

CHNT

Empower the World

ZFW34-550/Y5000-63 Gas-insulated metal-enclosed switchgear

Report information

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1、Product design

2、Type test

3、Manufacturing capability

1

Product design

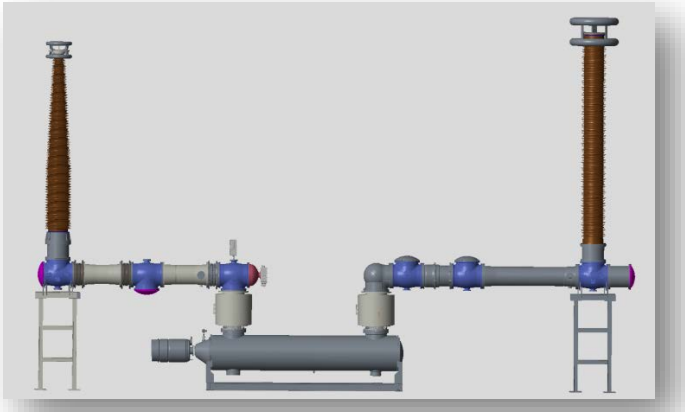
1.1 Main technical parameters

ZFW34-550/Y5000-63 type SF_6 gas-insulated metal-enclosed switchgear

- Basic parameter
  - Rated voltage：550kV
  - Rated current: 5000A/6300A(CB)
  - Rated frequency: 50Hz
  - Rated short-circuit current: 63kA/3s
  - Rated peak current：171kA
- Insulation property
  - 1min Power frequency withstand voltage: 740kV
  - Lightning impulse withstand voltage: 1675kV
  - The full bay Particular Discharge：
    （80%×740kV=592kV）：≤3Pc
- Mechanical reliability
  - Mechanical endurance：

CB：**11000times** DS、ES、FES：**11000times**

- Altitude：4000米
- Environment temperature：-40℃~+55℃
- Entirety structure：Three-phases box type
- SF_6 gas rated pressure（20℃）：
  CB：0.6MPa；Porcelain bushing：0.5MPa；others：0.4MPa
- Earthquake magnitude: horizontal acceleration 0.50g, vertical acceleration 0.25g
- SF6 gas leakage rate：**≤0.1%**

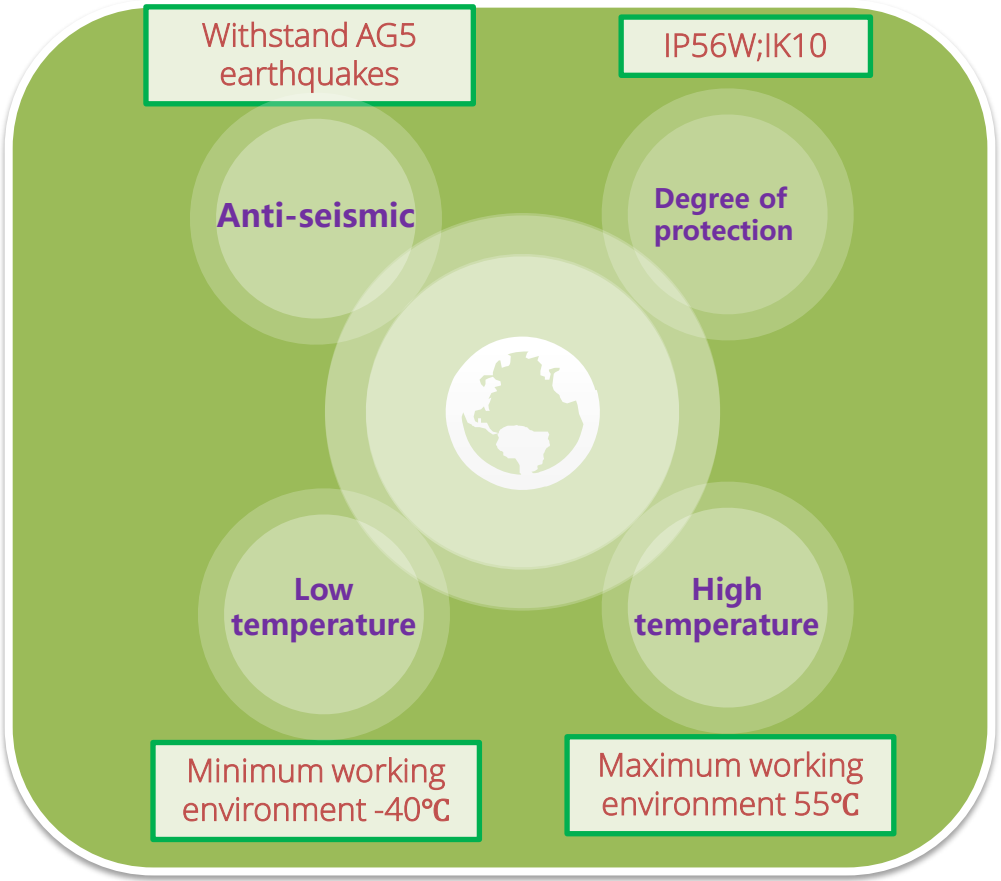


1.2 Applicative standard



IEC62271-203 AC gas-insulated metal-enclosed switchgear for rated voltages above52 kV
IEC62271-100 Alternating-current circuit-breakers
IEC62271-102 Alternating current disconnectors and earthing switches
IEC60694 Common specifications for high-voltage switchgear and controlgear standards
IEC 61869-2:2012 Additional requirements for current transformers
IEC 61869-3:2011 Additional requirements for inductive voltage transformers
IEC60099-4 Metal-oxide surge arresters without gaps for a.c. systems
GB/T 311.1-2012 Insulation co-ordination--Part 1:Definitions , principles and rules
GB/T 5582 External insulation pollution classes of high-voltage electric power equipments
GB/T 11022 Common specifications for high-voltage alternating-current switchgear and controlgear standards
GB/T 1984 High-voltage alternating-current circuit-breakers
GB/T 1985 High-voltage alternating-current disconnectors and earthing switches
GB/T 20840.2-2014 Current transformer
GB/T 22071.2-2017 Inductive voltage transformers
GB/T 4109 Insulated bushings for alternating voltages above 1000 V
GB/T 7674 Gas-insulated metal-enclosed switchgear for rated voltages of 72.5 kV and above
DL/T 593 Common specifications for high-voltage switchgear and controlgear standards
DL/T 618 Guide for hand-over test of gas-insulated metal-enclosed switchgear on site
NB/T42105 Basin insulator for high-voltage alternating current gas-insulated metal-enclosed switchgear

1.3 Environment condition





1.4 Circuit-breakers

CB

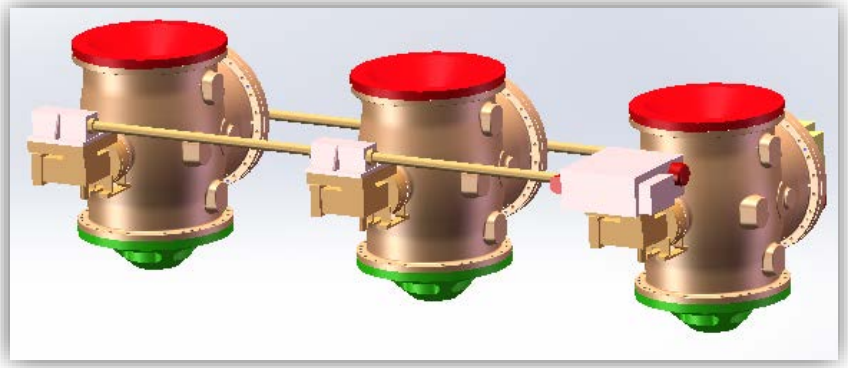
- The interrupter adopts the principle of double fracture pressure and self-energy, which improves the operation reliability of the product.
- Each electrode interrupter is equipped with a hydraulic spring operating mechanism, which can realize Three-phases electrical/mechanical linkage.
- At the large capacity test station of Xi 'an High Voltage Electrical Apparatus Research Institute, the severe short-circuit current test was passed in one time.
- CB class M2-C2， electrical endurance **24**times，mechanical endurance **11000**times.
- Convex basin, foreign bodies are not easy to fall on the high potential, reduce the probability of discharge, improve reliability.



