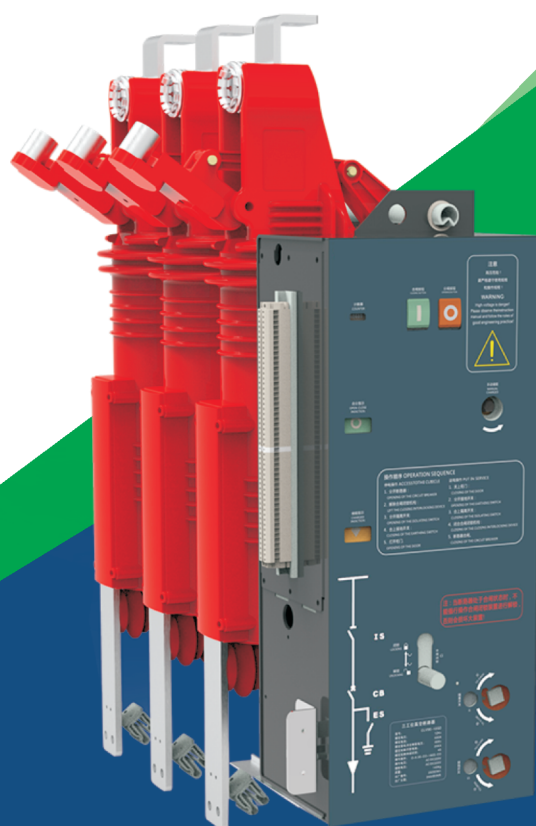






VEF-12GD

Side-mounted three-position vacuum circuit breaker
Product Instruction Manual



Zhejiang Aikai Electric Co., Ltd.

Catalog

Product Overview-----	01
Product Features-----	02
Technical Parameters-----	03
Operation Panel-----	04
Product Configuration-----	05
Outline Dimensions-----	06
Cabinet Reference Drawing-----	07
Electrical Schematic Diagram-----	08
Simplified Schematic Diagram-----	09
Other Matters-----	10
Inspection and Maintenance-----	11

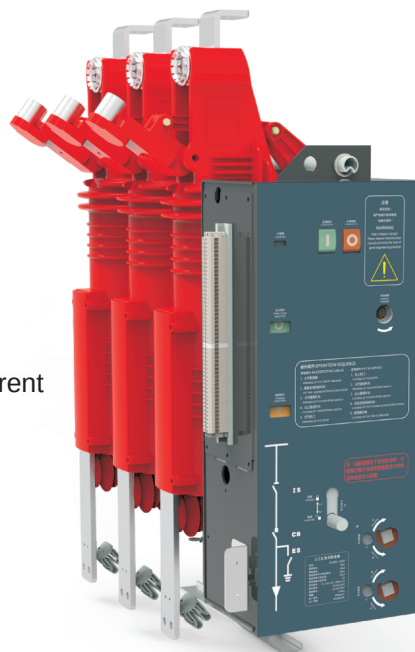
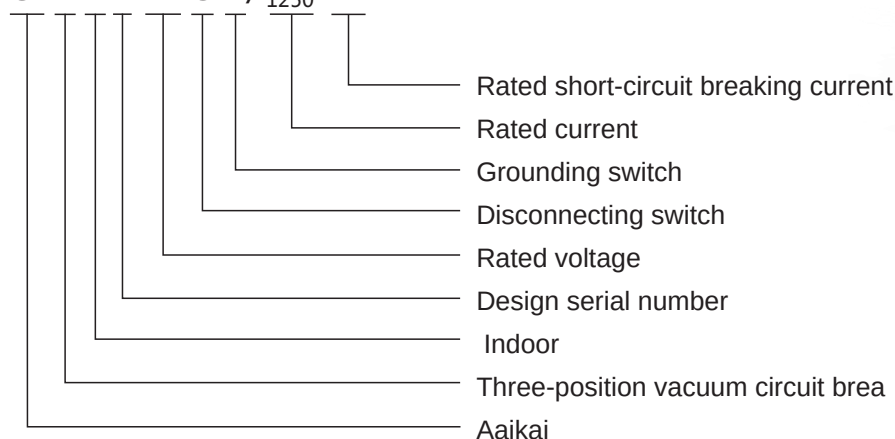
I. Product Overview

- ★ Integrated, side-mounted, with isolating switch, grounding switch (top and bottom grounding), and interlocking mechanism; miniaturized design.
- ★ 12kV, 630A...1250A,...31.5kA
- ★ Cabinet width 500mm
- ★ Solid sealing technology
- ★ Non-contact live display sensor at the outgoing terminals
- ★ No adjustment required for cabinet door locking

1.1 Model and Meaning

Three-position vacuum circuit breaker

CL V E F-12 G D/ ⁶³⁰₁₂₅₀ -25



1.2 Environmental Conditions

1.2.1 Ambient Temperature: -15~40°C, daily average temperature not exceeding +35°C;

1.2.2 Humidity: Average relative humidity measured over 24 hours ≤95%; average water vapor pressure measured over 24 hours ≤2.2 kPa; average relative humidity ≤90%; average monthly water vapor pressure ≤1.5 kPa.

