

Type ZF7G-72.5 -126KV Compact GIS  
Gas Insulated Metal Enclosed Switchgear



**XD | EGEMAC**

**XD – EGEMAC HIGH VOLTAGE EQUIPMENT CO., LTD.**

Address: The Economic and Industrial Development Zone at El-AIN EL-SOKHNA,  
North west of the Suez Gulf, Suez Governorate

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# Catalogue

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## ENERAL DESCRIPTION

Type ZF7G-72.5-126/T3150-40 GIS is a new type of GIS product researched and developed on the basis of such advantages of type ZF7A-72.5-126 GIS as superior breaking performance and reliable operation etc, so to meet the requirement of smaller land area, higher integration of components, maintenance-free and un-manned duty etc from the clients. The product is of three-phase enclosed and such key technology as complete aluminum alloy enclosure and three-position disconnecter is adopted. The product possesses the bay width of 1meter or less, compact structure, small land area, small space, bay shipment, convenience in installation, commissioning and shorter installation period at site. The product has the dielectric level and breaking capability at 145kV and has passed the whole type test at China National High Voltage Apparatus Quality Supervision and Testing Center in Xi'an .



## Main features

### 1.High dielectric margin

The design electric field strength on the surface of insulation parts and conductor is low. The dielectric performance at 0.5MPa of SF<sub>6</sub> gas pressure reached that at 145kV and the dielectric performance is reliable.

### 2. Strong current carrying capability

The unique integrated self compressed contact is adopted without contact spring, the electric contact is reliable and current-flowing capability on the conductor is strong. The rated current of the product is up to 3150A, the rated short time withstand current up to 40kA and the rated short circuit duration is 4s.

### 3. Superior breaking performance

The interruption principle of combing advanced self blast arc interruption with puffer type interruption used in the interrupter can reliably break various fault current and load current.

### 4. Long mechanical operation endurance

The circuit breaker can be operated for 10000 times and the three-position disconnecter for 10000 times (5000 times respectively at the disconnecting side and earthing side) and the fast earthing switch for 5000 times.

### 5. Advanced structure design

Three-phase enclosed aluminum alloy enclosure is adopted, the components are combined, the land area is less and weight is light. New type three-position disconnecter achieves the mechanical interlock between disconnecter and earthing switch so to be reliable in preventing mal-operation.

### 6. Excellent seismic features

The structure design of each component of GIS is simple with low weight and center of gravity, which increases safety of the product in the seismic condition and the seismic resistance reaches grade 9 ( intensity).

### 7. Perfect gas tightness performance

Adoption of SF<sub>6</sub> gas system with spread monitoring mode is adopted, and SF<sub>6</sub> gas monitoring component integrated gas pressure gauge with gas density relay is used. Each gas compartment is installed with multi-function check valve for the convenience of on line calibration of the SF<sub>6</sub> gauge. Adoption of reliable self sealing joint reduces gas leakage chains and increases gas tightness performance of the product.

### 8. Intelligent control

Adoption of intelligent and digital control mode to replace original electromagnetic relay control can achieve interlock by way of configuration software, flexible, convenient and reliable performance.

### 9. Standardized design, production and installation

The design and production of type ZF7G72.5-126 GIS can consider the project requirement; take mature basic function component and standard bay unit as base to achieve standardization and module in design, production and installation.

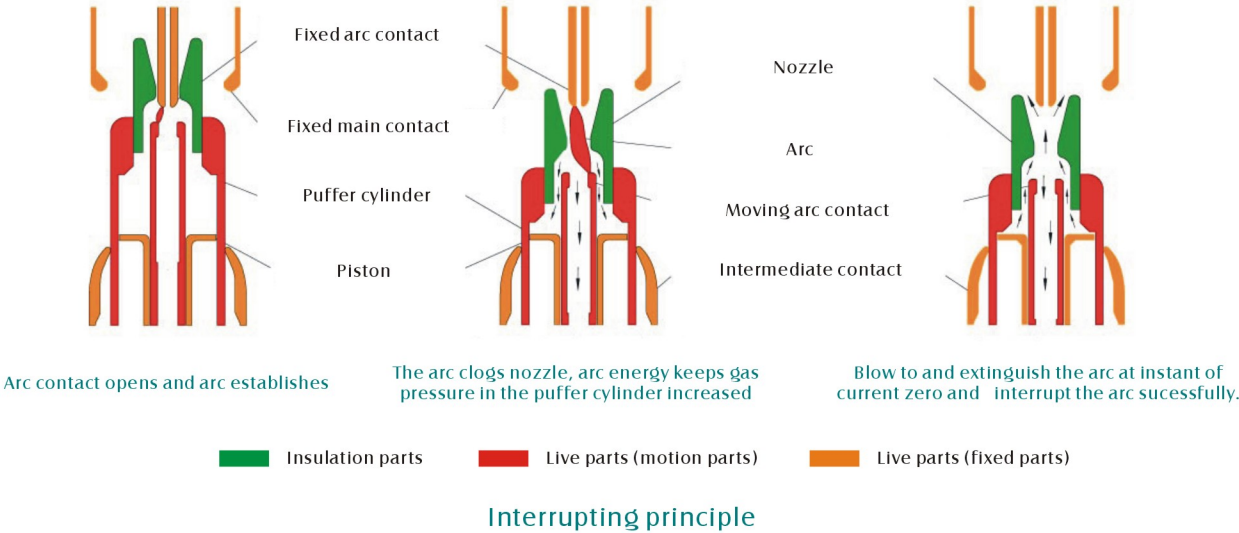


# INTRODUCTION TO THE BASIC COMPONENT

## 1) Circuit breaker

### a. Interrupter

Adoption of arc interruption principle combining advanced self blast with puffer interruption can use effectively the arc energy, thus reducing operating power of the operating mechanism. The structure of the interrupter is shown in the following Fig. In case of the short circuit breaking operation of the circuit breaker, the opening motion keeps SF<sub>6</sub> gas in the puffer cylinder compressed and, at the same time, arc produces clogging effect at throat of nozzle, thus keeping the gas in the puffer cylinder increase further, then the nozzle opens, high pressure SF<sub>6</sub> gas flows through the nozzle, effectively blows to and cool down arc and extinguishes the arc at current zero.

