ZFW34A-252 GIS

Voltage from 170kV up to 252kV

Content

1.0 Product Features

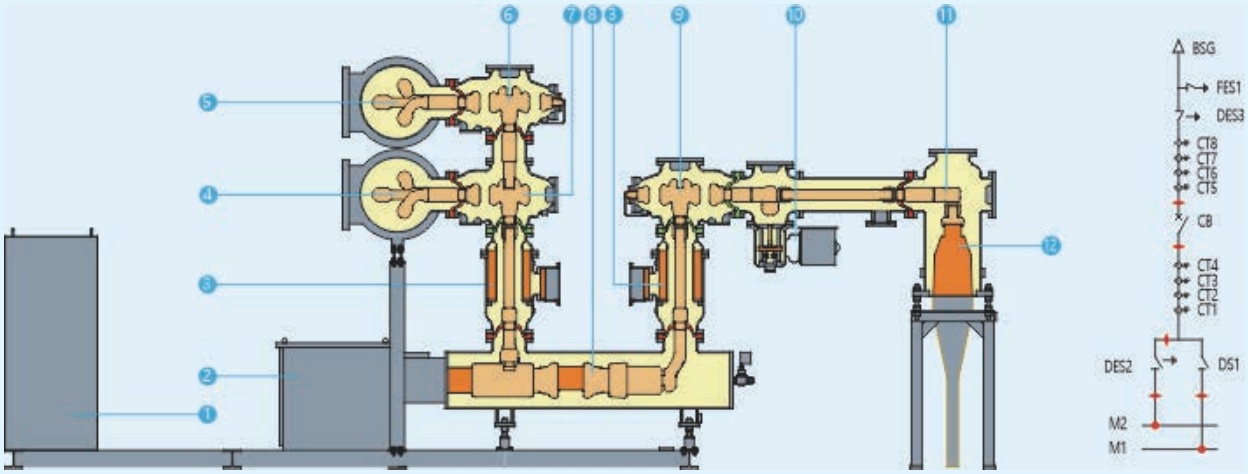
- **Low Partial Discharge:** Under 80% power frequency withstand voltage, the insulation is less than 2pc, and the partial discharge value of the whole bay is less than 5pc;
- **Low Leakage Rate:** The butt flange surface is specially designed for double sealing structure, and its annual gas leakage rate is ≤ 0.1%, which effectively reduces the risk of gas leakage;
- **High Reliability:** The electrical life of the Circuit Breaker is 22 cycles, the mechanical life is ≥ 10000 cycles, with C2-E2-M2 tier model of linkage performance. The mechanical life of disconnector and fast earthing switch is 10000 cycles, and the fast earthing switch is solely designed with the characteristic of super class B;
- **Compact Structure:** The three-phase common box connection method of the main bus, and the other three-phase individual box connection method, with the standard bay spacing is 2m and the minimum bay spacing is 1.8m;
- The product is subject to lightning impulse test when leaving the Factory to completely eliminate the hidden danger of insulation discharge and ensure the stability and reliability of product quality.
- **Smart:** The product is solely designed to be with the relevant sensor to realize the on-line monitoring and one key sequence control of the mechanical characteristics of the Circuit Breaker, gas, density, micro-moisture, partial discharge, etc.

Key Parameters

No.	Item		Unit	Parameter Value
1.	Rated Voltage		kV	252
2.	Rated Current		A	3150/4000
3.	Rated frequency		Hz	50/60
4.	Power frequency voltage test (Phase to ground/fracture, kV/1min)		kV	460/460+145
5.	Peak value of lightning impulse withstand voltage (1.2/50us) (Phase to ground/fracture)		kV	1050/1050+206
6.	Rated short-time withstand current		kA/s	50/3
7.	Rated peak withstand current		kA	125/130
8.	Rated pressure of SF_6 (20)	Circuit Breaker	MPa	0.62
		Surge Arrester, Potential Transformer		0.58
		Other		0.58
9.	Annual leakage rate of SF_6		%	≤0.1
10.	Partial discharge (Under 80% rated power frequency withstand voltage)	Whole bay	pC	≤5
		Single insulator		≤2
11.	Circuit Breaker	Mechanical life	Cycle	≥10000
		Electrical life		22
12	Three-position switch	Mechanical life	Cycle	11000
		Conversion current	A	2400
		Conversion voltage	V	300
13	FES designed solely with the characteristic of super class B	Mechanical life	Cycle	10000
		Electromagnetic induction	/	350A/15kV
		Electrostatic induction		25A/70kV