1.5 Disconnector and earthing switch

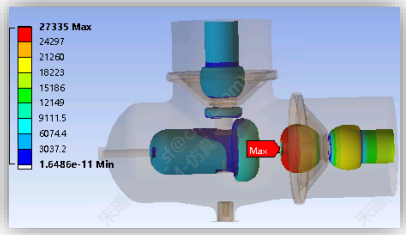
Disconnector

- Good opening and closing capacity of capacitive current and inductive current, the isolation switch with dual busbar configuration has **3000A, 435V** busbar conversion current opening and closing capacity.
- The interphase transmission connecting rod is not exposed outdoors, is less affected by the environment, and the structure is more reliable.
- Per-phase transmission has a open-close indicator.
- Can be separated phase operation or three-phase mechanical linkage.
- The disconnector has two kinds of linear and corner type, which can be flexibly arranged.





(a) Entirety potential distribution (kV)

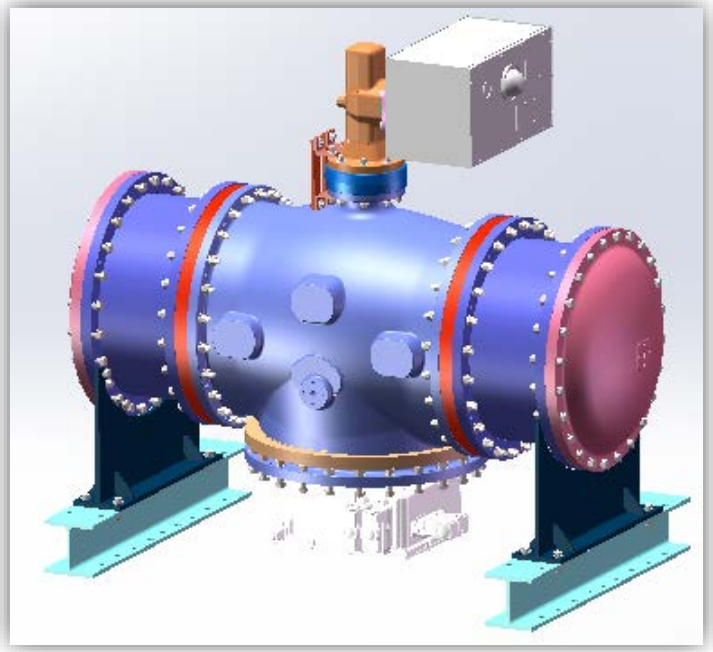


(b) Electric field distribution of high voltage conductor

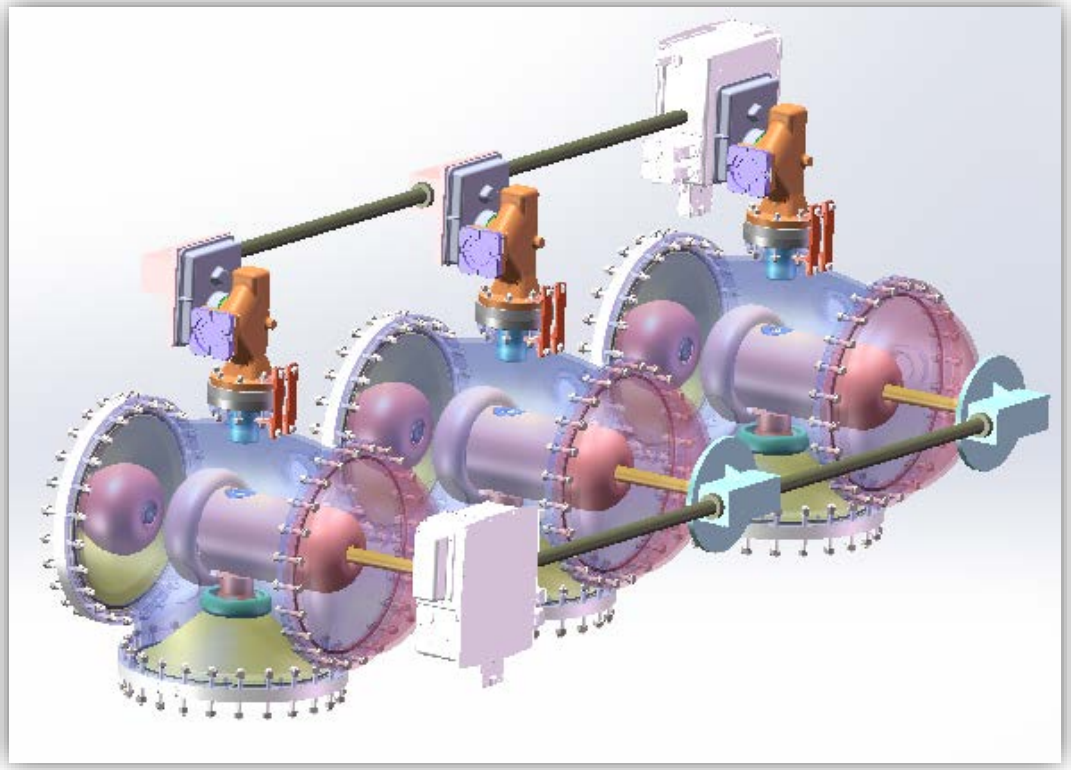
1.5 Disconnectors and earthing switch

ES/FES

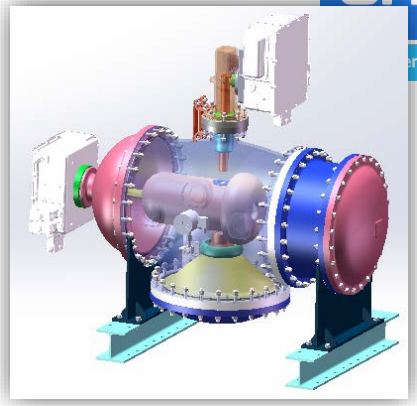
- FES has the ability of closing short circuit current, opening and closing electrostatic induction and electromagnetic induction current, and is equipped with a spring mechanism.
- The two types of ES in addition to the use of different functions, the internal structure is basically the same, high standardization.
- Good short-circuit current closing ability, can reliably close 63kA rated short-circuit current twice.
- Opening and closing induction current Class C design (industry highest standard) : electromagnetic induction **750A/50kV**, electrostatic induction **100A/75kV**.



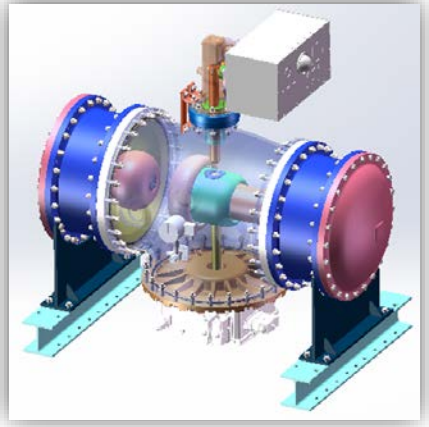
1.5 Disconnector and earthing switch



Corner disconnector+ slow earthing switch three-phase linkage



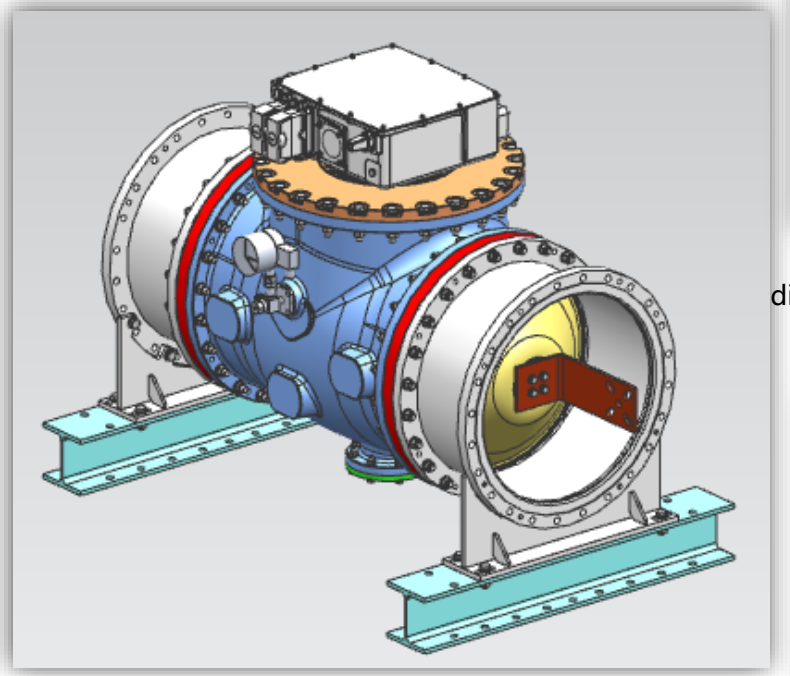
Corner disconnector + slow earthing switch single phase