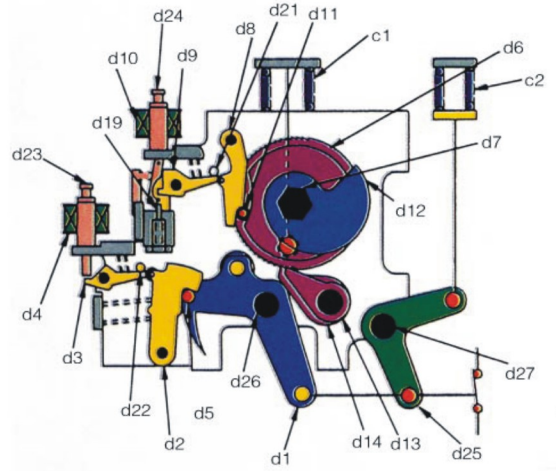


### b. Spring operating mechanism

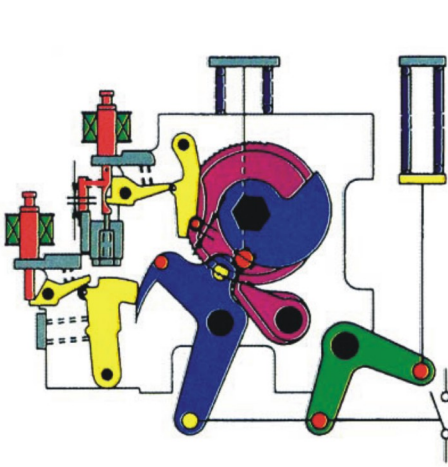
Fig a) shows the operating mechanism at closed position. When the opening command is received, the lever connected to the locking device is released and, under the drive of the opening spring, rotates in clockwise direction.

Fig b) shows the operating mechanism at closing position. When the opening command is received, the cam and ratchet claw wheel which are connected to the locking device are released and, under the drive of the closed spring, rotates in clockwise direction. At the same time, the lever rotates in counter clockwise direction and compresses the opening spring through the torque of the cam.

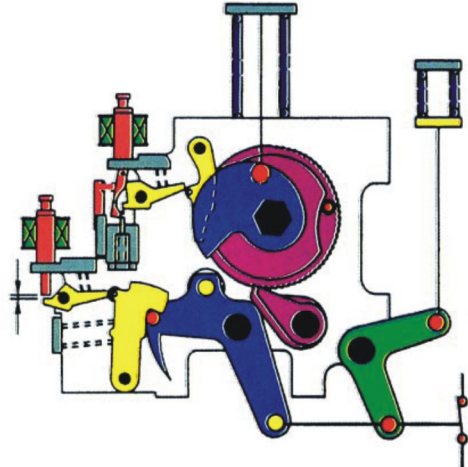
Fig c) shows the operating mechanism at the closed position but the closed spring has not been charged. Once the closing sequence is completed, the closed spring is charged through the ratchet claw connected with the motor.



a) Closed position ( The closed spring charged)



b) Opening position (The closed spring charged)



c) Closed position ( The closed spring released)

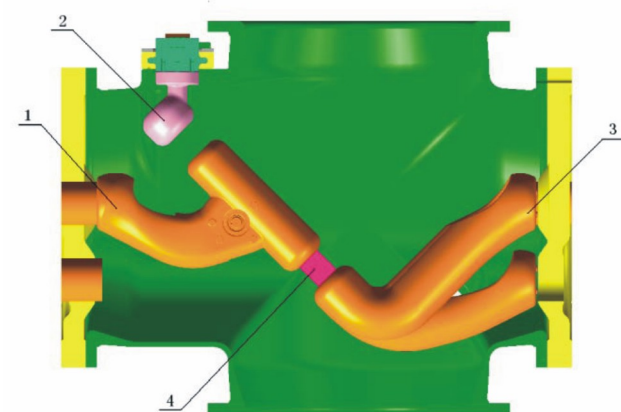
- c1. Closed spring
- d1. Lever A
- d3. Tripping trigger
- d5. Pin A
- d7. Cam shaft
- d9. Closed trigger
- d11. Pin B
- d13. Ratchet wheel shaft
- d19. Anti-pumping pin
- d22. Opening holding pin
- d24. Manual closing button
- d26. Main shaft A

- c2. Opening spring
- d2. Opening latch
- d4. Tripping coil
- d6. Ratchet wheel
- d8. Closed ratchet
- d10. Closed coil
- d12. Cam
- d14. Ratchet
- d21. Closing holding pin
- d23. Manual opening button
- d25. Lever 25
- d27. Main shaft B



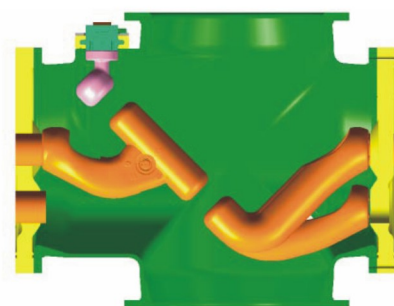
## 2) Disconnect

a. The three-position disconnect includes GL type for line side and GR type for busbar side.

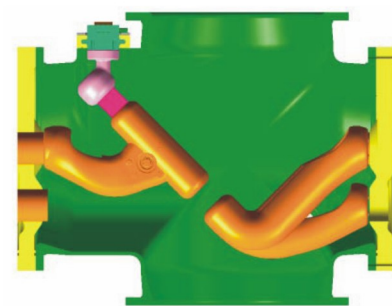


- 1.The moving side of the three-position disconnect
- 2.The earthing side of the three-position disconnect
- 3.The fixed side of the three-position disconnect
4. Moving contact

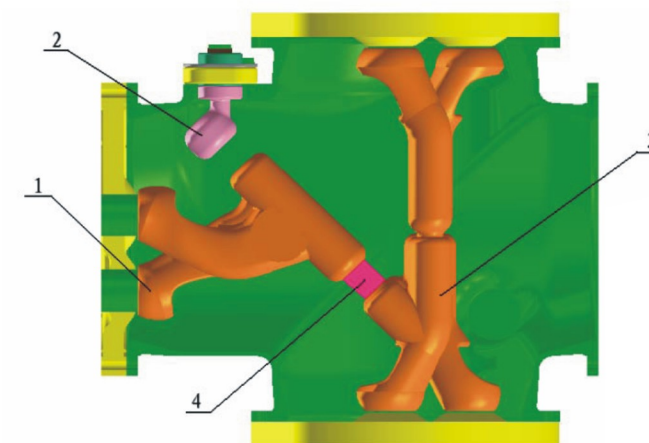
Body of GL type three-position disconnect  
( Disconnect for closing, earth for opening)



( Disconnect for opening, earth for opening )



( Disconnect for opening , earth for closing)