1.0

Product Features



1	LCP	7	Bus Disconnector
2	Circuit Breaker Operating Mechanism	8	Circuit Breaker
3	Current Transformer	9	Circuit Three-position Switch
4	M1 Main Bus	10	Fault Closing Earthing Switch
5	M2 Main Bus	11	Cable Terminal
6	Bus Three-position Switch	12	High-voltage Cable Joint (Need to be purchased by the User)

2.0

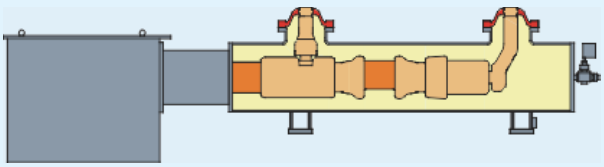
Functional Components

2.1 Circuit Breaker

The Circuit Breaker is the core component of GIS. It is composed of arc extinguishing chamber of three-phase individual box connection type and full spring operating mechanism, which can realize three-tier model of electrical linkage or three-tier model of mechanical linkage of Circuit Breaker.

- The Arc Extinguishing Chamber is specially designed as the principle of double-acting and self energy arc extinguishing, which can greatly reduce the operating power of the mechanism and improve the operation reliability of the product.
- Each tier Arc Extinguishing Chamber is designed to be equipped with a full spring operating mechanism, which can realize three-phase electrical linkage or single-phase operation.
- The three-tier Arc Extinguishing Chamber is designed to be equipped with a full spring operating mechanism, which can realize three-phase mechanical linkage.
- The Circuit Breaker has accepted and passed the test of high breaking capacity of rigorous short-circuit current at KEMA in the Netherlands.
- The Circuit Breaker of E2-M2-C2 tier model has electric life of 22 cycles, mechanical life of mechanical linkage of 10000 cycles and mechanical life of electrical linkage of 12000 cycles.

The Circuit Breaker Honored with KEMA Certificate in High Breaking Capacity



Circuit Breaker Diagram

a) Arc Extinguishing Principle

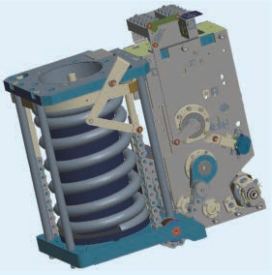
- **Breaking large Current:** Designed as the self energy principle. The arc combustion makes the SF6 gas in the thermal expansion chamber expand violently, generating high-speed air flow to the nozzle to extinguish the arc after zero-crossing, that is, the arc is extinguished by using the energy of the arc itself, so as to significantly reduce the operating power of the operating mechanism.ble.
- **Breaking Small Current:** Designed as the compressed-air principle. SF6 gas in the compressor chamber is compressed to produce air flow to the nozzle, which extinguishes the arc after zero-crossing. To optimize the volume of the compressor chamber and the geometry of the nozzle to ensure that the arc does not reignite after zero-crossing.

2.0

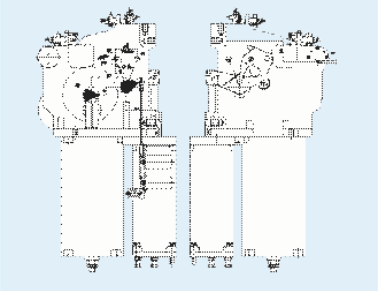
Functional Components

b) Operating Mechanism

— The Spring Operating Mechanism is small in size and has a mechanical life of more than 10000 cycles, meeting the environmental protection requirements of oil-free and no gasification.



Spring Operating Mechanism with Single-phase Operation Electric Linkage



Spring Operating Mechanism with Three-phase Mechanical Linkage

2.2 Three- position Disconnector Earthing Switch

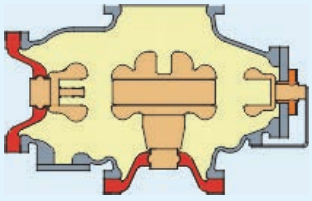
a) Arc Extinguishing Chamber

— Three-position Disconnector Earthing Switch module integrates the functions of disconnector and earthing switch and shares a set of moving contact structure. It is one of the main components of GIS.