1.2.3 Altitude ≤1000m;

1.2.4 Vibration from outside the switchgear and control equipment is negligible;

1.2.5 The surrounding air is not significantly polluted by dust, smoke, corrosive or flammable gases, vapors, or fumes.

1.3 Special Environmental Conditions

1.3.1 For the use of circuit breakers under special conditions, the user and manufacturer shall negotiate the solution.

The following usage conditions are usually considered by the manufacturer:

1.3.2 If the equipment installation site has an altitude exceeding 1000m, the external insulation strength will be reduced, or a high-altitude prototype product meeting the corresponding insulation requirements should be ordered.

1.3.3 Higher ambient temperatures: The circuit breaker needs to have its rated current reduced, or a forced cooling fan installed; Other issues should be handled in consultation with the manufacturer according to Clause 2.2 of GB/T11022 standard;

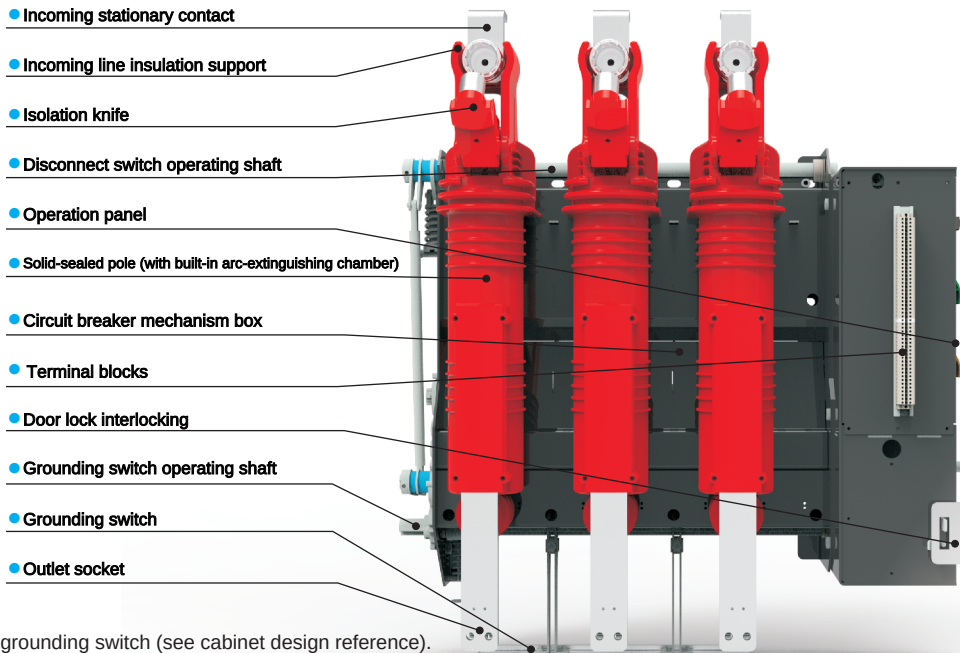
1.3.4 Users must perform relevant calculations when selecting switches;

1.3.5 Recommended calculation method: Determine the altitude H of the specified location, calculate the relevant altitude coefficient Kα according to GB311.1 (Formula 1), multiply the switch's lightning impulse withstand voltage and power frequency withstand voltage by Kα. The resulting value is the switch's operating condition when used at high altitudes H, and must be suitable for environments below 1000 meters.

The achieved pressure resistance parameters. Formula 1 : $K\alpha = \frac{1}{1.1-H \times 10^{-4}}$

II. Product Features

The CLVEF-12GD series side-mounted three-position vacuum circuit breaker has a longitudinal main circuit arrangement, with a disconnecting switch at the top, a vacuum circuit breaker in the middle, and a grounding switch at the bottom. The operating mechanism, circuit breaker mechanism, and interlocking mechanism are located at the front of the switch. This switch can be installed upside down.



High-quality solid-sealed pole

High reliability, stable insulation performance, more robust structure, miniaturization, maintenance-free, more environmentally friendly, and high mechanical resistance.

Visual isolation break

Rotary disconnect switch with a visible break after opening.

Modular operating mechanism

The circuit breaker adopts a modular operating mechanism, allowing for independent replacement or maintenance and good interchangeability. It can be operated manually or with AC/DC energy storage for remote control.