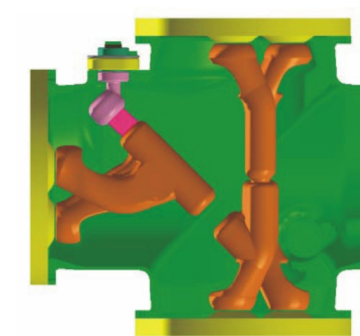


- 1.The moving side of the three-position disconnect
- 2.The earthing side of the three-position disconnect
- 3.The fixed side of the three-position disconnect( busbar side)
4. Moving contact

Body of GR type three-position disconnect  
( Disconnect for closing, earth for opening)



( Disconnect for opening , earth for opening )



( Disconnect for opening , earth for closing)

The three-position disconnecter is the switch component integrated the disconnecter and the earthing switch, with three-phase enclosed structure and one set of motor operating mechanism. Since the disconnecter and the earthing switch share one moving contact (4) , there are three working positions : Disconnect for opening , earth for opening ; disconnect for closing , earth for opening ; disconnect for opening and earth for closing , thus achieving reliably mechanical lock of the disconnecting and the earthing . And, at the same time, there are two sets of driving and control devices inside the motor operating mechanism, which can increase electrical interlock of disconnecting and earthing. The three-position disconnecter can not only perform electrical operation by motor, but also manual operation by way of tools.

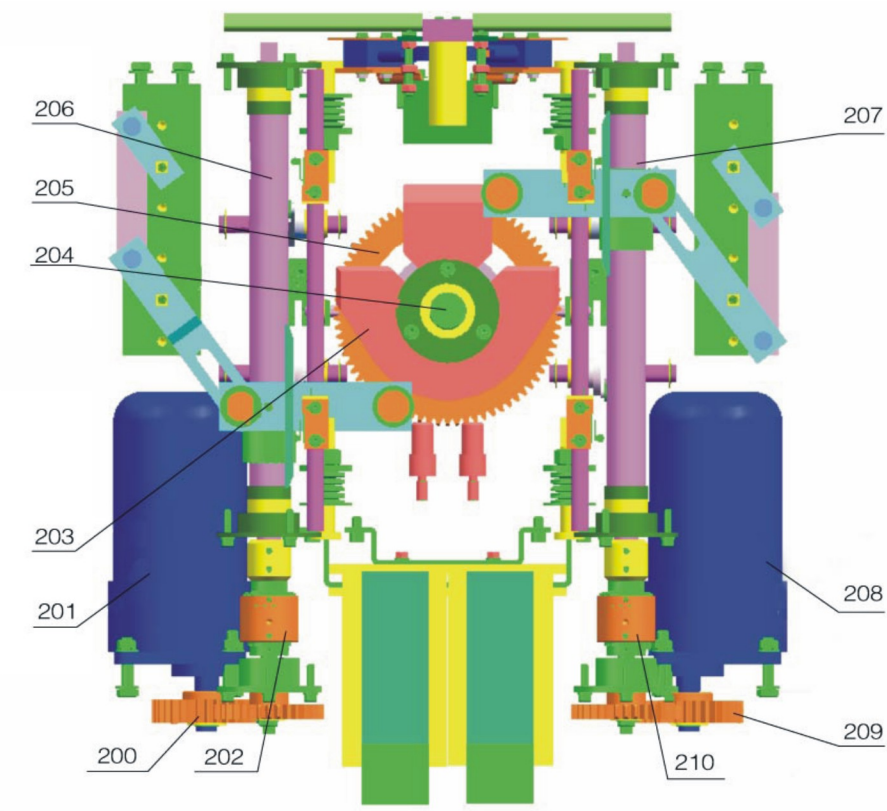
b. Motor operating mechanism (for the three-position disconnecter)  
The motor operating mechanism for the three-position disconnecter is shown in the Figure below.

(1) Motor operation

- Operation of disconnector  
Closing operation: When the motor I( 201) rotates in clockwise direction , it drives directly the main shaft (204) and gear (205) on the main shaft to rotate through a pair of gear (200), clutch (202) , lead screw (206) and sliding wheel device(203) . Gear (205) is engaged with the input gear of the three-position disconnecter body so to achieve closing operation of the disconnecter.  
Opening operation: The operating motion and rotation are the same as that in closing operation, but with different direction opposite.
- Operation of earthing switch  
Closing operation: When motor II(208) rotates in clockwise direction, it drives the main shaft (204) and gear (205) on the main shaft to rotate through a pair of gear (209), clutch (210) , lead screw (207) and sliding wheel device(203) . Gear (205) is engaged with the input gear of the three-position disconnecter so to achieve closing operation of the earthing switch.  
Opening operation: The operation motion and rotation are the same as that in closing operation, but with different direction opposite.

(2) Manual operation

In case of manual closing and opening operation, open manual operating door firstly, and slide the retaining plate as per the indication direction( see arrow on the plate), insert the manual operating handle, connect to the shaft of the lead screw and rotate . It is not allowed to take out the operating handle during the operation.



- |                           |                 |                   |
|---------------------------|-----------------|-------------------|
| 200. Gear                 | 204. Main shaft | 208. Motor        |
| 201. Motor                | 205. Gear       | 209. Gear         |
| 202. Clutch               | 206. Lead screw | 210. Clutch wheel |
| 203. Sliding wheel device | 207. Lead screw |                   |



(3)Motor spring operating mechanism ( for fast earthing switch)

The structure of the spring mechanism is shown in the Figure, Fig a) shows closed condition , while Fig b) shows opening condition).