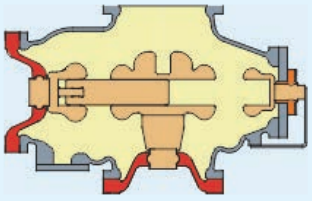
— The effective mechanical interlocking is considered in the structural design, which can fundamentally eliminate the problem of misoperation between the disconnector and the earthing switch, thanks to the special design of the Three- position Disconnector Earthing Switch structure.

— With good capability to open and close capacitive current and inductive current. The Disconnector configured on double-bus with the capacity of switching bus maximum conversion current of 2400A.

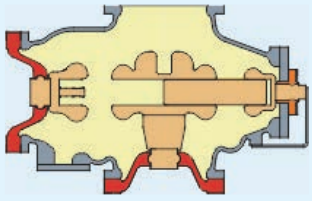
b) Three Working Positions of Three-position Disconnector Earthing Switch



Disconnector Opening + Earthing Switch Opening



Disconnector Closing + Earthing Switch Opening



Disconnector Opening + Earthing Switch Closing

c) Three-position Operating Mechanism

— Three-position Disconnector Earthing Switch shares one operating mechanism, which can be operated manually.

— The mechanism design of mechanical interlock and isolator structure can ensure the stability and safety of the cooperation between the Mechanism and the Switch.

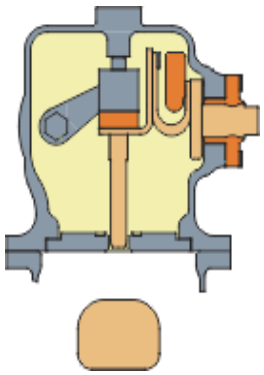
— The Mechanism and Switch are specially designed for direct connection mode, with high transmission efficiency and reliable protection.

— To meet the requirement of State Grid on "One Key Sequence Control".

2.0

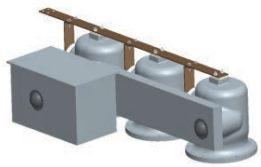
Functional Components

2.3 Maintenance Earthing Switch/Fault Closing Earthing Switch



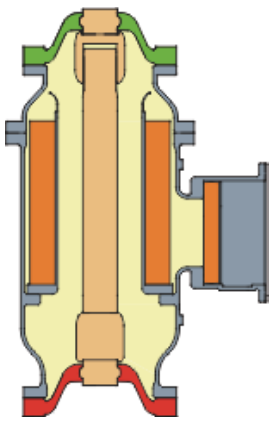
- There are Two Types of Switches: Maintenance Earthing Switch and Fault Closing Earthing Switch.
- The Fault Closing Earthing Switch is specially designed for making short-circuit current and opening/closing electrostatic induction and electromagnetic induction current.
- In addition to different functions, the internal structure of the two types of Earthing Switches is basically the same with high degree of standardization.
- Designed with three- phase individual box connection method and three-phase mechanical linkage.
- With good short-circuit current making capacity, capable of reliably making 50kA rated short-circuit current twice.
- Switching induced current capacity is solely designed with the characteristic of super class B: Electromagnetic induction current of 350A/15kV, electrostatic induction current of 25A/70kV.

2.4 Electric Spring Operating Mechanism



- The operating mechanism for the Fast Earthing Switch is an Electric Spring Operating Mechanism, which can also be operated manually in case of emergency.
- The energy storage process has simple transmission and no redundant intermediate links.
- The Mechanism is not designed for external leakage connecting with high durability.

2.5 Current Transformer



- It is designed for Electromagnetic Current Transformer with three-phase individual box connection method, which is placed on the outgoing side of the Circuit Breaker and is in a different air chamber from the Circuit Breaker.
- It is designed for coil built-in and secondary coil epoxy resin casting; With the features of good electrical and mechanical strength and good heat resistance.
- The coil is made of insulating material with good water resistance, and the moisture is strictly controlled.
- The secondary junction box is cast into a whole with the enclosure, with the feature of good sealing. The secondary junction board is epoxy cast. The selection of Current Transformer shall be based on the secondary coil level in transformation ratio, accuracy grade and capacity according to Users needs.

2.0 Functional Components

2.6 Potential Transformer

- The Potential Transformer is designed with an independent air chamber, which can realize gas detection independently.
- Each phase Potential Transformer is designed to be equipped with explosion-proof sheet to improve product safety.
- The protection grade of secondary junction box is IP55.
- The selection of Potential Transformer shall be based on the secondary coil level in transformation ratio, accuracy grade and capacity according to Users needs.

