

252kV Gas Insulated Switchgear (GIS)

1. Standard: IEC 62271-203

2. Typical Feature

2.1 Great Breaking Character of Circuit Breaker

The circuit breaker adopts the self-extinguishing principle; it can achieve three-pole or one-pole operation by only adopting a spring mechanism with small operating power.

2.2 Compact Design

- Adopt the advanced three-position switch, less parts, simple structure, small space and high reliability.
- Adopt the advanced PLC intelligent control system, reduce the secondary elements, shrink the volume of cabinet greatly.

2.3 High Reliability of Mechanism

The circuit breaker adopts a spring mechanism with small operate power, and the three-position switch adopts electric operating mechanism.

2.4 Convenient Transportation and Installation

It can be transported as bigger unit and it is easy to install.

2.5 High Reliability and Maintenance

No maintenance under normal condition.

3. Technical Parameter

3.1 Main GIS Technical Parameters

Description		Unit	Parameter
Installation			Indoor or outdoor
Temperature		(°C)	-40 ~ +55
Rated voltage		kV	252
Rated frequency		Hz	50
Rated current		A	2000~4000
Rated short-time withstands current ,3s		kA	50
Rated peak withstands current(peak)		kA	125
Rated short time power frequency withstands voltage, 1min		kV	460
Rated lightening impulse withstands voltage(peak)		kV	1050
Power frequency withstands voltage under zero gauge pressure, 5min		kV	189
Rated SF6 pressure (20°C)	Circuit breaker gas room	MPa	0.72
	Other gas room	MPa	0.68
SF6 annual leakage rate		%	≤0.5

3.2 Main Technical Parameters of Circuit Breaker

Description		Unit	Parameter
Rated short-circuit breaking current		kA	50
Rated short-circuit making current(peak)		kA	125
First phase breaking factor			1.5
Rated short time power frequency withstand voltage,1min	Open contacts	kV	530
	To earth	kV	460
Rated lighting impulse withstand voltage(peak)	Open contacts	kV	1200
	To earth	kV	1050
Power frequency withstand voltage under zero gauge pressure, 5min		kV	189
Rated operating sequence			O-0.3s-CO-180s-CO
Entire breaking time		ms	≤60
Closing time		ms	≤110
Opening time		ms	≤30
Operation mechanism			Spring

3.3 Main Technical Parameters of Disconnector and Maintenance Earthing Switch

Description		Unit	Parameter
Rated short time power frequency withstand voltage,1min	Open contacts	kV	530
	To earth	kV	460
Rated lighting impulse withstand voltage(peak)	Open contacts	kV	1200
	To earth	kV	1050
Power frequency withstand voltage under zero gauge pressure, 5min		kV	184
Closing time		s	≤4
Opening time		s	≤4

3.4 Main Technical Parameters of Fault Making Erathing Switch

Description	Unit	Parameter
Rated short-circuit making current(peak)	kA	125
Closing time	s	≤4
Opening time	s	≤4

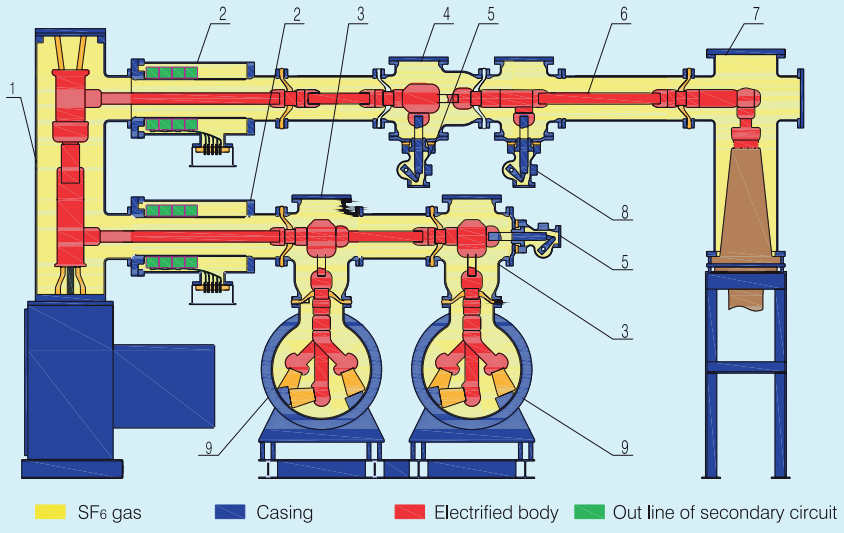
3.5 Main Technical Parameters of Bus

Description	Unit	Parameter
Rated current	A	2000 - 4000
Type of casing		main busbar three-pole common box/ tapped bus three-pole split box

4. Structure

Modular design makes the structure varified as per different arrangements

Fig.1 Sectional diagram of one bay



1. Circuit breaker
2. Current transformer
3. Disconnector (right-angle type)
4. Disconnector (line type)
5. Earthing switch for repairing
6. Branch bus
7. Cable Sealing End(CSE) box
8. Fault making earthing switch
9. Main bus

5. Standard Module

5.1 Circuit Breaker

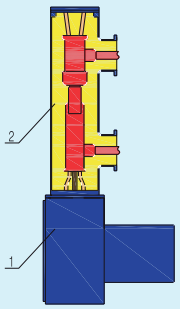
The circuit breaker is the core component of GIS.