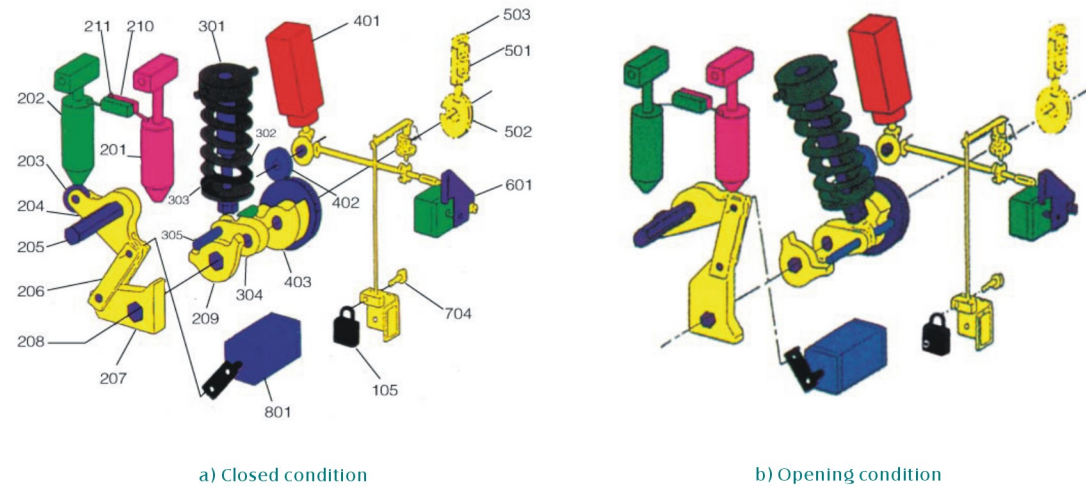
(a)Motor operation

Closing operation: Motor (401) drives the spring charged lever(403) to move in clockwise direction through gear (402). Insert Pin A(305)into lever(403) and keep spring rod (304) rotate and spring (302) is charged till to the final position. After reaching the final position, insert the other side of pin A(305) into cam rod A(209) . The charging of spring can keep the lock rod(207) and lever(209) which is fixed on the main shaft(208) rotate , thus keeping the output shaft (205) rotate in counterclockwise direction driven by the link (206) . In case of final closing position, the closing damper (201) damps the output shaft (204) for successive motion through the winding shaft(203), thus keeping the output shaft(205) stop rotation. Then, the closing damper (201) moves upward, connect to the limit switch (210) and cut off motor circuit.

Opening operation: The motion and rotation are the same as that of closing operation, but with direction opposite.

(b) Manual operation

Manual operation is made by way of the operating handle and manual operating tool.

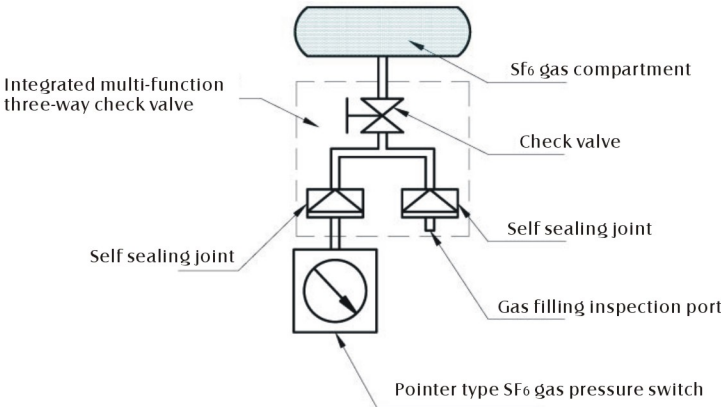


- |                               |                            |                                 |
|-------------------------------|----------------------------|---------------------------------|
| 105. Padlock                  | 201. Closing damper        | 202 Opening damper              |
| 203. Winding shaft            | 204. Output lever          | 205. Output shaft               |
| 206. Link                     | 207. Lock bar              | 208. Main shaft                 |
| 209. Cam rod A                | 210. Limit switch          | 211. Limit switch               |
| 301. Spring seat              | 302. Spring                | 303. Spring rod                 |
| 304. Spring lever             | 305. Pin A                 | 401. Motor                      |
| 402. Gear                     | 403. Spring charging lever | 501. Interlock key ( free part) |
| 502. Cam lever B              | 503. Contact A             | 601. Shuttle                    |
| 704. Mechanical interlock key | 801. Auxiliary switch      |                                 |

3). SF<sub>6</sub> gas density detection device

SF<sub>6</sub> gas at rated pressure is filled into the gas compartment, its density is monitored by SF<sub>6</sub> gas pressure switch with pressure gauge, and the pressure gauge is provided with temperature compensation. Gas refilling command is given when the gas pressure is lower than the alarm pressure, and in case of lower than the lockout pressure, operation of the circuit breaker is locked. New type multi-function check valve can achieve on line check work.

The gas pressure switch can be provided with 4-20mA simulation output so to achieve on line monitoring of gas density.



Principle diagram of SF<sub>6</sub> gas monitoring device

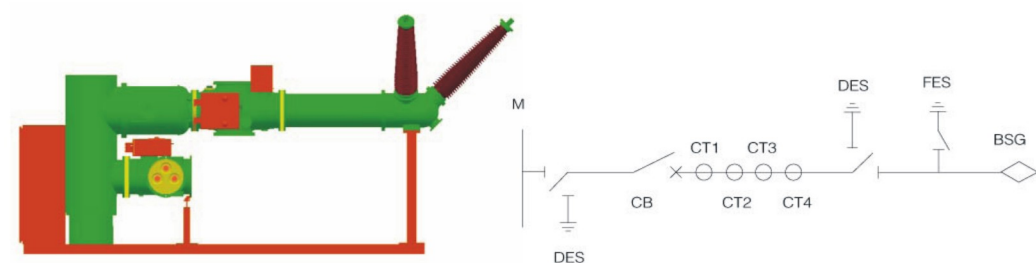


# SHIPMENT, INSTALLATION AND COMMISSIONING

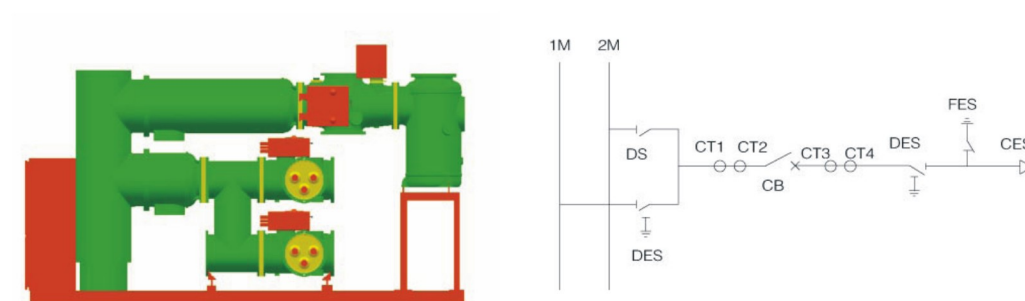
All the GIS product is assembled at our company in accordance with design and site requirement, is subject to strict component inspection and delivery test. At the same time, GIS product needing disassembly for shipment is for divided into several packing units in design , which is convenient for shipment and does not impact integrity , can achieve shipment of complete bay with low gas pressure, reduction of installation and commissioning work at site.  
Spring and motor operating mechanisms are adopted for each GIS component, which have reliable operation and less maintenance work.