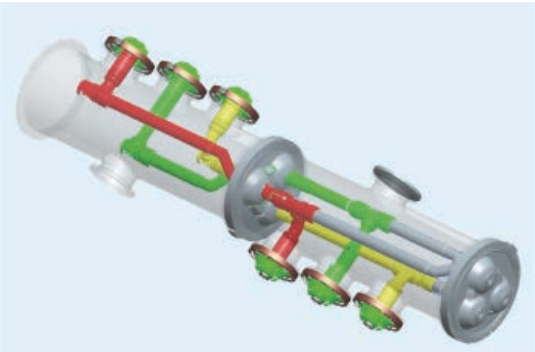
2.7 Metal Oxide Surge Arrester

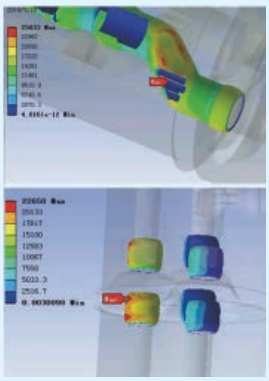
- As the protective component of GIS, Surge Arrester is specially designed for protecting GIS from thunder & lightning and partial switching over-voltage.
- Each Surge Arrester is specially designed for using an independent air chamber structure and with independent gas detection equipment and operation detection.
- As the core component of Surge Arrester, zinc oxide resistor has good volt-ampere characteristics. The resistor is connected in series into a cylinder.
- Each Surge Arrester is specially designed with a discharge monitor, which can monitor the leakage current in real time and record the discharge times.

2.8 Main Bus and Branch Bus

Main Bus

- The main bus is designed solely for three-phase common box connection method.
- Symmetrical design of two bus systems, with more compact and reasonable structure.
- Internal conductor with the feature of high versatility.
- The full bay can be exited for maintenance, thanks to the removable internal conductor and the bellows.





Simulation Analysis of Main Bus Electric Field

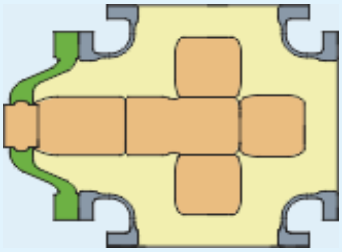
2.0 Functional Components

Branch Bus

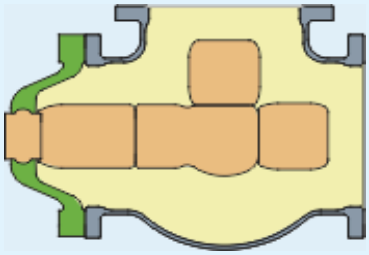
- The branch bus is designed solely for the three-phase individual box connection method, and the enclosure is welded with high-quality formed aluminum tubes.
- The flow capacity of branch bus is reliable, thanks to the designed with spring contact finger.

2.9 Transfer Module

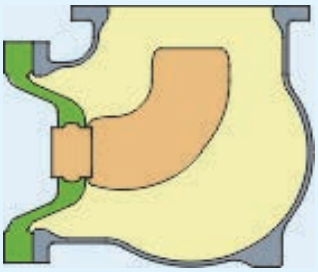
- The single-phase connection module is designed to realize the interconnection inside the bay or between bays.
- With the features of good versatility and interchangeability, thanks to the modular and standardized design.
- According to the space requirements of circuit design, bay layout and connection mode, to select the corresponding Transfer Module.



Four- way Module



Tee Module



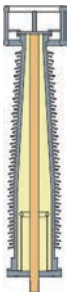
Right Angle Module

2.0

Functional Components

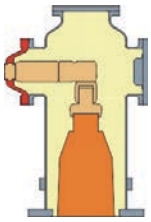
2.10 Terminal Component

GIS (HGIS) shall be connected with overhead line, transformer or reactor and cable. Three connection methods for GIS: Bushing overhead connection, cable terminal connection and gas-oil bushing connection.



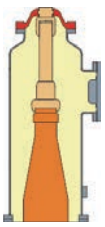
SF_6-Air Bushing

- The connection from GIS to air insulated equipment or overhead line has been realized through a corner module and an SF_6-Air Bushing.
- Two options for bushings: Traditional porcelain bushing and composite bushing, which can meet the needs of different Users.
- The length, umbrella skirt and creepage distance of the bushing are specially designed according to insulation coordination, minimum air insulation clearance and pollution degree.



Cable Termination

- GIS can be connected with various types of cables, thanks to the three-phase individual box connection type Cable Termination module. The design structure of cable termination complies with the regulation of GB/T22381 and IEC62271-209.



