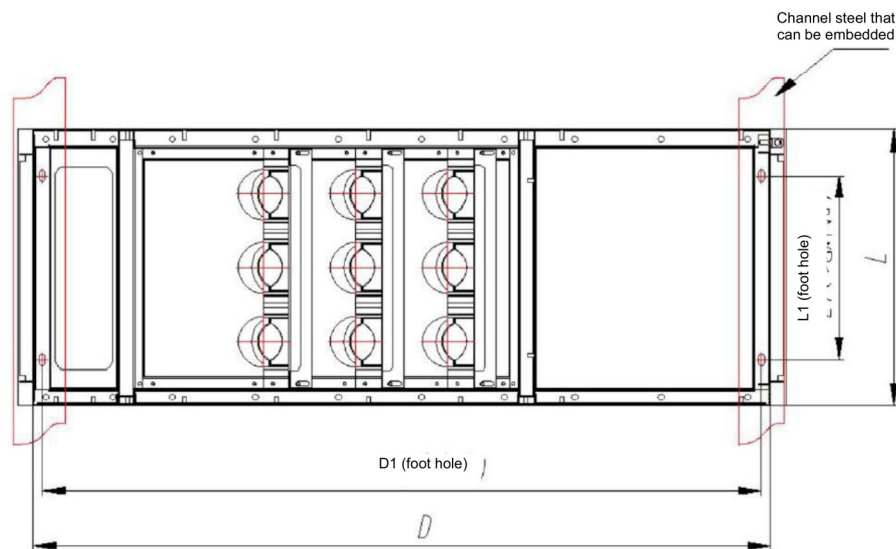
Interlocking function

- Prevent the circuit breaker from closing again in the closed position.
- The circuit breaker can only close or open when the three-position switch is in the working position corresponding to closing, isolating or grounding.
- When the isolating switch is connected, isolated or grounded, the operation handle cannot be removed when the switch is not in place and the circuit breaker cannot be closed.
- When the live indicator shows that the cable side is live, manual and electric locking of the grounding switch operation lever prevents the grounding switch from being operated, preventing the line side from closing the grounding switch when the line side is live.
- If there are no special instructions when ordering, the circuit breaker has been equipped with electrical anti-trip function before leaving the factory.

Installation dimensions and foundation reference drawings



I. Foundation reference diagram



II. Basic channel steel diagram

Technical requirements

1. The basic frame is made of 10# channel steel, galvanized and the allowable flatness tolerance is $\pm 1\text{mm/m}$.
2. The shape and position tolerance requirements of the channel steel foundation installation frame: the allowable tolerance of straightness is 1mm/m and the total length does not exceed 3mm .
3. The specific parameters of the mounting holes are shown in the table below:

(Unit mm)

Cabinet width L	600	900
Foot hole distance L1	400	700
Cabinet depth D	1900	1900
Foot hole distance D1	1860	1860

Note: The actual mounting hole size is subject to the specific project drawings.

Ordering instructions

Primary solution drawing and floor plan.

The name, model, specification and quantity of the main electrical component used in the primary and secondary circuits.

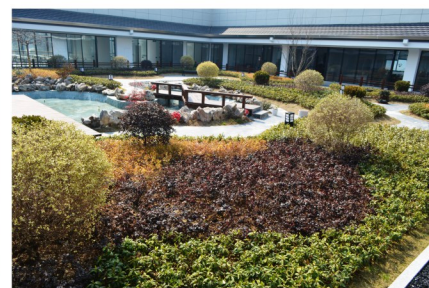
Technical requirements for the product when ordering.

If users need plateau or three-proof products, they must make a special request when ordering.

If the user has other special requirements, they should be mentioned when ordering.



CORPORATE PRESENCE



Office
environment

Garden in
air

Employees
training

Competition

SMART MANUFACTURING



Fully automatic ring main unit welding
production line



Intelligent ring main unit production line



Outdoor circuit breaker intelligent
production line



CNC busbar punching and shearing
machine



CNC laser cutting machine



CNC punch press



CNC bending machine



Fully-automatic wire harness
processing equipment



Prefabricated substation workshop

DETECTION EQUIPMENT



Lightning strike test area



Discharge test area



Ring main unit detection area