The circuit break is compose d of two parts: interrupter unit and spring operating mechanism.

5.1.1 Interrupter Unit

The interrupter unit is self-extinguishing circuit breaker, during the operation of circuit to arc-quenching. Adopting spring operating mechanism of small operate power because it needs less operating power.

Fig.2 Circuit breaker



1. Spring operating mechanism
2. Interrupter unit

5.1.2 Operating Mechanism

Spring stored energy operation mechanism is provide energy to opening or closing operation of circuit breaker. The mechanisms sealed in mechanism cabinet.

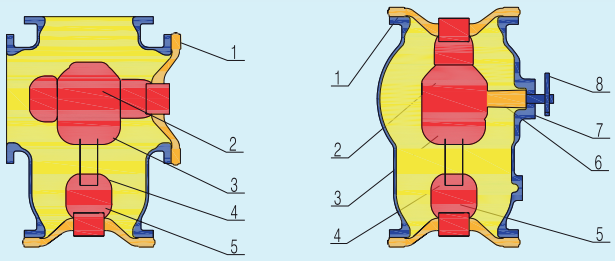
Features:

- Compact designed.
- The circuit breaker can accomplish more than 3000 times opening and closing operation.
- No noise operation.

5.2 Disconnector

- Able to can open or close the bus charging current, low inductive current and bus switching current.
- High insulation level at breaks
- Strongly commonality. All of the spare parts of the two types of disconnector switch are general service expect type of installation.
- Can be operated by three-pole linking of electric mechanism or manual operation.

Fig.4 Disconnector



A. Right-angle type disconnecting switch

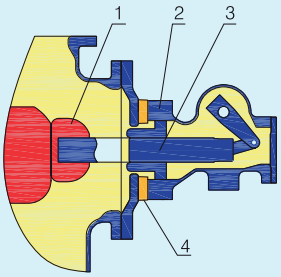
B. Line type disconnecting switch

1' Basin type insulator
2' Moving contact assembly 3' Moving side shield
4' Static side shield
5' Static contact assembly 6' Insulation pull rod
7' Shaft seal
8' Connecting lever

5.3 Earthing Switch

- The fault making earthing switch can make the short-circuit current, it also can open or close the electrostatic induction current and electromagnetic induction current.
- Strongly commonality. Except the different service foundation of two types of earthing switch, they are the same in internal structure, and the spare parts of the two types of earthing switch are general service.
- Resistance measurement of GIS main circuit, measurement of mechanical characteristic of circuit breaker and performance test of current transformer is come true through earthing switch.

Fig.5 Earthing switch



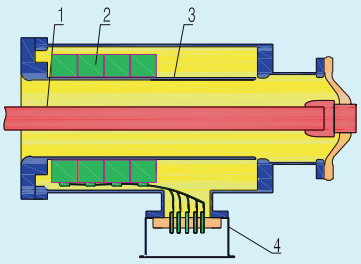
1. Static contact assembly
2. Shell
3. Moving contact assembly
4. Insulation flange

Accordingto the different requirement of arrangement, earthing switch for repair can be installed on disconnecting switch or bus. Fault making earthing switch is usually be installed on incoming and outgoing line. The high potential of GIS are safe grounding through earthing switch for security of people and equipment during installing and repair.

5.4 Current Transformer

- Toroidal core, secondary circuit is epoxide resin packaged.
- Variety quantity of class of measurement and protective winding available.
- According to the requirement of main wiring of secondary circuit, there is different ratio of transformer, class of accuracy and capacity.
- Electromagnetic induction type.

Fig.6 Current transformer



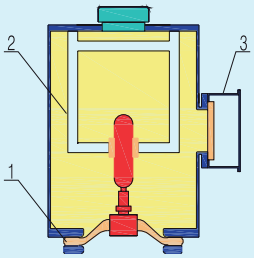
1 Primary conductor
2. Winding
3. Internal shield
4. Terminal box

The current transformer can be installed on one side or two sides of circuit breaker, or any position of incoming and outgoing line. The primary winding consists of high voltage conductor. Outgoing feeder of secondary winding is be lead-out through sealed terminal which be installed on shell.

5.5 Voltage Transformer

- Electromagnetic-type transformer.
- Variety of secondary windings and spare windings available.
- According to the requirement of customer, secondary winding has different ratio of transformer, class of accuracy and capacity.
- Installed on any position of GIS.

Fig.7 Voltage transformer



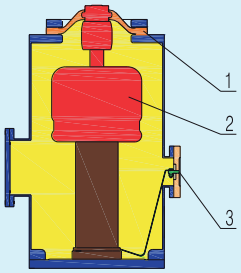
1. Basin type insulator
2. Voltage Transform
3. Terminal box

Voltage transformer has an independent gas room of SF6. It can be installed vertically, upward and downward.