Three-axis step-by-step operation
with reliable mechanical interlocking

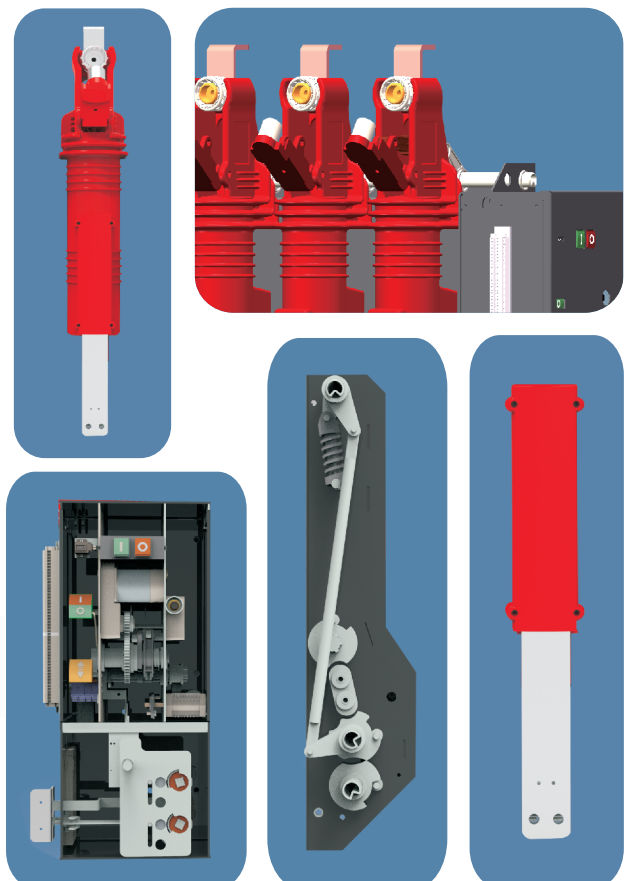
The disconnecter, circuit breaker, and grounding switch are operated on a single axis, and there is a forced mechanical interlock between the three axes to prevent misoperation.

The outgoing terminal has a non-contact live display sensor.

Capacitorless and using non-contact sensing technology, safe and reliable!

The cabinet door and the grounding switch are designed with a reliable interlocking structure.

Ensure operator safety with an adjustable cabinet door lock.



III. Technical Parameters

NO	Name	Unit	Parameters		
1	Rated voltage	kV	12		
2	(1 min) Rated short-time power frequency withstand voltage: phase-to-phase/break		42/48		
3	Rated lightning impulse withstand voltage (peak): phase-to-phase/break		75/85		
4	Secondary circuit power frequency withstand voltage (1 min)	V	2000		
5	Rated frequency	Hz	50		
6	Rated current	A	630	1250	
7	Rated short-circuit breaking current	kA	20	25	31.5
8	Rated peak withstand current	kA	50	63	80
9	Rated short-circuit making current	kA	50	63	80
10	4s rated short-time withstand current	KA	20	25	31.5
11	Rated short-time withstand current duration	s	4		
12	Rated single/back-to-back capacitor bank breaking current	A	630/400		
13	Rated capacitor bank inrush current	kA	12.5(Frequency not greater than 1000Hz)		
14	Number of times rated short-circuit current interruption	bout	30		
15	Mechanical life (disconnecting switch/circuit breaker/grounding switch)		3000/10000/3000		
16	Allowable cumulative wear thickness of moving and stationary contacts	mm	3		
17	Rated closing operating voltage	V	AC24/48/110/220	DC24/48/110/220	
18	Rated tripping operation voltage				
19	Rated voltage of energy storage motor	V	AC24/48/110/220	DC24/48/110/220	
20	Rated power of energy storage motor	W	70		
21	Energy storage time	s	≤15		
22	Contact gap	mm	9±1		
23	Over-trip		3.5±1		
24	Contact closing bounce time	ms	≤2		
25	Three-phase switching off and closing asynchronous		≤2		
26	Opening time (rated voltage)		≤40		
27	Closing time (rated voltage)		≤60		
28	Average opening speed (contacts just opening ~ 6mm)	m/s	0.9 ~ 1.3		
29	Average closing speed (6mm to just as the contacts close)		0.5 ~ 1.1		
30	Contact tripping rebound amplitude	mm	≤2		
31	Contact pressure when closing the contact	N	2400±200 (20-25kA)	3100±200 (31.5kA)	
32	Rated operating sequence	/	O-0.3s-CO-180s-CO		

IV. Operation Panel

Referring to the switch operation indicator on the right, the following explanations apply:

- Double Interlocking: The circuit breaker, disconnector, and grounding switch are equipped with mandatory mechanical interlocking operations.

The circuit breaker, disconnector, and grounding switch are designed with anti-misoperation interlocking devices.

- The disconnecter and grounding switch are operated on independent shafts in steps, with mandatory mechanical interlocking operations between the two operating shafts.

- After the switch opening and closing operations, please check their respective opening and closing status through the observation window.

Interlocking of Circuit Breakers, Disconnect Switches, Grounding Switches, and Cabinet Doors

- The disconnect switch and grounding switch are mechanically interlocked; they can only be closed together, not simultaneously. The disconnect switch can only be closed after the grounding switch has been opened; the grounding switch cannot be closed after the disconnect switch has been closed.

- The circuit breaker can only be closed when the closing interlock is in the locked position; the disconnect switch and grounding switch cannot be operated.