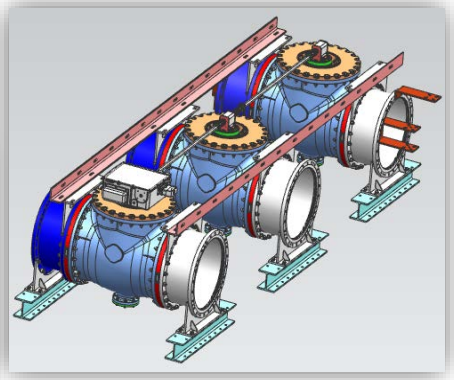
Linear disconnector + fast earthing switch single phase

1.5 Disconnector and earthing switch

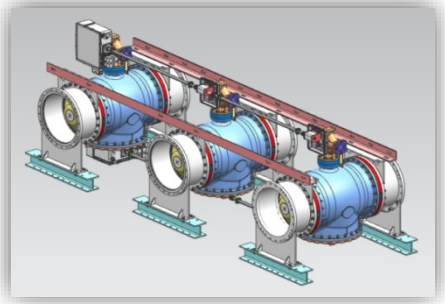
Test layout picture



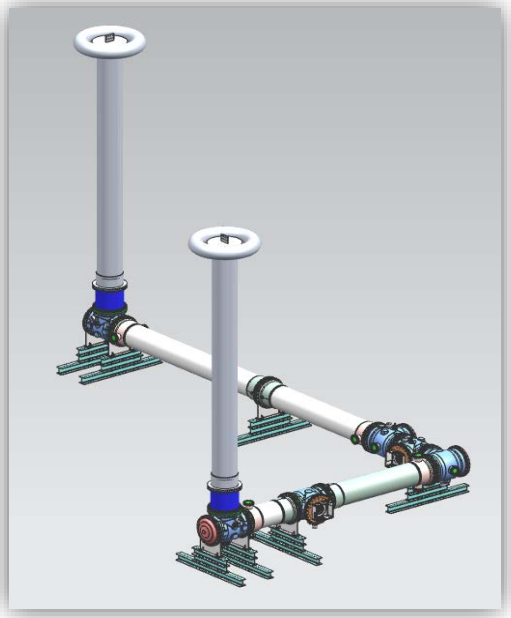
Linear disconnector busbar conversion test layout



Three-phase linkage linear disconnector dynamic thermal stability test layout



Three-phase linkage ES dynamic thermal stability test layout



Linear disconnector busbar charging test layout

1.5 Disconnector and earthing switch

Disconnector ,earthing switch and busbar bar have the advantages of compact structure, flexible assembly, simple operation and low space occupancy.



Three-phase linkage linear disconnector



Corner disconnector + ES



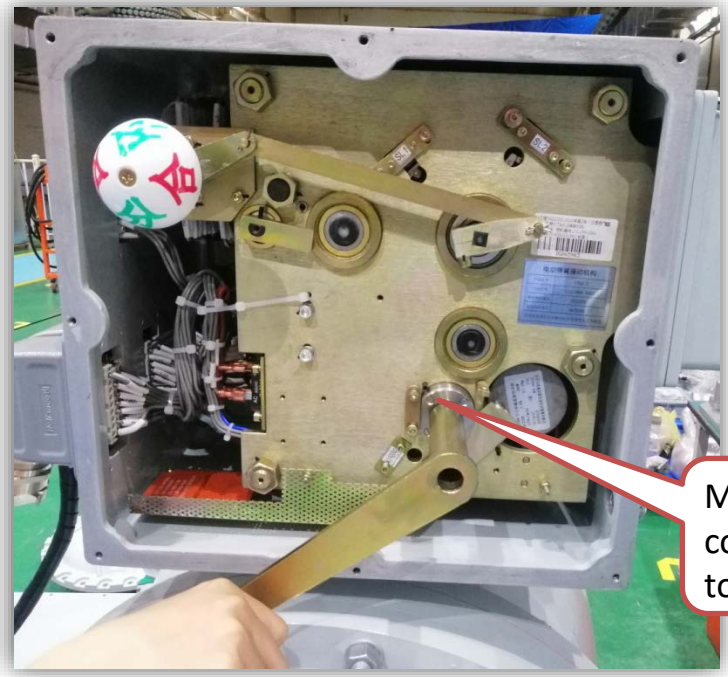
Linear disconnector + high speed earthing switch

1.5 Disconnector and earthing switch

Disconnector, ES using electric mechanism. quick earthing switch using electric spring mechanism. All these switches can be remotely controlled or local manual control, easy to operate, high safety. The overall structure has good sealing, the secondary wiring is led out by the connector, and the on-site installation is convenient.



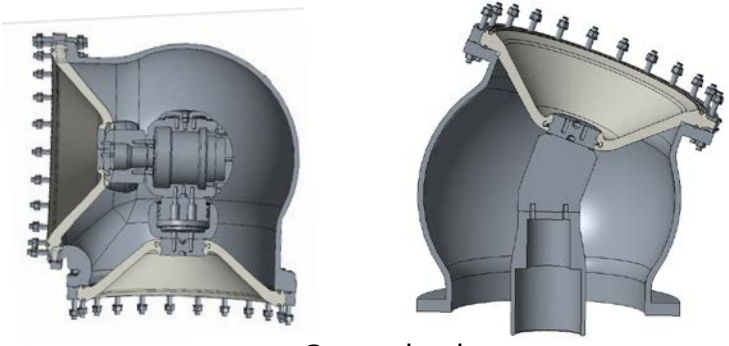
Mechanism connection mode



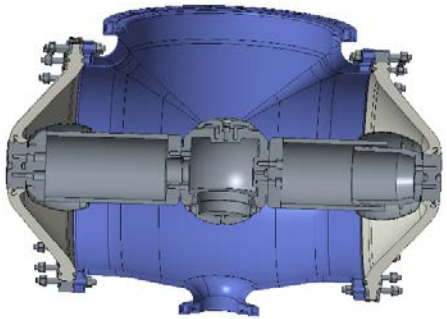
Mechanism manual control mode

1.6 Busbar

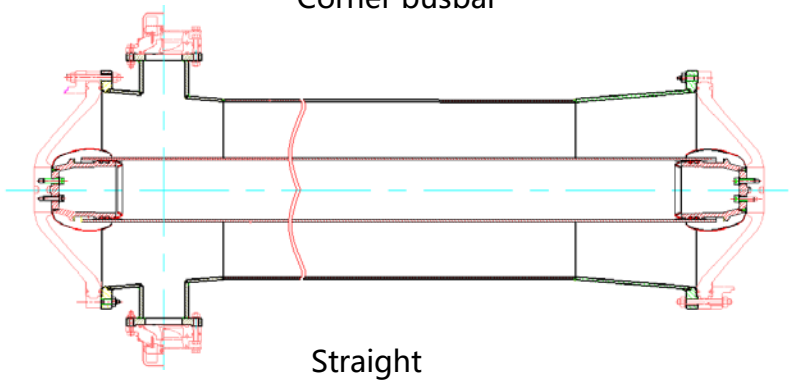
Tee busbar, corner busbar, straight busbar structure design is reasonable, complete function, can meet the different positions and requirements of the connection.