## APPEARANCE OF STANDARD BAY AND PRIMARY WIRING DIAGRAM

According to requirements of primary wiring diagrams from the clients and of electrical function, ZF7G GIS has various independent standard bays. The followings are the appearance and primary wiring diagrams of four types of main standard bays.



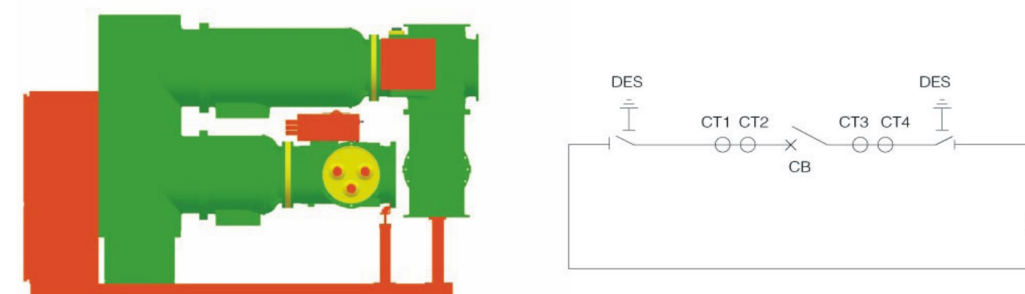
Incoming (outgoing) bay of single busbar bushing



Incoming (outgoing) bay of double busbar cable

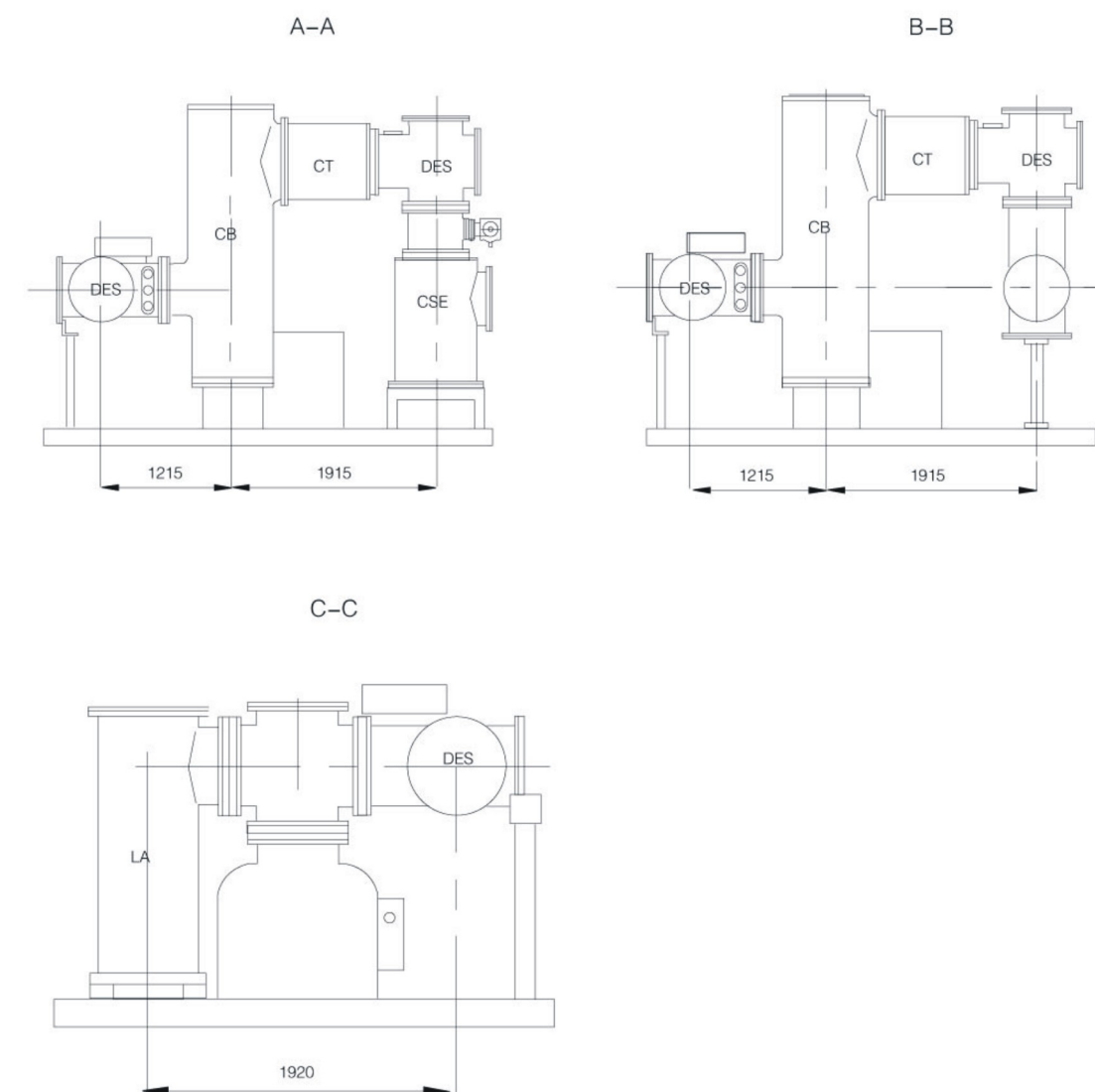
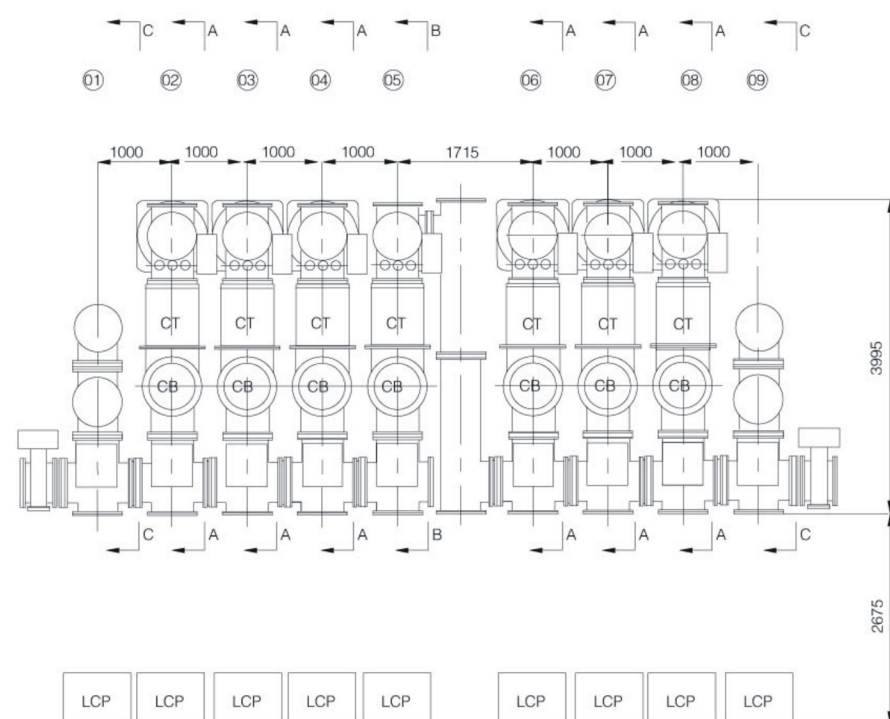
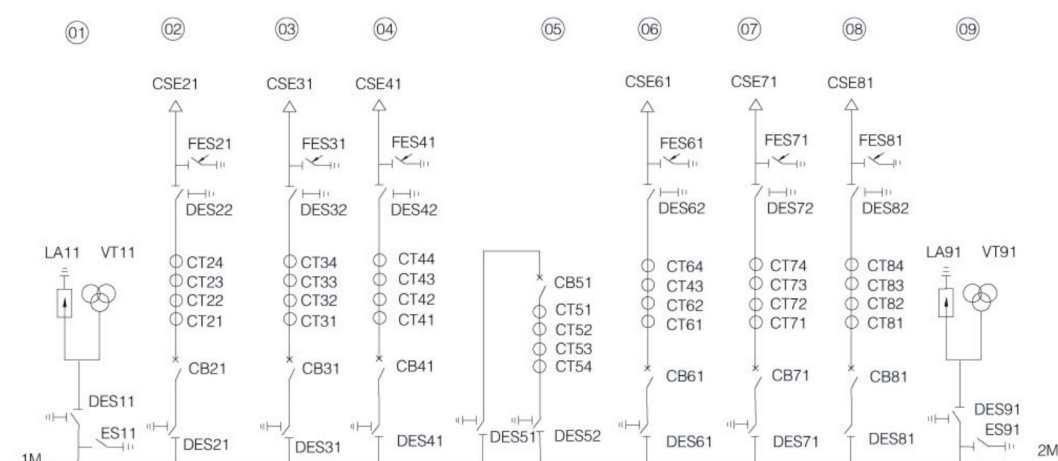