- After the circuit breaker is closed, the closing interlock cannot be unlocked; the disconnect switch and grounding switch cannot be operated.

- The cabinet door can only be opened after the grounding switch has been closed.

- The grounding switch can only be opened after the cabinet door has been closed.

V. Operation of closing interlock

1. Locking

Rotate the outer ring of the locking operating shaft 90° (release positioning), push it to the limit position in the locking direction, then rotate the outer ring of the operating shaft 90° (position).

2. Unlocking

Rotate the outer ring of the locking operating shaft 90° (release positioning), push it to the limit position in the unlocking direction, then rotate the outer ring of the operating shaft 90° (position).

VI. Circuit Breaker Operation

Manual Operation

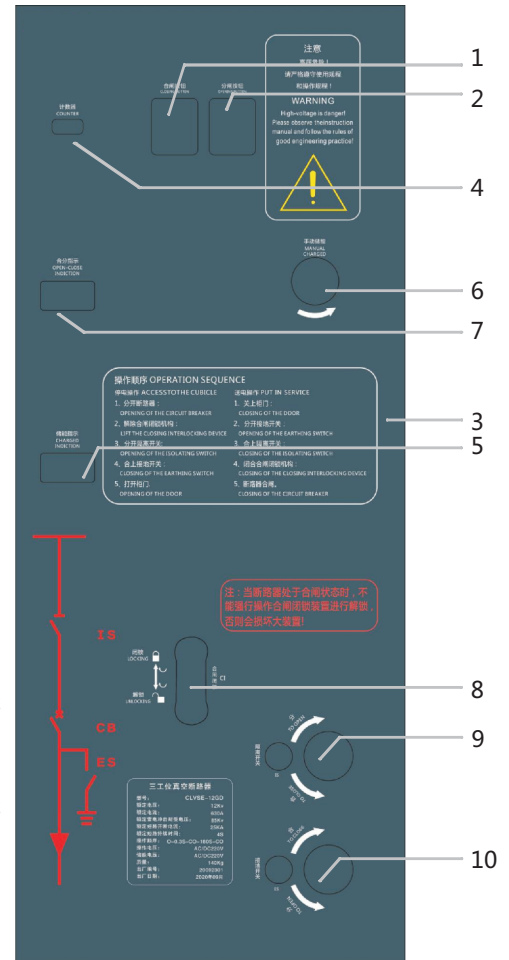
1. Open the energy storage cover and use the dedicated energy storage rod to store energy.
2. Close: Press the close button. (If it has a closing interlock or undervoltage device, the secondary circuit must be energized before closing.)
3. Open: Press the open button.

Electrical Operation

1. After the secondary circuit is energized, the energy storage mechanism automatically stores energy.
2. Close: Press the close button in the control circuit.
3. Open: Press the open button in the control circuit.

VII. Operation of the disconnect switch

- Clockwise rotation opens the disconnect switch.
- Counterclockwise rotation closes the disconnect switch.



1. Closing button
2. Opening button
3. Operating sequence instructions
4. Counter
5. Energy storage indicator
6. Manual energy storage
7. Circuit breaker closing/opening indicator
8. Closing interlock
9. Disconnecting switch operating shaft
10. Grounding switch operating shaft

Grounding switch operation

- Clockwise rotation closes the grounding switch.
- Counterclockwise rotation opens the grounding switch.