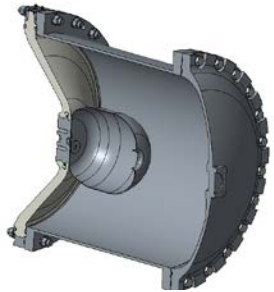
Corner busbar



T type busbar



Straight busbar

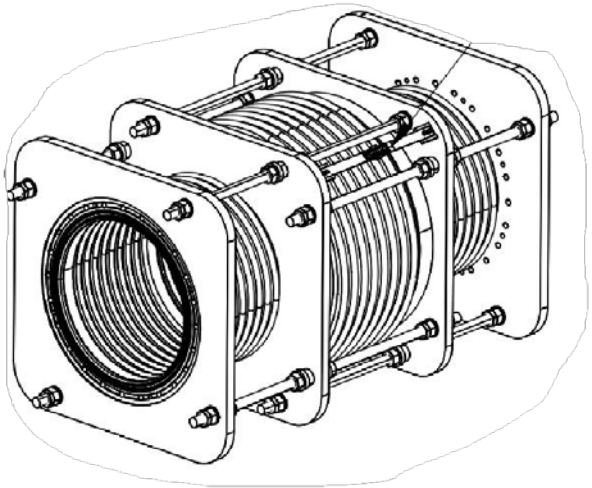


busbar end

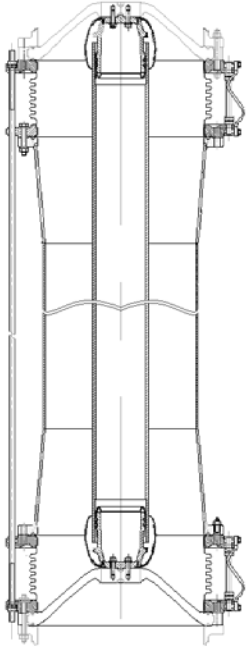
1.6 Busbar

Radial compensation busbar can meet the compensation demand of long-distance busbar.

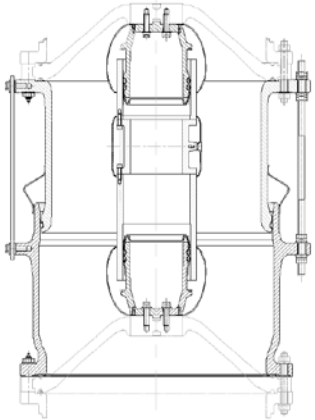
Detachable busbar is convenient for GIS repair and maintenance.



Self-balancing bellows



Radial compensation busbar



Detachable busbar

1.7 Potential transformer

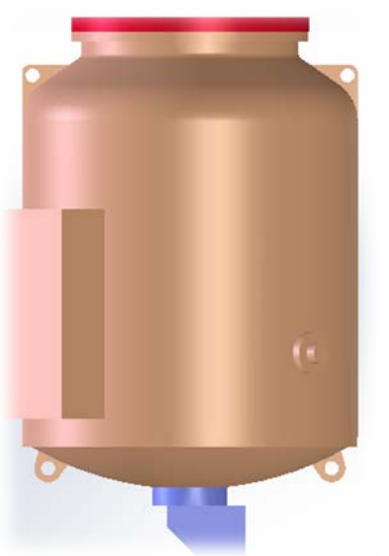
PT

- Low magnetic density design.
- It can be installed on GIS to power frequency withstand voltage.
- Coil capacity can be provided according to user requirements.

  The structure is designed to effectively suppress ferromagnetic resonance.

  Low loss core material is used.

  Flexible layout, can be dressed or inverted.
- Compact design, maintenance-free.





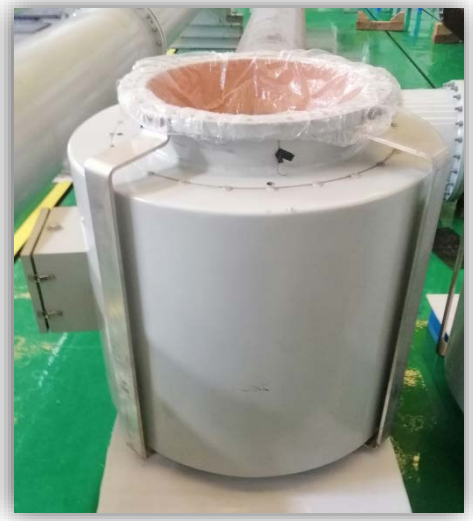
potential transformer

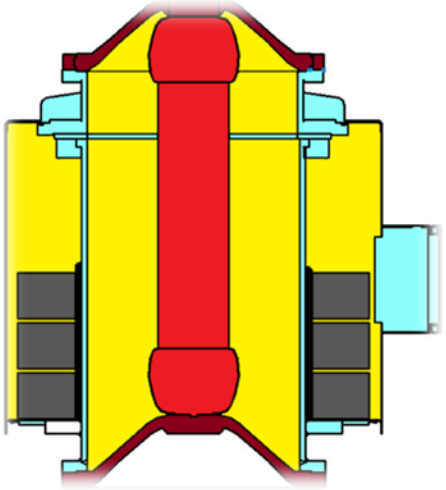
1.8 Current transformer

CT

Main feature:

Annular iron core metal armouring external current transformer, no impact on the equipment inside the metal enclosure closed, free from external interference compact and simple design.





current transformer

1.9 Bushing

Main feature:

1. Porcelain, composite insulator
2. With a large and small umbrella skirt rain proof design
3. Extended climb design
4. Maintenance-free
5. The internal and external shielding electrode structure is provided to reduce the field strength



Porcelain bushing



Composite bushing

1.10 Arrester

Main feature:

1. The internal insulation level of the product is high, and the bureau is small.
2. Good quality control, reasonable potential distribution, long product life.
3. The arrester has high discharge level, large square wave withstand current and high absorption energy.
4. Arrester residual low pressure, good protection performance.





Arrester

1.11 Secondary and intelligence



Control cabinet

- The elements of the GIS control system, such as contactors, intermediate relays, time relays and wires, that make up the electrical circuit, are mostly installed in the GIS local control cabinet, and a small part is installed in the mechanism box.
- GIS local control cabinet (LCP or LCC for short) is a centralized control screen for on-site monitoring and control of GIS, as well as a relay hub for electrical communication between GIS and the main control room.

1.11 Secondary and intelligence

Intelligence

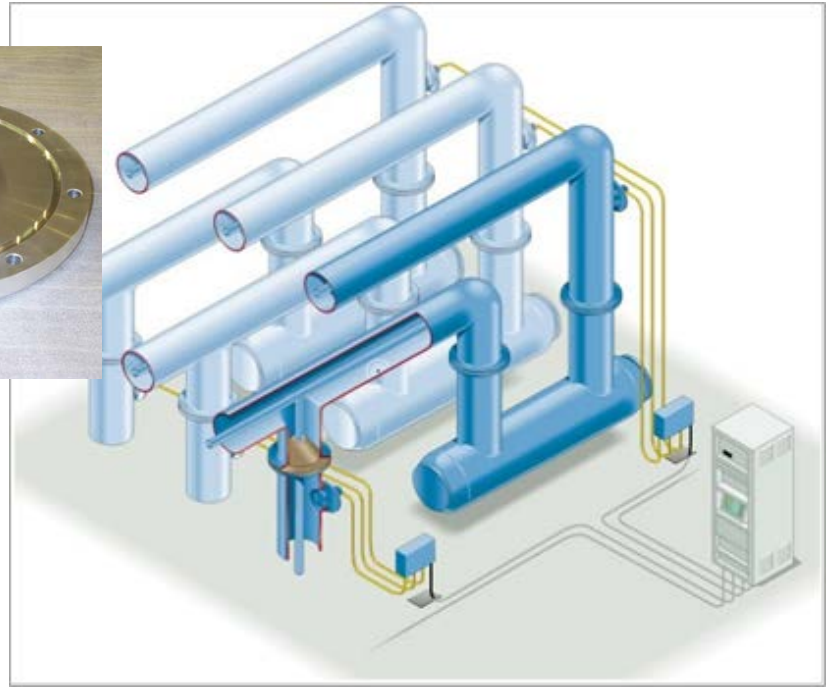


- Particular discharge on line monitoring
- Online monitoring of arrester
- Circuit breaker mechanism monitoring
- Electronic transformer
- SF_6 gas condition monitoring