Protection bay for voltage transformer/ lightning arrester

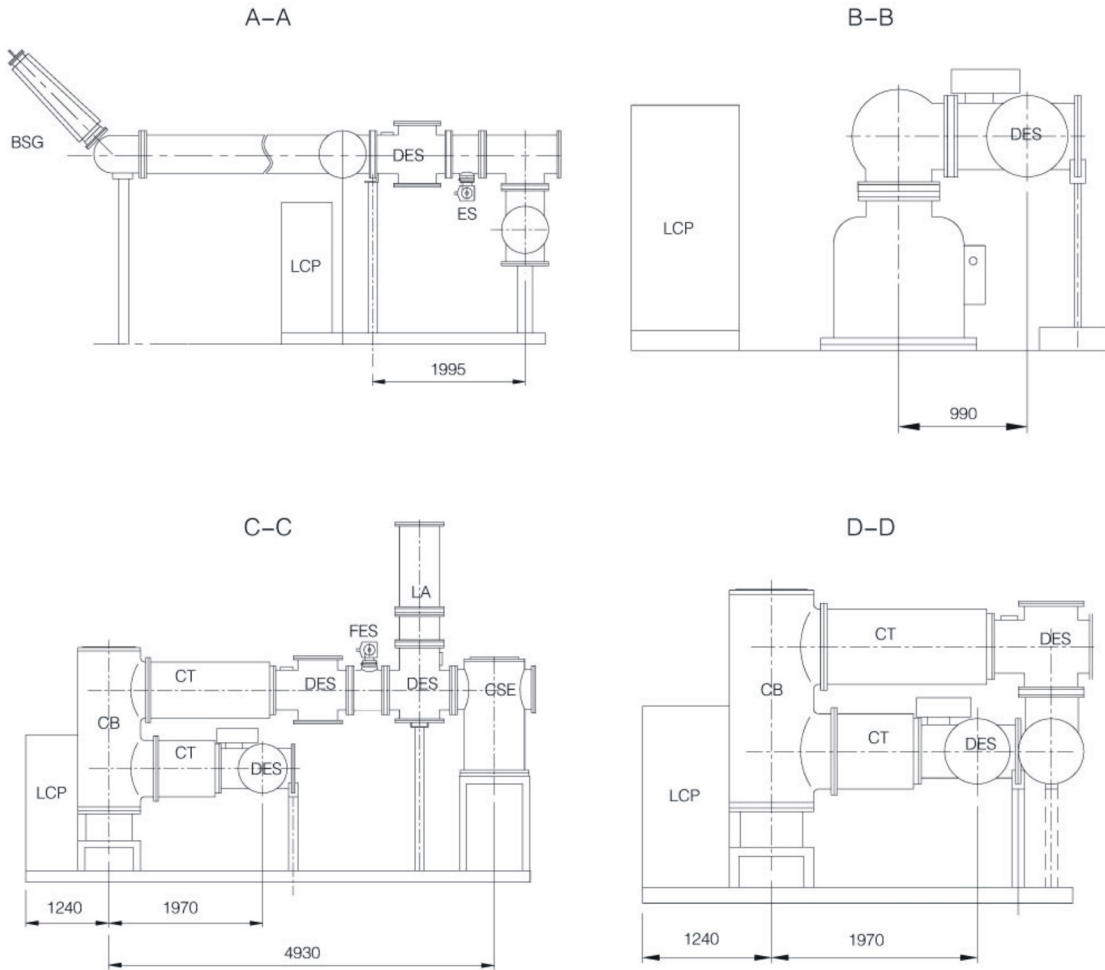
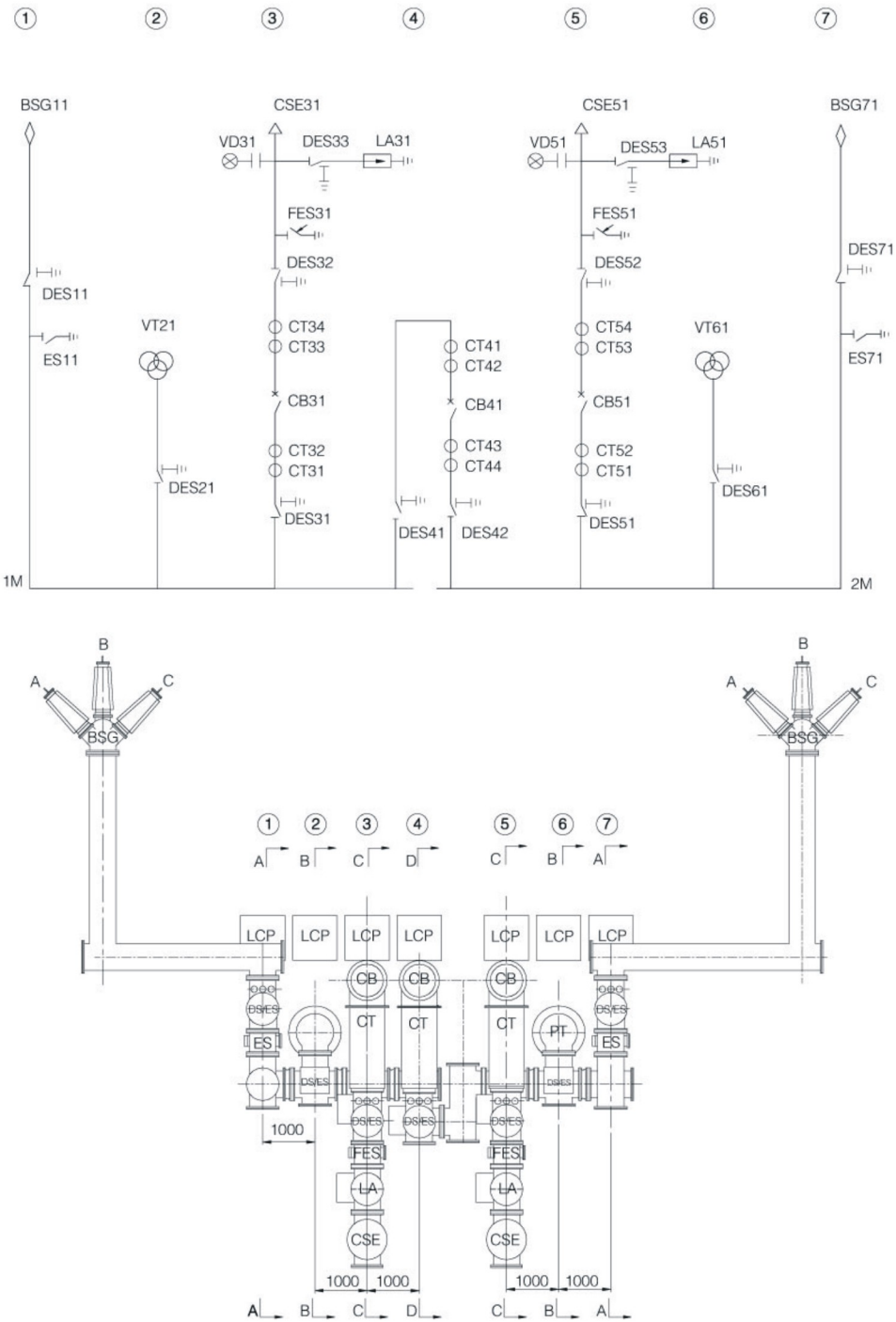