Cabinet door locking operation

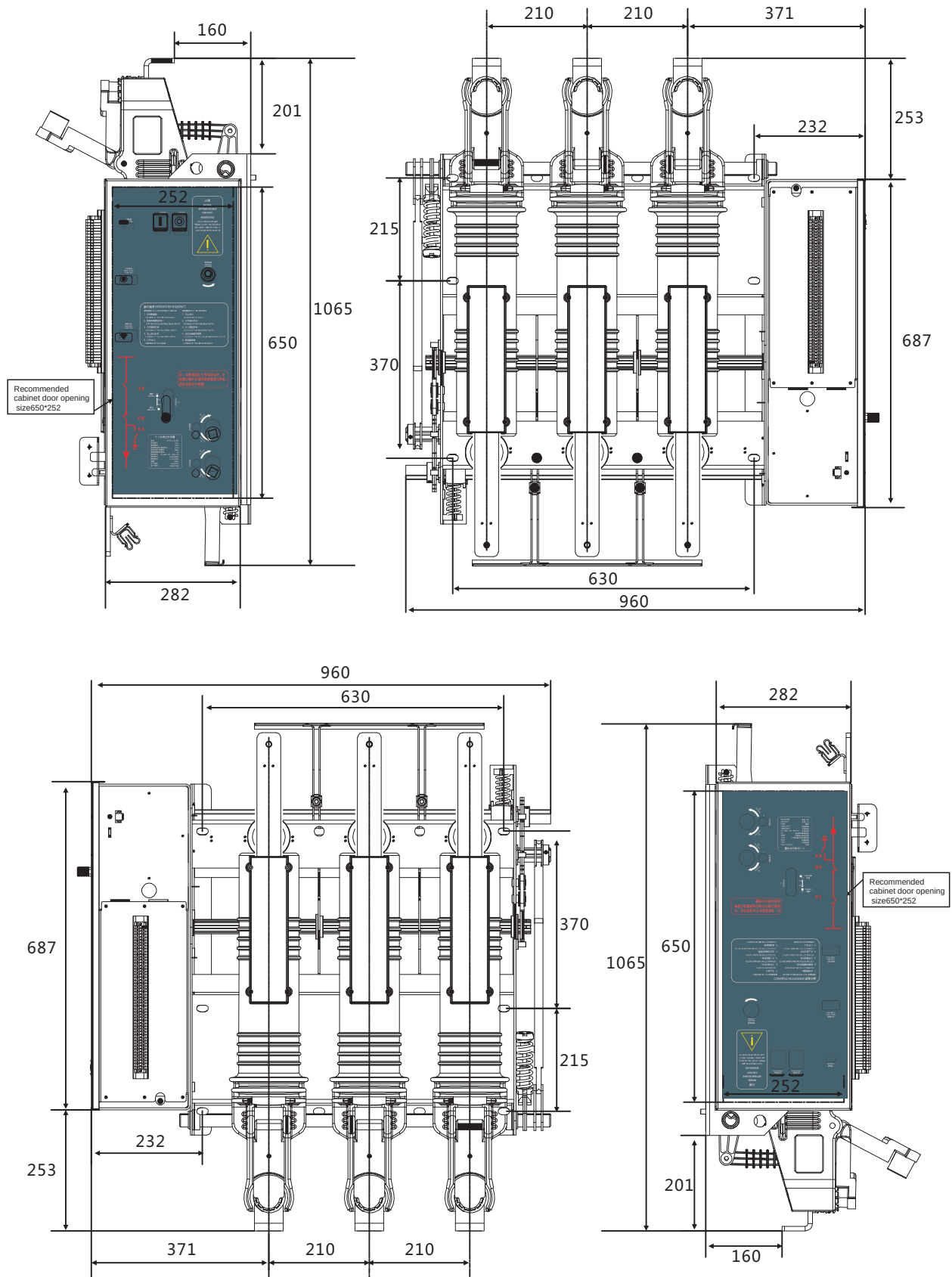
- Closing the cabinet door automatically unlocks the door from the grounding switch.
- After the grounding switch is closed, opening the cabinet door will automatically lock the grounding switch, preventing further operation.

V. Product Configuration

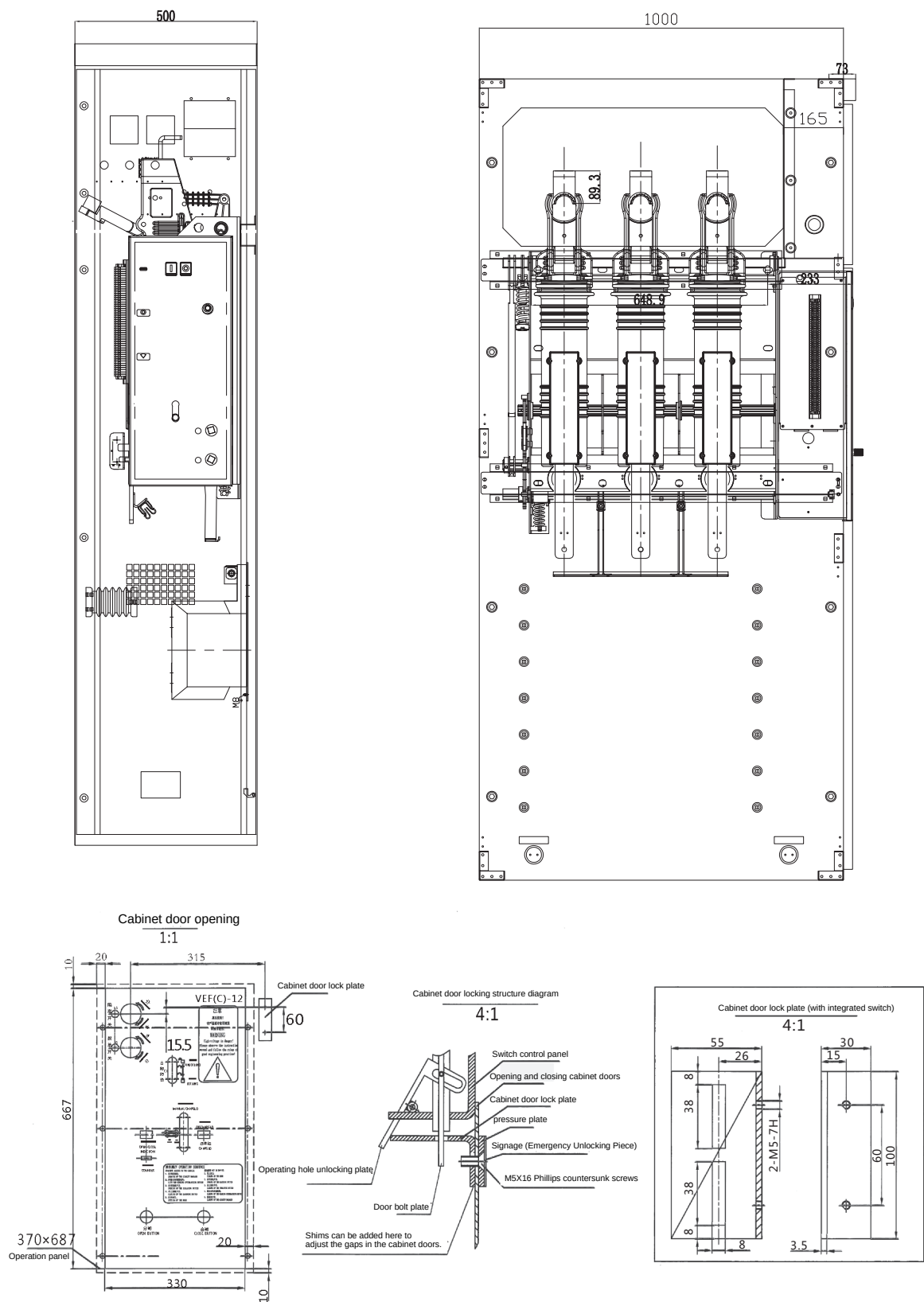
Standard configuration: Wiring according to standard wiring diagram, including anti-pumping device, no interlocking device, no overcurrent device, and no undervoltage device.