1.11 Secondary and intelligence

Particular discharge on line monitoring





Built-in sensor

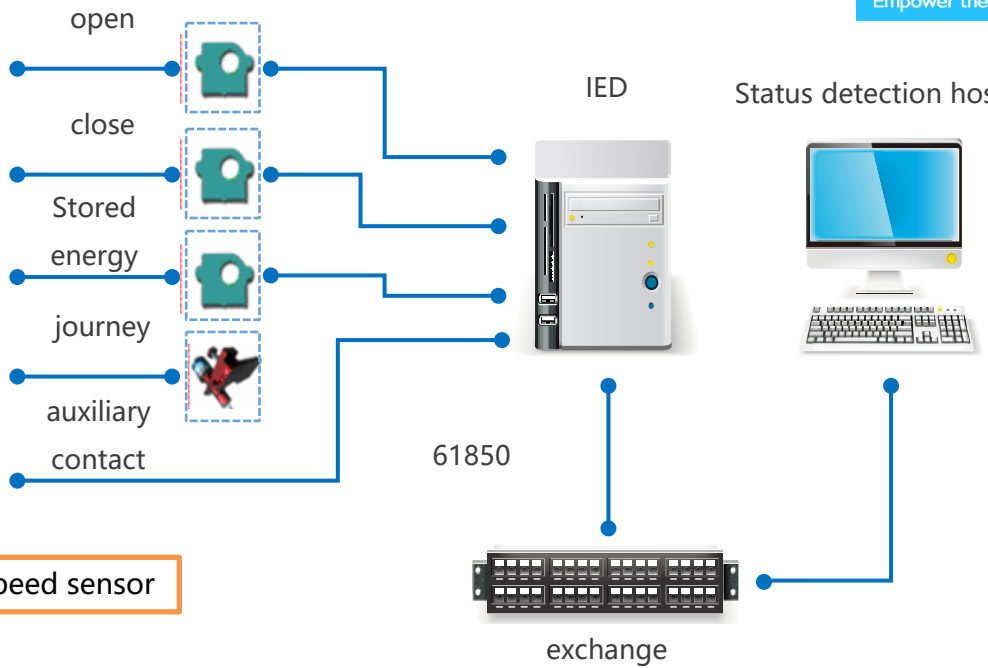
Particular discharge monitoring equipment is composed of probe (built-in or external), acquisition equipment, expert system, man-machine interface four parts.

The UHF sensor technology is used to detect the particular discharge signal in GIS in real time, and the data analysis software and intelligent diagnosis system in the background are used to analyze and process the office discharge signal, evaluate the insulation status of GIS, determine the type and approximate location of the defect, and provide maintenance suggestions.

1.11 Secondary and intelligence

CB On-line monitoring of mechanical properties







Mechanism speed sensor

After GIS operating mechanism the system will calculate its opening and closing time, opening (closing) speed, moving contact travel, open distance, overrange and other mechanical characteristics parameters, at the same time through the expert diagnoses system and analyze these data, judge the operating state of the mechanism; If there is a potential mechanical failure, call the police. The communication interface is connected with the network in the substation, and the mechanical characteristic parameters and status results of the GIS operating mechanism are uploaded in real time to provide the operation basis for the substation control center.

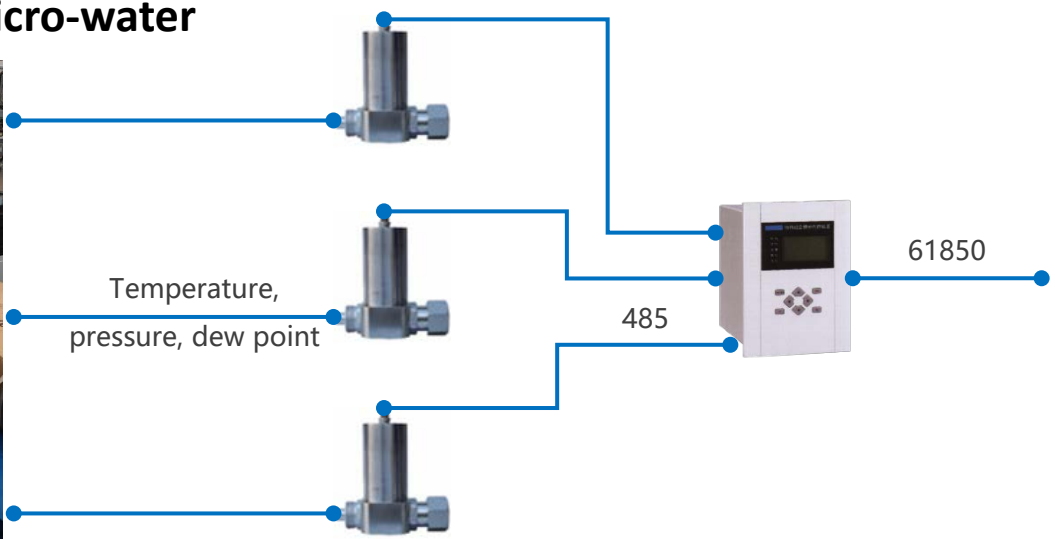
1.11 Secondary and intelligence

On-line monitoring of gas density micro-water





SF_6 gas density micro-water sensor



SF_6 density micro-water monitoring system is composed of SF_6 density micro-water sensor, IED and software background. The SF_6 density micro-water monitoring device integrates high-performance micro-water sensor, temperature sensor, pressure sensor, high-precision micro-water sensor, temperature and pressure sensor to convert the analog quantity collected into digital quantity through A/D, and then through the microprocessor for analysis, calculation, temperature compensation, etc. Finally, it is connected to the substation integrated automation system and remote monitoring center through RS-485 busbar.