5.6 Metal Oxide Surge Arrester

- Adopt metal oxide resistor wafer.
- Installed on any position of GIS.

Fig.8 Metal oxide surge arrester



1. Basin type insulator
2. Core of surge arrester
3. Earthing Terminal

As the overvoltage protective device, surge arrester is installed on incoming side or any position of GIS. The surge arrester is an independent gas room. The core of surge arrester consists of metal oxide resistor wafer which has obvious nonlinearity of current and voltage, connect with GIS through gas insulator. The equipment is installed on casing of surge arrester for monitor and control.

5.7 Bus

Main bus type and branch bus type.

The main bus is three-pole common box, and the branch bus is three-pole split box type.

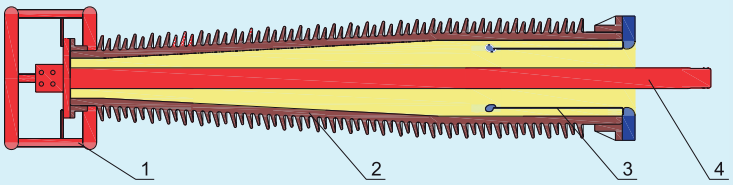
5.8 Terminal Component

The GIS connects with the overhead line, transformer, reactor or cable through following component: SF6-air bushing , cable terminal box and transformer terminal box (SF6 oil bushing).

5.8.1 SF6-air Bushing

GIS connects with open equipment or overhead line through SF6-airbushing. It has considered the air insulation distance and pollution degree that design of length of bushing, umbrella type and creepage distance, and it is suitable for different area. The insulation distance of three-pole bushing had been considered during the design.

Fig.11 SF6-air bushing



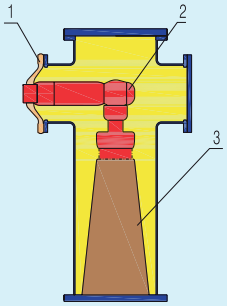
1. Grading ring
2. Porcelain bushing
3. Internal shield
4. Central conductor

5.8.2 Cable Sealing End(CSE) Box

Through cable terminal box, it can joint all kinds of high voltage cable to GIS. The design and scope of supply of cable terminal box comply with the requirements of IEC62271-209.

The connection conduct between GIS and cable terminal is removable, GIS and cable can do test separately.

Fig.12 Cable terminal box



1. Basin type insulator
2. Removable conductor
3. Cabele terminal

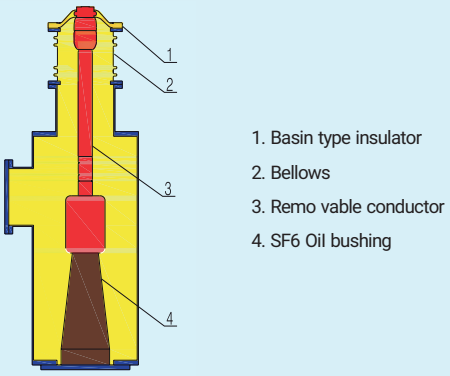
5.8.3 Transformer Termination Box (SF6-oil Bushing)

The transformer terminal box connects the oil insulation transformer or reactor. The design and scope of supply of transformer terminal box tallies with the requirements of IEC 62271-306.

The connection conduct between GIS and cable terminal is removable, GIS and cable can do test separately.

In order to compensate the error, the bellows is usually installed on between transformer terminal box and GIS.

Fig.13 Transformer terminal box



6. Controlling, Interlocking, Monitoring

6.1 Local Control Cubicle

The circuit breaker, disconnecting switch, control of earthing switch, position indicator and the monitor of SF6 are all concentrate in local control cabinet of space.

The main function of control cabinet:

- The local operation of circuit breaker, disconnecting switch, earthing switch come true, and operation choice of remote control room comes true.
- Transmite all of the signal to center control room and protective device
- Setting a mimic diagram of primary main wiring, position indicator of circuit breaker, disconnecting switch and earthing switch.
- Setting local operation switch of circuit breaker, disconnecting switch and earthing switch.
- Ligthing alarm annunciator of SF6, monitor the SF6 state of every gas room.
- Connect with circuit breaker, disconnecting switch, earthing switch, current transformer and terminal of voltage transformer.

6.2 Interlocking

Electric interlock is set during circuit breaker, disconnecting switch and earthing switch, it can avoid incorrect operation effectively. So people can operate the circuit breaker, disconnecting switch and earthing switch correctly in main control room or local position.

6.3 SF6 monitoring

The space of GIS is separated to several unattached gas room by basin insulator, the SF6 monitor are installed in every gas room. And it also has independent aeration interface. The signal is transmitted to local control cabinet through cable. When the SF6 in the gas room is abnormal, the alarm signal is sent out. The circuit breaker also has block-signal of SF6 pressure reduce operation.