Transformer Terminal (SF6 gas-Oil bushing)

- Transformer Terminal is designed for the three-phase individual box connection method to directly connect with the Ttransformer to realize the compact space layout.
- The Transformer Terminal and the Transformer are separated by insulating plate to reduce the fault impact at both ends.

2.11 Bellows (Expansion Joint)

Installation Compensating Bellows

- To be made of high-quality stainless steel
- It is used to adjust the installation deviation during installation stage.

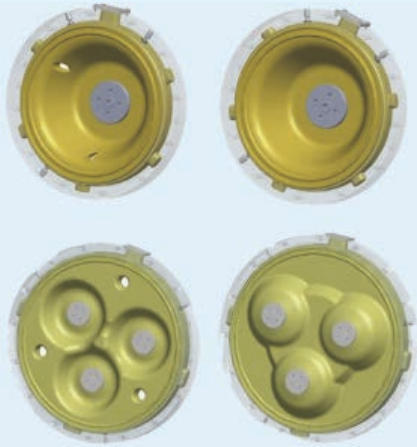
2.0 Functional Components

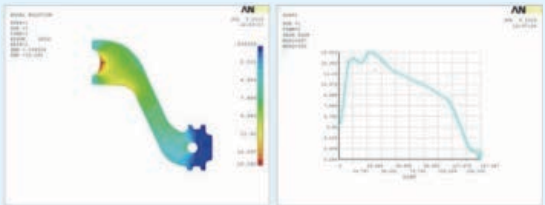
Temperature Compensating Bellows

- To be made of high-quality stainless steel
- It is used to compensate for axial length change of busbar caused by thermal expansion and contraction.

2.12 Basin-type Insulator

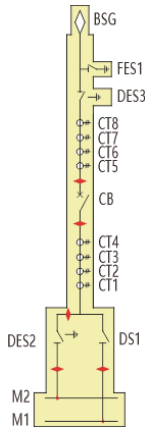
- The design with metal flange can effectively prevent the insulation from environmental damage (Such as ultraviolet, rain and snow)
- The partial discharge value of a single insulator is <2pc under 80% power frequency test voltage, which is 2.3 times higher than the standard value, thanks to the reasonable electric field structure design.
- The metal flange has the effective shielding effect to reduce electromagnetic wave leakage and radio interference.
- The outer ring prevents moisture from entering to prolong the service life of the main ring, thanks to double-seal design. The main ring prevents SF6 gas leakage, and the annual leakage rate is ≤ 0.1%.
- The external side of the metal flange is with a partial discharge detection port to realize on-line monitoring of partial discharge.





2.0 Functional Components

2.13 SF_6 Density Detection System



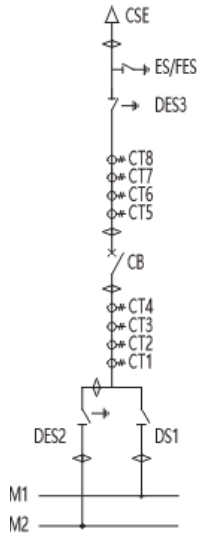
- The design principle of SF_6 gas detection system is formulated according to the executive function of each component of the equipment, and shall be set according to the comprehensive consideration of the scope of maintenance.
- The air chambers of different modules are separated by diaphragm insulators, and the pressure difference of different air chambers has been taken into account in the design of diaphragm structure.
- Each air chamber is with a valve, which can be used for on-line calibration of density relay.
- According to the project configuration, the density relay can be configured with signal remote transmission function to realize more smart monitoring.
- According to the project configuration, the micro-moisture online monitoring function module can be configured with.

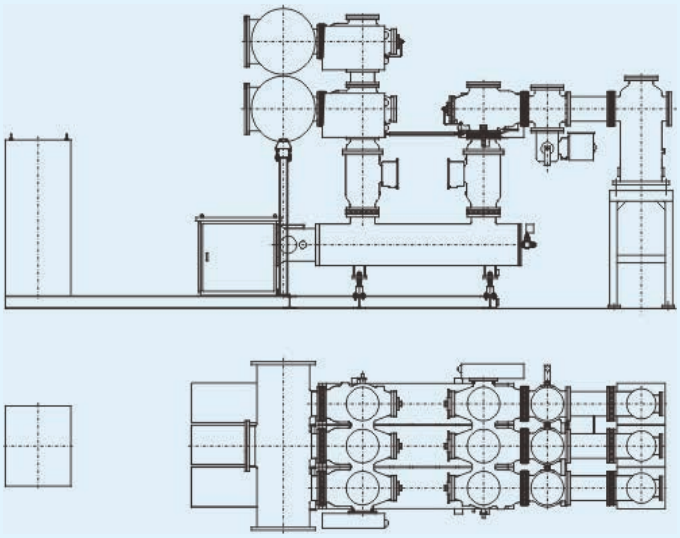
2.14 Local Control Panel (LCP)