1.11 Secondary and intelligence

LCP cabinet



Online monitoring device



Intelligent terminal



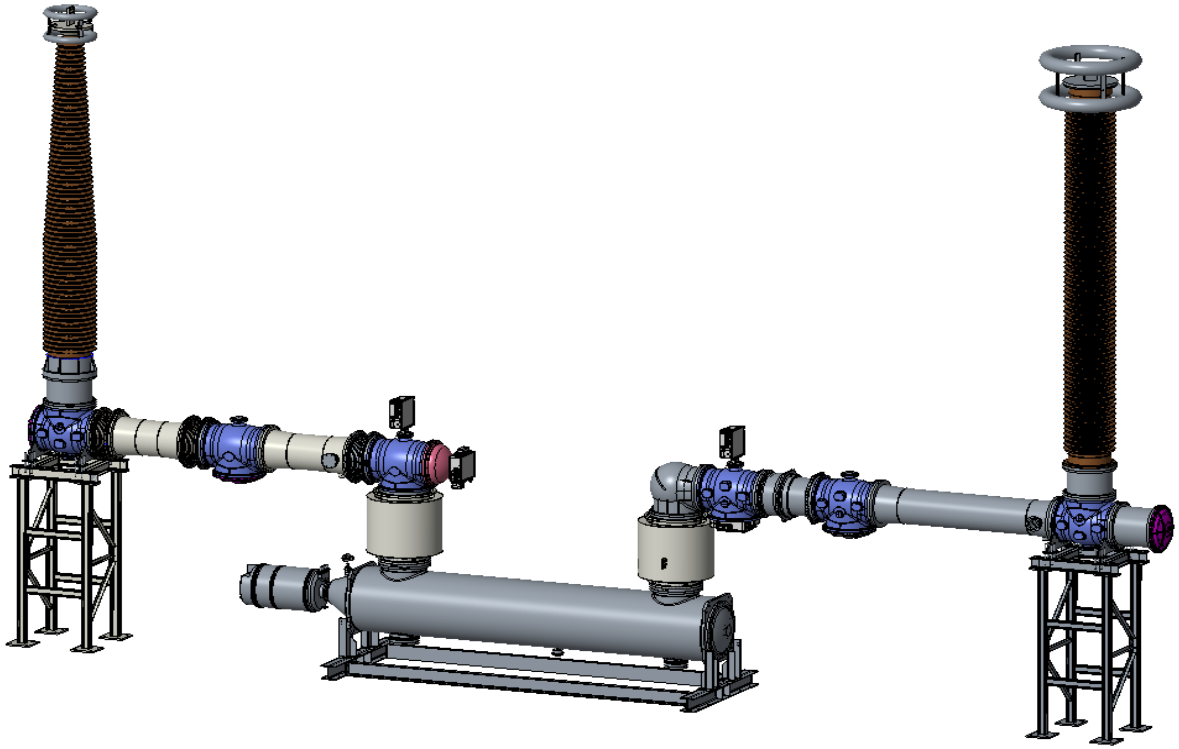
Merge unit



Summarize

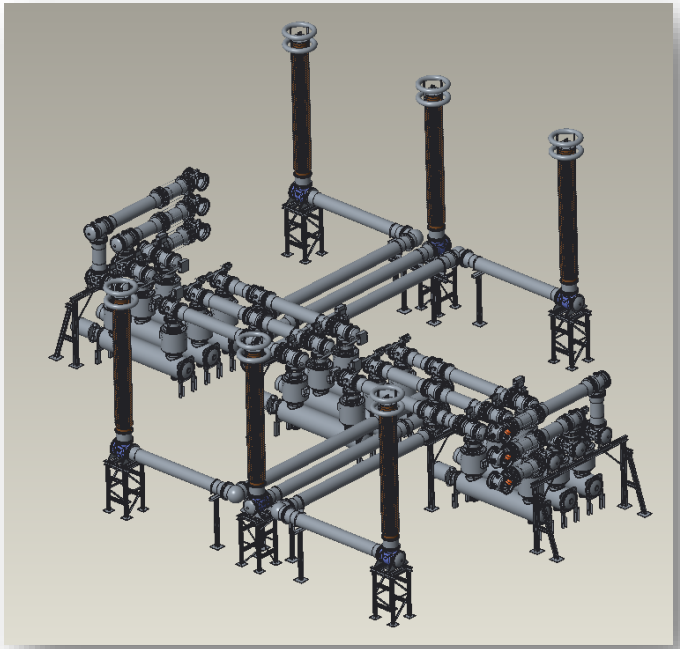
- EMC design: stainless steel sealing structure design and metal shielding network; The cabinet door glass adopts the film with EMC function
- Vibration resistance
- Rain and snow protection measures: IP56 degree of protect
- Low temperature resistance measures: double-layer design, the middle filled with insulation layer； Air conditioning will be installed in special areas.
- Dehumidification and heat dissipation measures: fans and shutters are adjusted by intelligent temperature and humidity controllers that can be uploaded

1.12 Engineering layout

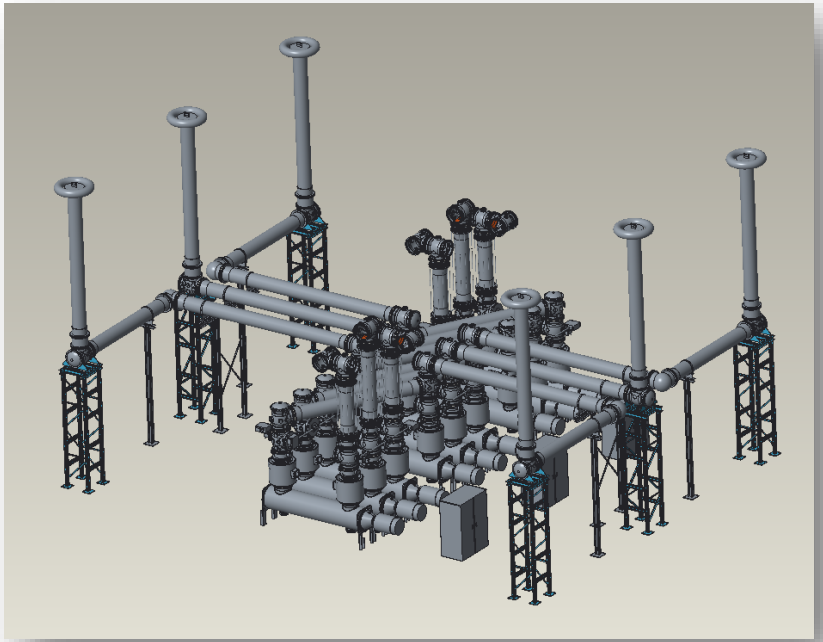


Layout of prototype

1.12 Engineering layout



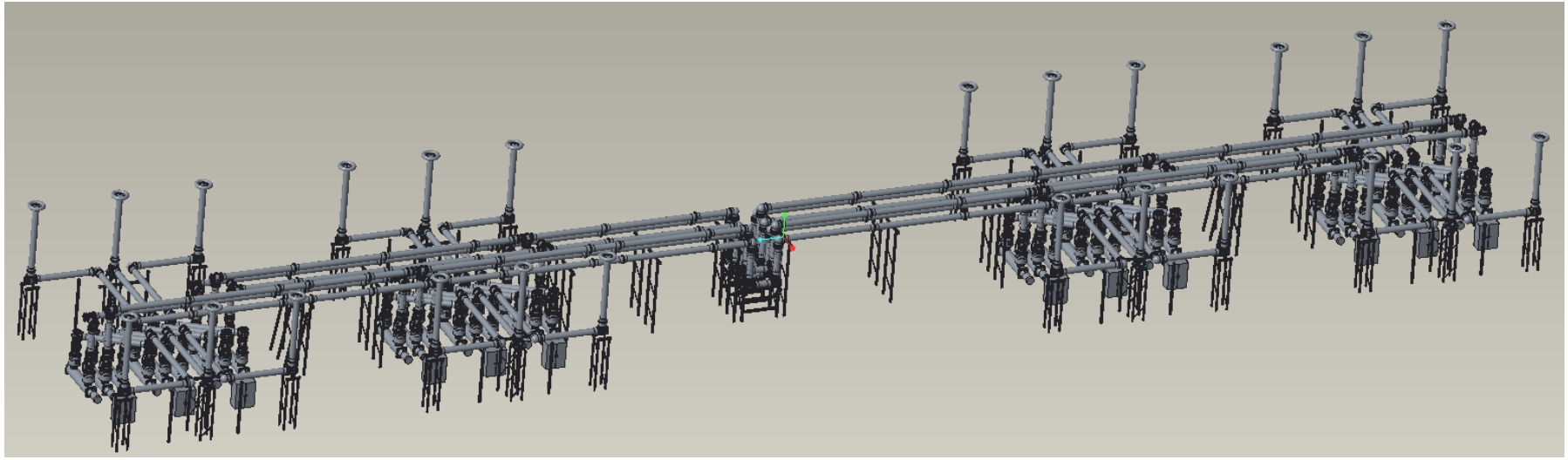
"—" type layout



"Z" type layout

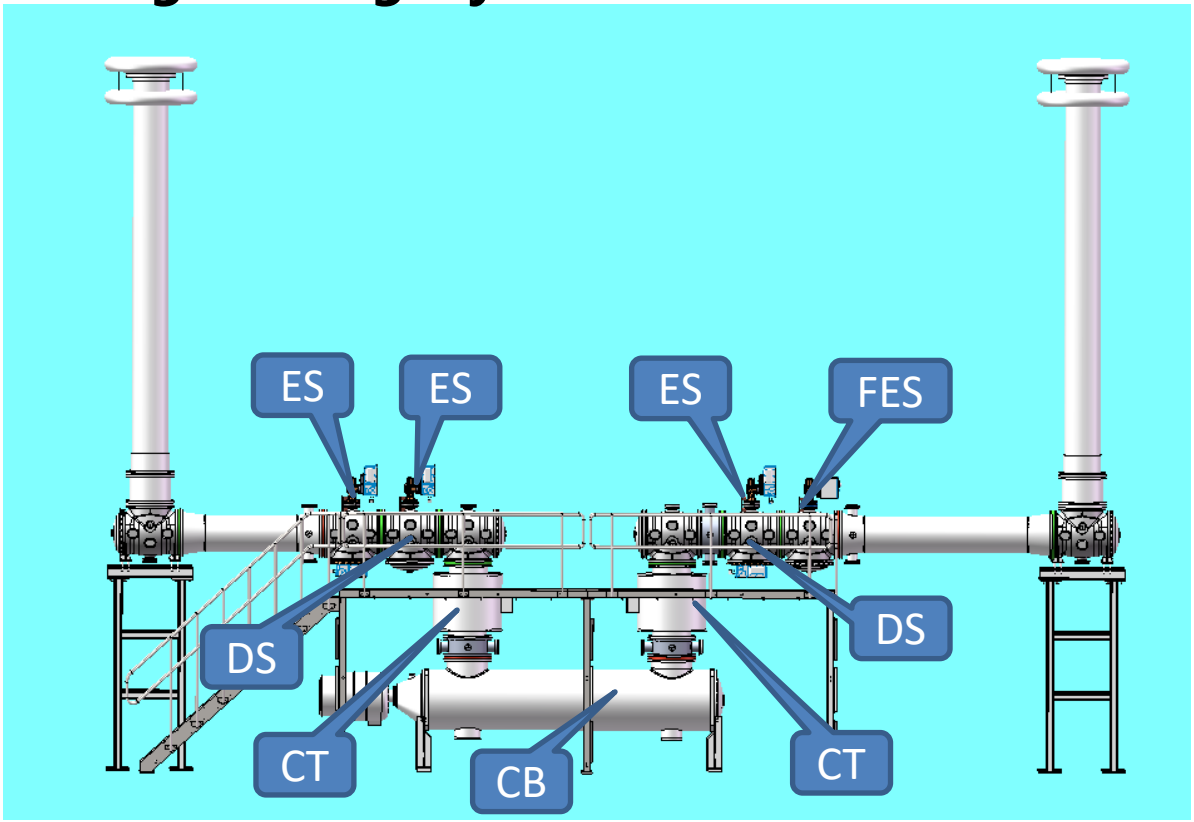
One and a half times standard spacing engineering layout