Configuration	parameter	Remark
Energy storage motor	120W	Standard configuration
Closing coil	A(D)C24~220V	Standard configuration
Trip coil	A(D)C24~220V	Standard configuration
Isolation auxiliary switch	1K1B 5A	Standard configuration
Grounding auxiliary switch	1K1B 5A	Standard configuration
Auxiliary switch of energy storage mechanism	2K1B 5A	Standard configuration
Circuit breaker auxiliary switch	8K8B 5A	Standard configuration
Anti-jump device	A(D)C24~220V	Standard configuration
live sensor	Non-contact	Standard configuration
Locking device	A(D)C24~220V	Optional
Overcurrent trip unit	3.5A、5A	Optional
undervoltage device	A(D)C24~220V	Optional

VI. External Dimensions Drawing

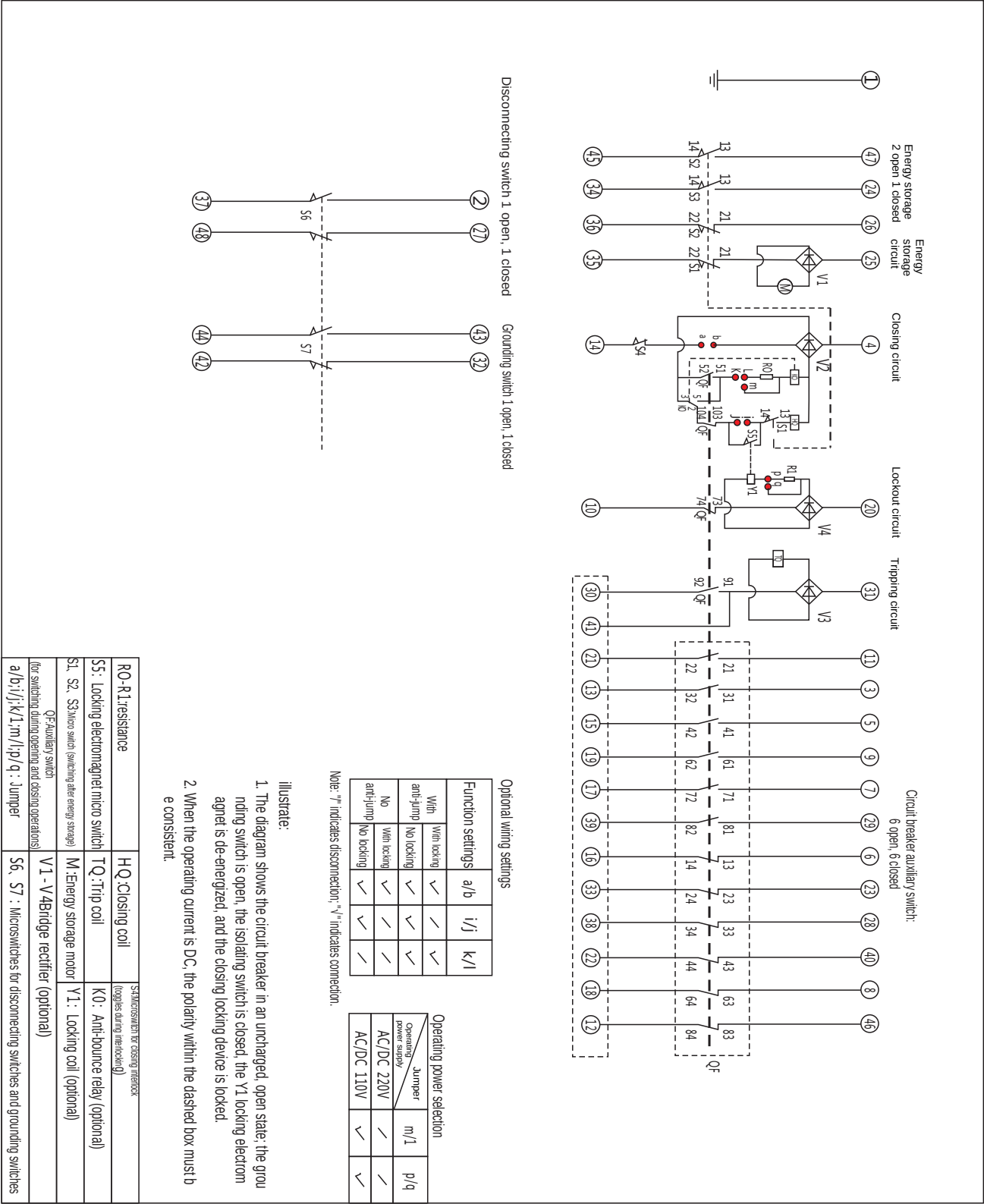


VII. Cabinet Reference Drawing



Inverted installation with circuit breaker bottom entry on the left side - cabinet dimensions reference (cabinet depth: 1000)

VIII. Electrical Schematic Diagram



IX. Primary Scheme Diagram

Reference diagram of a single solution

Primary Mainline Chart					
	number	01	02	03	04
	Rated voltage (kV)	12	12	12	12
	Rated current (A)	630-1250	630-1250	630-1250	630-1250
	Circuit Breaker (Integrated Circuit Breaker/Disconnecting Switch/Grounding Switch/Interlocking Mechanism)	12 0 2 12 12 0 1	12 0 2 12 12 0 1	12 0 2 12 12 0 1	12 0 2 12 12 0 1
	Fuse				3
	Voltage transformer				2
	Current transformer	3	3	3	3
	lightning arrester	3	3	3	3
	live display	3	3	3	3
	Width x Depth x Height	500X1000X (1700-2200)	500X1000X (1700-2200)	500X1000X (1700-2200)	500X1000K (1700-2200)

Primary Mainline Chart					
	number	05	06	07	08
	Rated voltage (kV)	12	12	12	12
	Rated current (A)	630-1250	630-1250	630-1250	630-1250
	Circuit Breaker (Integrated Circuit Breaker/Disconnecting Switch/Grounding Switch/Interlocking Mechanism)	12 0 2 12 12 0 1	12 0 2 12 12 0 1	12 0 2 12 12 0 1	12 0 2 12 12 0 1
	Fuse				3
	Voltage transformer				2
	Current transformer	3	3	3	3
	lightning arrester	3	3	3	3
	live display	3	3	3	3
	Width x Depth x Height(MM)	500X1000X (1700-2200)	500X1000X (1700-2200)	500X1000X (1700-2200)	500X1000X (1700-2200)

Note: The schematic diagram is for reference only; the actual situation shall prevail.