- **There are two types of LCPs:** Outdoor LCP and indoor LCP. The outdoor LCP is generally made of stainless steel, and the indoor LCP is generally made of cold-rolled steel plate.
- **Two options of split LCP and integrated LCP,** which can be flexibly arranged according to Customer requirements and on-site conditions.
- With high protection grade, it can meet the requirements of outdoor use under various adverse conditions.
- With the feature of compact structure, saving land.
- The LCP is specifically designed for beautiful appearance, high strength and high protection grade.
- To reserve digital interface, for intelligence in the future.

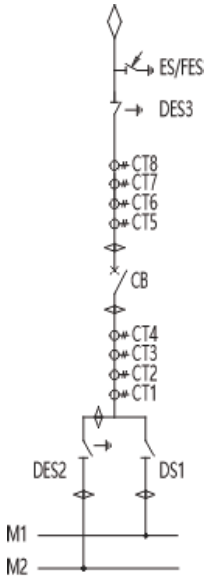
3.0 Typical Arrangement

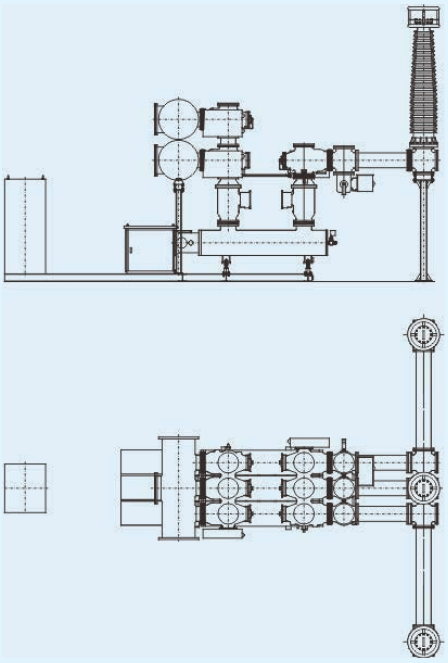
- With the features of modular design, standard interface and strong module interchangeability, easy for expansion in future.
- The module is made of high-quality aluminum alloy welded enclosure and cast enclosure, with no magnetization, small eddy current loss and low center of gravity of standard bay, which is convenient for transportation and installation.
- The standard bay spacing is 2000mm and the standard bay width is 1800mm; With compact structure, easy for installation and lifting.





- Bay of double- busbar cable incoming/outgoing line.

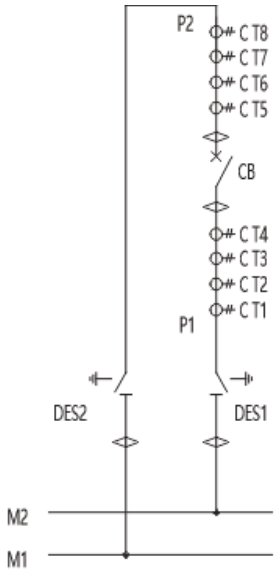


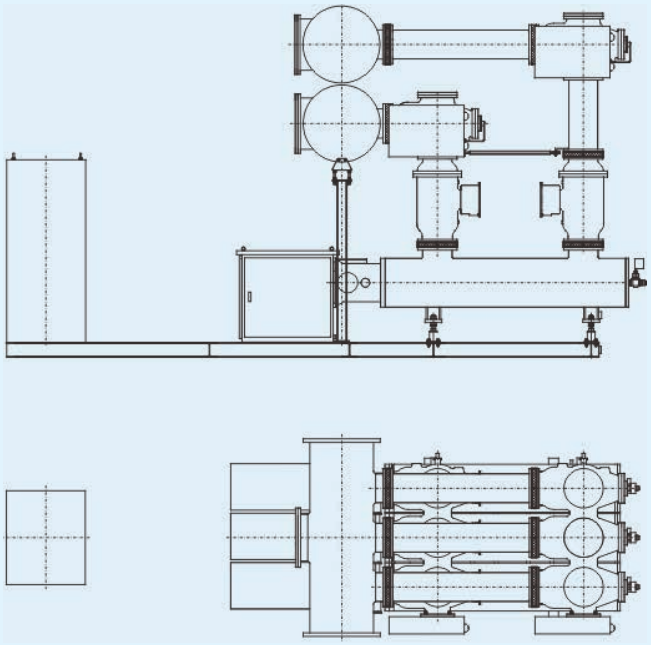


- Bay of double- busbar overhead incoming/outgoing line.