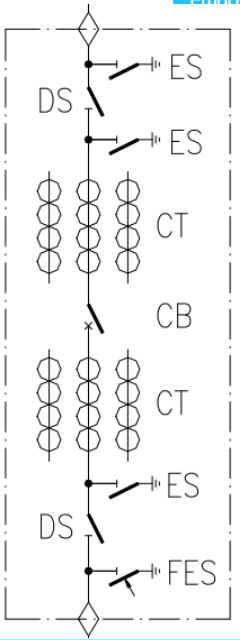
1.12 Engineering layout

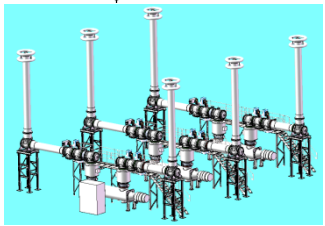


Entire substation layout（Z type layout)

1.12 Engineering layout



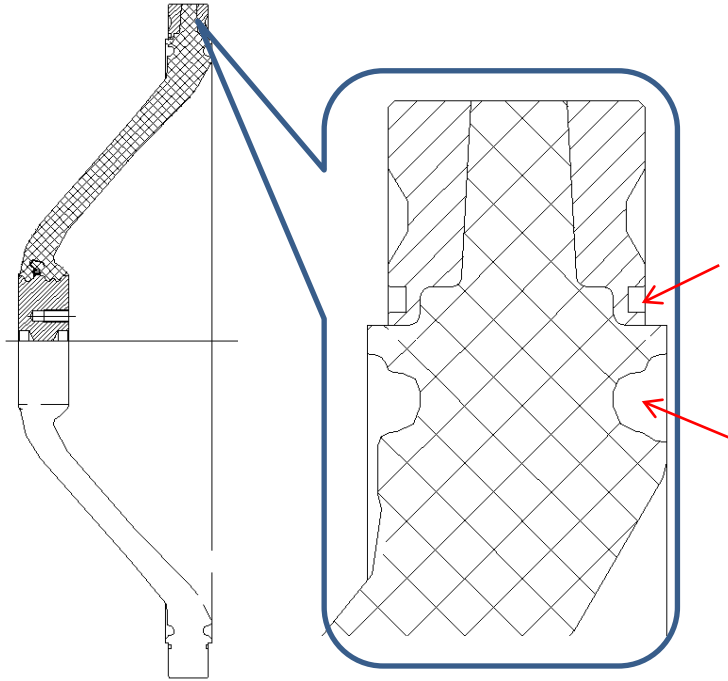




HGIS project layout

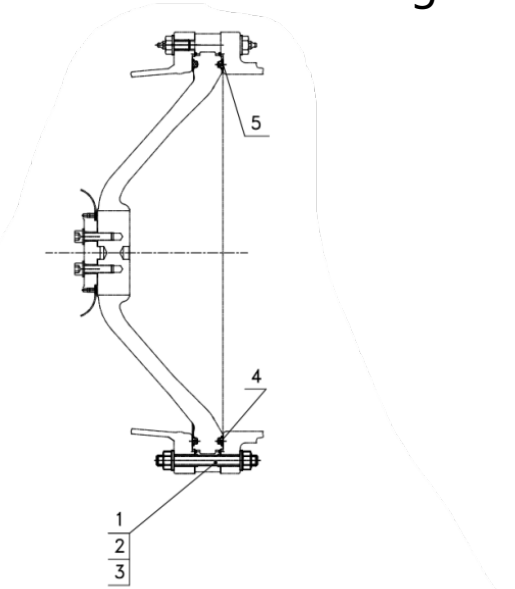
1.13 Double seal

In order to improve the sealing performance of the product, double-channel sealing is adopted.



Basin insulator





5	5100009273	O形圈	外径615×3.5 三元乙丙胶	2				
4	5100019191	O形圈	外径590×10三元乙丙胶	2				
3	5100004232	六角螺母	GB/T6170 M16-8 碳钢 热镀锌	48				
2	5100002075	平垫圈	GB/T97.1 16 碳钢140HV 热镀锌	48				
1	5100004137	螺杆	GB/T15389 M16×160-8.8 碳钢 热镀锌	24				

Basin assembly

1.14 Structure characteristics

◊ Product advantages: Miniaturized, modular structure, occupy small space, flexible layout

- The minimum spacing width is 3m.
- The whole machine has light weight, small operation work, small foundation load, and saves civil construction cost.
- All aluminum alloy housing, low loss.
- Exclusive outdoor protection structure, corrosion resistance.
- Highly modular design, flexible layout, strong interchangeability.

2

Type test

2.1 Test report

❖In May 2023, Xi 'an National High Voltage Electrical Appliances Quality Supervision and Inspection Center passed the complete type test according to the latest standards, fully meeting the requirements of IEC/GB/DL standards.

Test report number: NO.220734G, NO.220861G, NO.220862G, NO.230173G

依据标准 Standards for Test Performance: GB/T 7674-2020、DL/T 617-2019、IEC 62271-203:2011、GB/T 1985-2014、DL/T 486-2021、IEC 62271-102:2018、GB/T 1984-2014、DL/T 402-2016、IEC 62271-100:2021、JB/T 9694-2008



CHPTL

XIHARI

No. 220734G

检 验 报 告

TEST REPORT

试品型号: TYPE	ZFW34-550/Y5000-63
试品名称: DESIGNATION	气体绝缘金属封闭开关设备 GAS INSULATED METAL ENCLOSED SWITCHGEAR
委托单位: APPLICANT	正泰电气股份有限公司 CHINT ELECTRIC CO., LTD.
制造单位: MANUFACTURER	正泰电气股份有限公司 CHINT ELECTRIC CO., LTD.
检验类别: CLASSIFICATION	型式试验（温升、开合、绝缘及短路性能） TYPE TEST (TEMPERATURE-RISE, SWITCHING, DIELECTRIC AND SHORT-CIRCUIT PERFORMANCE)

西安高压电器研究院股份有限公司

XI'AN HIGH VOLTAGE APPARATUS RESEARCH INSTITUTE CO.,LTD.

2.1 Test report

Main test parameters

Number	Project		Unit	Parameter value	Remark
1	Rated voltage		kV	550	
2	Rated current		A	5000/6300(CB)	
3	SF_6 gas leakage rate		%	≤0.1	Meet the State grid class A requirements
4	Particular Discharge (80% rated power frequency withstand voltage)	The full bay	pC	≤3	Meet the State grid class A requirements
		Individual insulation	pC	≤2	Meet the State grid class A requirements
5	Circuit breaker	Mechanism endurance	time	11000	Industry high parameter
		Mechanism endurance	time	24	Industry high parameter
6	disconnector busbar conversion	Conversion current	A	3000	Meet the State grid class A requirements
		Conversion voltage	V	435	Meet the State grid class A requirements
7	Quick earthing class C	Electromagnetic induction	/	750A/50kV	Industry high parameter
		Electrostatic induction	/	100A/75kV	Industry high parameter

2.2 Test parameter

This test project also meets the relevant requirements of ICE/GB/DL standards, and considers the latest draft for review, so there are more test projects and relatively high parameters:

1. Disconnector busbar charging current mode 1, mode 2, mode 3 all passed the test; The disconnector busbar conversion current is 3000A and the voltage is 435V.
2. The high and low temperature test of circuit breaker, disconnector and earthing switch, quick earthing, bushings, current transformer, voltage transformer and other main modules is carried out, and the high and low temperature test of circuit breaker meet IEC/GB standard, and the assessment of tracing zone is the first manufacturer in China that passes -40℃~+55℃ according to ICE standard.
3. All tests are carried out on the control cabinet, including high and low temperature, EMC, vibration, chain, degree of protect and other tests.
4. The seismic test of the whole machine is carried out and reaches AG5.
5. Circuit breaker, disconnector, ES, quick earthing mechanical endurance through 11,000 verification.