Busbar section bay

# TYPICAL LAYOUT SCHEME

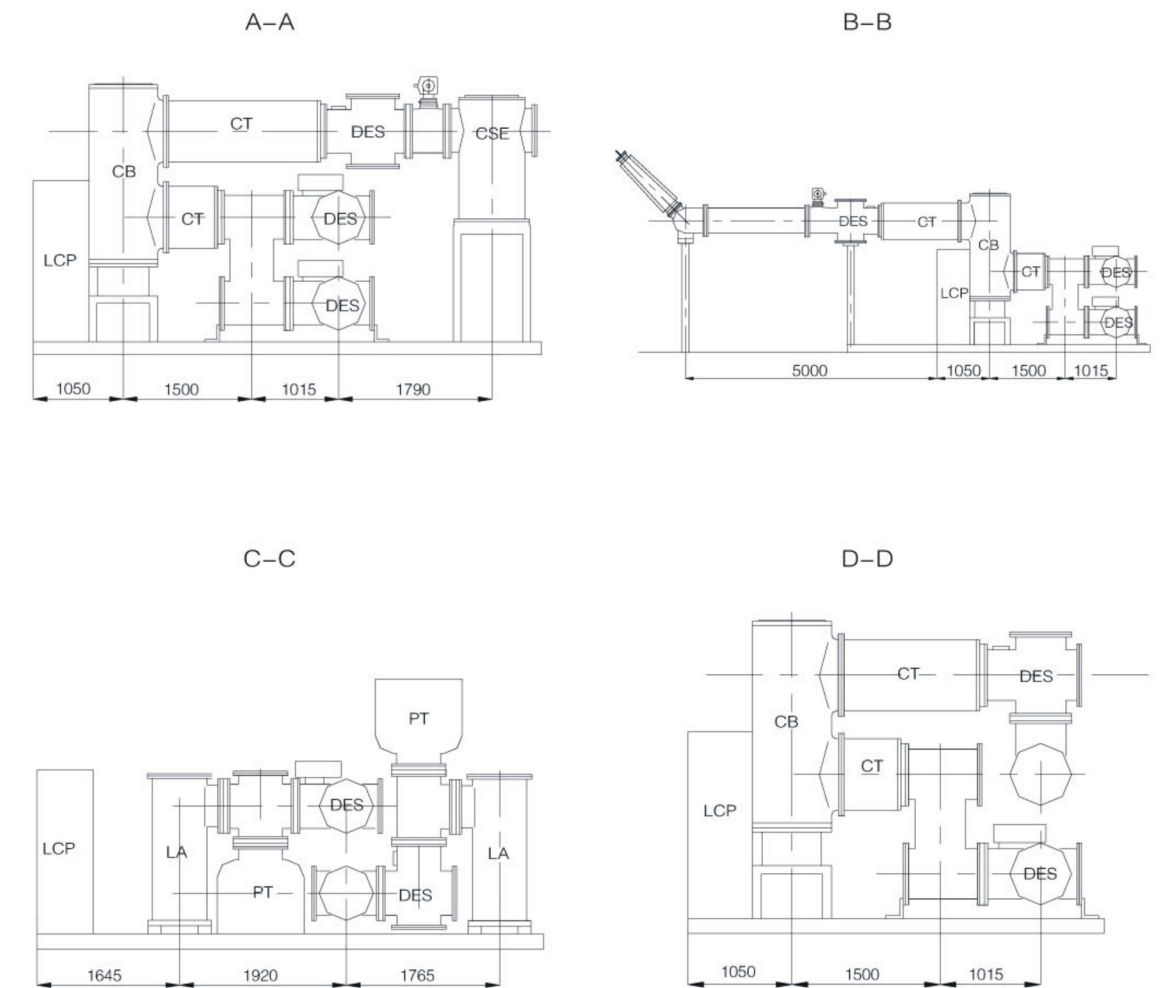
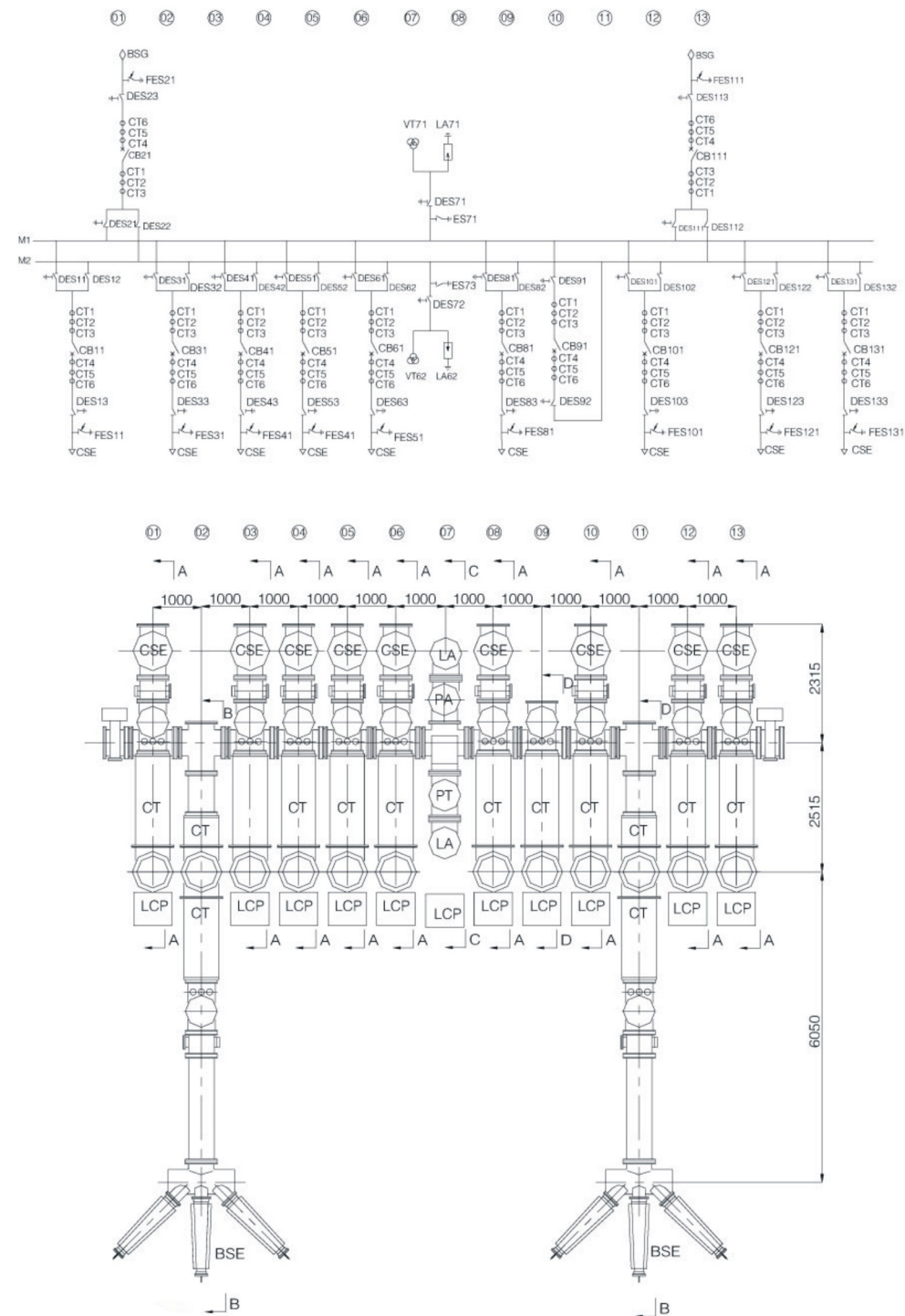


Typical layout: Single busbar section



Typical layout : Inner bridge





Typical layout : Double busbar

# TECHNICAL RATING

## 1. Normal service condition:

Indoor/outdoor  
Ambient temperature(℃):-25~+40(50)  
Altitude above sea level: ≤1000  
Contamination grade: III/IV  
Ice coating thickness(mm): ≤10  
Wind velocity(m/s): ≤34  
Humidity( Daily average relative humidity indoor): ≤95  
Seismic resistance : Grade 9 (intensity)

| Item  | Unit    | Ratings  |
|---|---------|--|
| Rated voltage   | kV      | 126 (145)  |
| Rated insulation level  |         |  |
| Rated short time power frequency withstand voltage                            |         |  |
| Circuit breaker:<br>Across open contacts<br>Phase to earth and between phases | kV      | 230(275)   |
| Isolating break   | kV      | 300(355)   |
| Rated lightning impulse withstand voltage                                     |         |  |
| Circuit breaker:<br>Across open contacts<br>Phase to earth and between phases | kV      | 550(650)   |
| Isolating break   | kV      | 650(750)   |
| Rated frequency   | Hz      | 50   |
| Rated current   | A       | 2000/2500/3150   |
| Rated short time withstand current  | kA      | 31.5/40  |
| Rated peak withstand current  | kA      | 80/100   |
| Rated short circuit duration  | s       | 4  |
| Radio interference  | μ V     | ≤500   |
| Rated SF6 gas pressure( at 20℃)   | Mpa     | For CB gas compartment: 0.5<br>For three-position disconnector gas compartment: 0.5<br>For other gas compartments: 0.4 |
| SF6 gas annual leakage  | %       | ≤0.5%  |
| Moisture content in gas compartment   | μ L/L   | For CB gas compartment: ≤150<br>For other gas compartments: ≤250   |
| Secondary control voltage   | DC,V    | 110/220  |
| Motor voltage of operating mechanism  | AC/DC,V | 110/220  |