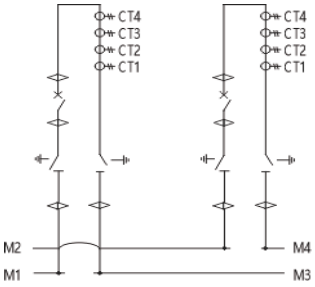
3.0

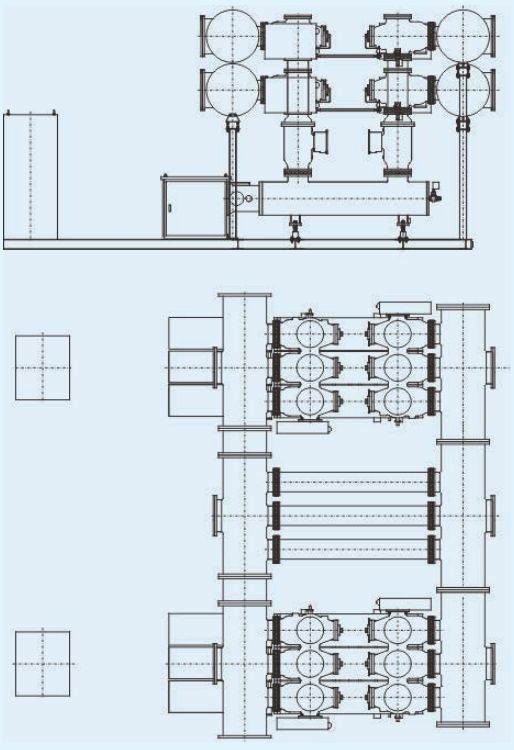
Typical Arrangement





— Bus coupler bay.

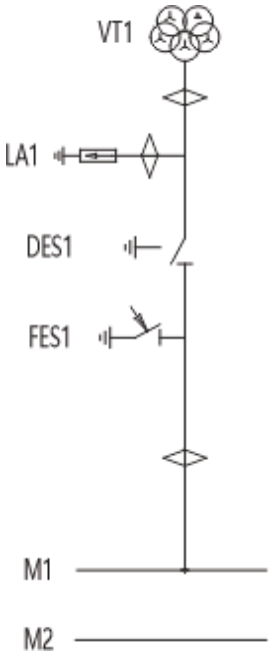


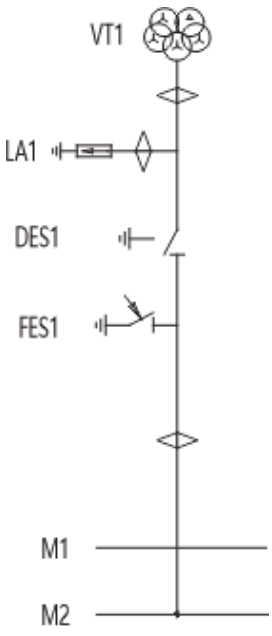


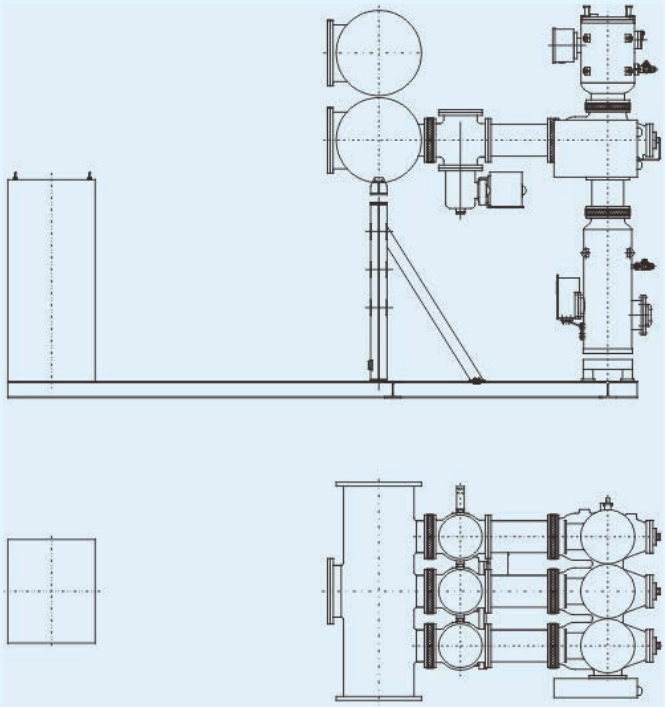
— Bay of double-bus and double-sectionalized connection method.