2.2 Test parameter

6. Disconnector breaking capacity is large, disconnector breaking current is 63kA, time constant is 120ms; Short-time and peak withstand current: 63kA 3s, peak 171kA, electrical endurance up to 24 times, the highest level of similar products in the industry.
7. Fault-off earthing switch on and off induction current ability is over Class B design: electromagnetic induction 750A/50kV, electrostatic induction 100A/75kV.
8. Low particular discharge, at 80% power frequency withstand voltage, the insulation is less than 2pC, the full pay particular discharge is less than 3pC.
9. High protection level, dustproof IP56, anti-collision IK10.
10. Terminal static mechanical load test, horizontal transverse 7000N, horizontal longitudinal 5250N, vertical 5250N, meet the safety factor of 3.5 times.
11. High insulation margin, according to the State grid "330 kV and above GIS technical compliance assessment implementation Rules" carried out zero gauge voltage test, zero gauge voltage test results can reach 1.4 times the phase voltage.

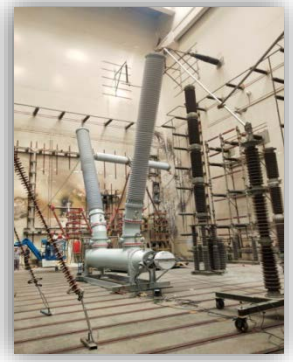
2.3 Test prototype



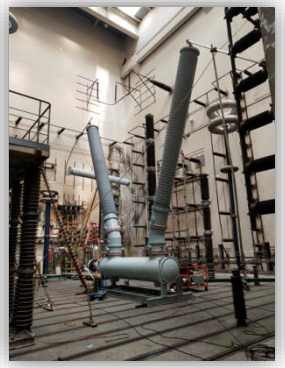
The full bay insulated test

2.3 Test prototype

Circuit breaker test



T100s test



T100a test



L90 test



LC/CC test



T60/OP test

2.3 Test prototype



Disconnector characteristic test



Linear disconnector busbar conversion test layout



Linear disconnector insulation test

2.3 Test prototype



Three-phase linear linkage disconnector dynamic thermal test



Quick earthing switch opening and closing test



Disconnector busbar charging

2.3 Test prototype



Bus + disconnector temperature rise test





Porcelain casing + composite casing temperature rise test

2.3 Test prototype







Earthquake magnitude: AG5

High and low temperature:

environment temperature -40℃~+55℃

2.3 Test prototype



Mechanism operating test



Shock test of control cabinet

CHINT
Empower the World

3

Manufacturing capability

3.1 Assembly workshop

Spacious and bright clean workshop

The workshop strictly implements the self-inspection inspection system in accordance with the assembly process card and the process quality control point examination table, implements the traceability system for all assembly processes, and carries out strict factory test for each component and the full bay according to their own standards to ensure the stable and reliable quality of the factory products. The assembly equipment in the workshop is complete, and the assembly quality is guaranteed.







The workshop has complete testing and testing equipment and facilities, and has an independent test area, which can meet the various tests of 550 kV and below high-voltage electrical equipment, to ensure the factory pass rate of products.

3.2 Insulation Workshop

Production - Complete manufacturing process

Germany Hedrich vacuum casting production line





All process parameters are automatically controlled and recorded by microcomputer in production

Chint T&D is a professional manufacturer of high voltage electrical appliances, with the ability of epoxy resin insulating parts manufacturing, electrochemical surface, surface coating, welding, machining and assembly, and has chemical analysis, metallographic analysis, mechanical property test, electrical test, environmental test, chromatographic analysis, physical property test, ultrasonic inspection, X-ray inspection, sealing test and other testing methods. Various types of high-voltage test equipment can meet the requirements of some type tests and all factory tests of products.

Surface treatment production line




3.3 Enclosure Workshop







The shell workshop is equipped with plasma longitudinal seam welding system, large horizontal boring machine, AC-DC welding machine, X-ray flaw detection and other equipment, which fully meets the production needs of the business department. The shell has gone through strict quality inspection to ensure 100% pass rate.

3.4 Mechining

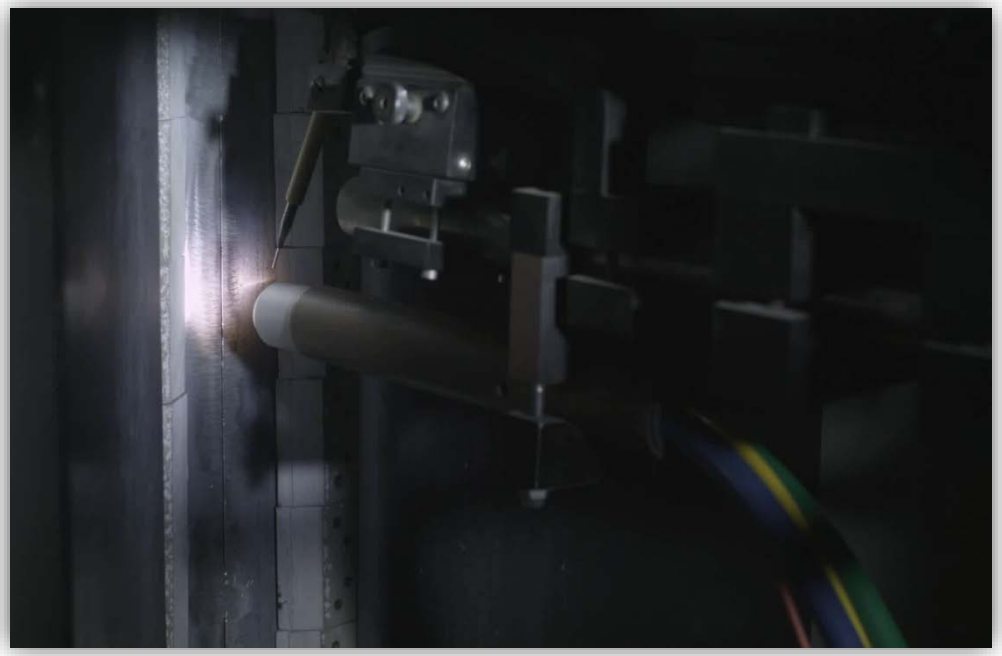
Production-Advanced and efficient processing equipment



]American Harting vertical machining center



Italy PAMA boring and milling center



Plasma longitudinal seam welding system

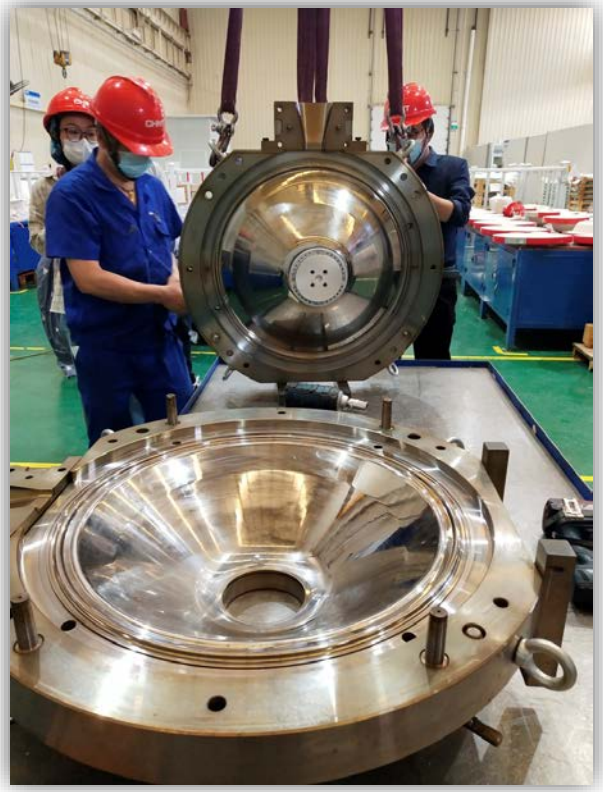


Barrel welding



Swiss laser cutting machine

3.5 Parts processing



Insulated basin casting





Circuit breaker enclosure processing



Product assembly

THANKS