X. Other matters

10.1 Packaging, Transportation and Storage

10.1.1 Factory Conditions Vacuum circuit breakers undergo complete performance testing and 300 mechanical break-in cycles before leaving the factory to ensure the reliability of each unit.

10.1.2 Packaging Vacuum circuit breakers should be packaged in the open position. First, seal them in a plastic bag with an appropriate amount of desiccant, then secure them to a wooden base, and finally install them with plywood.

10.1.3 Transportation Only cranes, forklifts, and overhead cranes should be used for loading and unloading the packaging. When lifting is required during transportation, strictly follow the positions marked on the outside of the packaging.

10.1.4 Unpacking Inspection Upon receiving the product, the user should inspect it immediately. Check for any damage to the packaging and transportation process, verify that the accessories match the packing list, and confirm that the product model and specifications are the same as ordered.

10.1.5 Storage The product should be stored indoors in a well-ventilated, dry place, free from severe vibration and corrosive gases.

10.2 Factory Documentation and Attachments

10.2.1 Product Instruction Manual / 1 copy

10.2.2 Product Certificate of Conformity / 1 copy

10.2.3 Factory Inspection Report / 1 copy

10.2.4 Packing List / 1 copy

10.2.5 Cabinet Door Emergency Unlock Piece / 1 piece

10.2.6 Energy Storage Handle / 1 piece

10.2.7 Operating Handle / 1 piece

10.3 Installation, Debugging and Operation

10.3.1 Before installation, check that the product is intact and that all fasteners are secure.

10.3.2 Remove dirt, especially from the surfaces of the insulation components. This dirt may have been absorbed through packaging materials during transport or during storage. Check the connections of the primary and secondary circuits and the grounding electrode.

10.3.3 Connect the auxiliary power supply for electric energy storage, or manually store energy using the energy storage handle. The energy storage indicator will show that energy storage is complete.