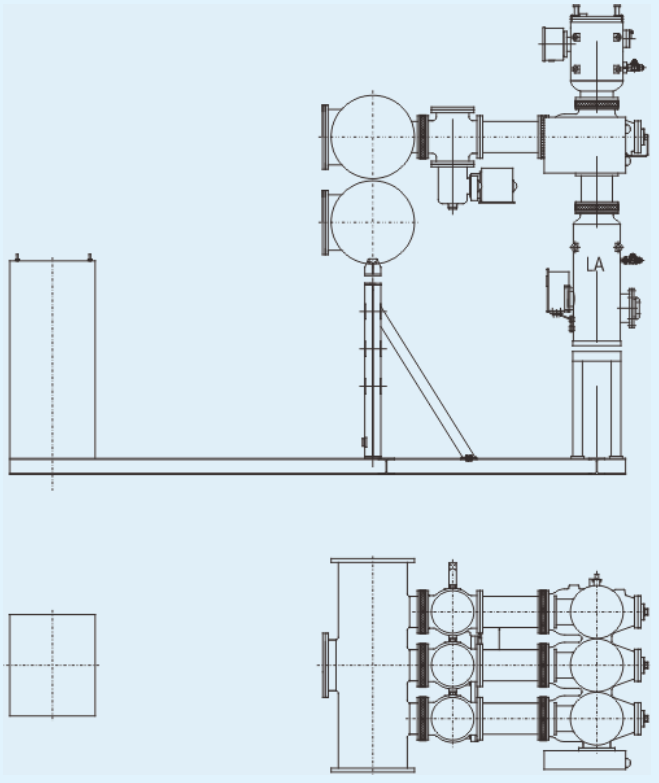
3.0

Typical Arrangement









Bay for Measurement Module and Protection Module.

4.0 Quality Assurance

Certificate and Type Test Reports

- The GIS has passed the full set of type tests at KEMA in the Netherlands, which is international authoritative testing institution.
- To implement ISO9001 Quality Management System.

Production Capacity

Sub-assembly Workshop of Class 100,000 Cleanroom

General Assembly Workshop of Class 1,000,000 Cleanroom

4.0 Quality Assurance

Lightning Impulse Test Device

Power Frequency and Partial Discharge Test Device

Tester Interface

Characteristics Tester

5.0 Customer Service

Transportation

— To ensure the safety of product transportation, the micro positive pressure nitrogen is filled in the bay for transportation, with the way of modular integrated transportation.

Installation

— The product is transported in a whole bay and modularity, which greatly reduces the workload of on-site installation.

— With professional after-sales installation guidance Engineer and standardized installation process, to ensure the on-site installation quality of product.

Commissioning

After the completion of on-site installation, the on-site test shall be carried out. The main on-site test items are as follows:

— Switch operation test

— Main circuit resistance measurement

— SF_6 gas tightness test

— SF_6 gas moisture content measurement

— Secondary wiring inspection and electrical interlocking test

— Insulation test of main circuit

— Insulation test of auxiliary circuit

Maintenance

Due to the excellent performance of the product, it ensures less maintenance or maintenance-free during operation stage. The equipment can be maintained according to the following principles:

— Switch operation cycles have reached the cycles specified in the Instruction Manual.

— The breaking cycles of the Circuit Breaker have reached the cycles specified in the Instruction Manual.

— GIS operation has reached the specified service life.

Service

Quality Management in the Whole Process and Life Cycle:

— Rapid response to Customer needs;

— Technical Service Team for Customer needs with professional service, standardized operation and well-trained;

— With the green emergency service emergency repair channel, to make the acceptance of Customer service demands more rapid and convenient.

6.0 Global Reference

— Brazil

— Brazil

— Kuwait

— India

— India

— Dalian