10.3.4 Use the buttons to perform the opening and closing operations, and observe the operation of the circuit breaker's opening and closing position indicators.

10.3.5 During each operation, the counter on the circuit breaker automatically records the data. The opening and closing positions of the circuit breaker, indicated by the circuit breaker's opening and closing indicators, can be observed on the circuit breaker panel.

10.4 Maintenance

10.4.1 General Requirements Maintenance is essential to ensure the circuit breaker operates without failure and achieves its maximum service life. Vacuum circuit breakers, due to their simple structure and durability, have a long service life. Throughout their service life, the circuit breaker operating mechanism is maintenance-free, and the vacuum interrupter requires no maintenance. Even frequent tripping operations and short-circuit current interruptions will not affect the vacuum level.

10.4.2 Maintenance work is related to wear and aging of components. The required intervals and scope of maintenance work for reliable circuit breaker operation will depend on factors such as the influence of the working environment, the number of operations, operating time, and the number of short-circuit current interruptions.

10.4.3 Under normal operating conditions, with careful inspection and maintenance, the secondary auxiliary components can withstand more than 10,000 operations.

Note:

Maintenance work should only be performed by trained personnel familiar with the characteristics of this switchgear.

During maintenance work, all auxiliary power supplies must be disconnected and there should be no risk of re-energizing.

XI. Inspection and Maintenance

10.1 Circuit Breaker Body Under normal circumstances, the circuit breaker poles do not require maintenance. Vacuum checks are only necessary if there is strong suspicion that external force may have caused damage to the vacuum interrupter. The service life of the vacuum interrupter depends on the total current limit; it should only be replaced when the total current limit is reached.

10.2 Operating Mechanism Under normal operating conditions, inspections within the service life's operating cycles are unnecessary. Inspections and performance tests should be performed on the operating mechanism in the following situations:

- After a certain number of operating cycles.
- Under special operating conditions, including harsh climatic conditions and environments with severe pollution and corrosive gases.

10.3 Circuit Breaker Tripping Before Performance Testing:

Performance Testing Scope:

- Connecting auxiliary power.
- Performing several opening and closing operations under no-load conditions to check the correctness of the operation.

10.3 General Requirements for Vacuum Circuit Breakers

10.3.1 After approximately 5 years of operation, or when the operating mechanism is under maintenance, the vacuum circuit breaker body should also be inspected, especially its appearance.

10.3.2 After the appearance inspection, any dirty or damp areas on the exterior surface must be cleaned. Wipe the surface of the insulation with a dry cloth, then wipe away any remaining dirt with a damp cloth containing detergent.

10.3.3 For switchgear operating in special applications or under particularly damaging environmental conditions (such as in environments with high levels of pollution and corrosive gases), the minimum interval between the above inspections should be less than 5 years.

1. After the switch is put into use, it should be maintained and inspected 1-2 times per year.
2. An inspection should be performed after each interruption of the circuit current, and maintenance should be performed after a cumulative total of 3 consecutive interruptions of the circuit current.

Maintenance Engineering and Quality:

I. Clean, inspect, and tighten all components and screws.

1. All components should be free of oil, rust, deformation, and severe wear.
2. All fastening screws, washers, and spring rings should be complete, spring washers should be firmly pressed and flat, cotter pins should be properly open, and retaining clips should not be detached.

II. Inspect the supporting insulators, insulating rods, varistors, and grounding wires.

1. The surfaces of insulators, insulating rods, and varistors should be clean and free of oil.
2. Insulators, insulating rods, and varistors should be undamaged and free of discharge.
3. Grounding should be good.

III. Inspect the vacuum interrupter and its conductive connections.

1. The vacuum interrupter should be undamaged, with a clean surface free of dust and oil. The protective cap of the vacuum seal should be intact and not loose or detached.
2. The assembly of the interrupter guide sleeve should ensure the coaxiality of the moving and stationary conductive rods.
3. When connecting the upper and lower conductive plates of the vacuum interrupter, excessive stress should be avoided to prevent damage to the interrupter due to excessive stress.
4. The connection between the conductive rod and the conductive clamp on the vacuum side should be tight, and the clamp should be tightened to ensure a gap of at least 1mm on one side.
5. The flexible connection surface should be neat, free of burrs, and free of dirt in the surface gaps. The number of broken wires should not exceed 5% of the total number, and broken parts should be soldered securely.
6. All conductive connection surfaces should be coated with neutral petroleum jelly or conductive paste.
7. There should be no overheating at any conductive connection point.

IV. Inspection and Adjustment of the Operating Mechanism

1. All components should be free of deformation and wear; springs should be free of rust, cracks, breaks, and insufficient elasticity; the shaft holes of the connecting transmission should fit well, rotate freely, and be lubricated.
2. The copper sleeves of the opening and closing coils should be clean, free of oil and deformation; the iron core of the opening and closing electromagnets should move freely without jamming.
3. The oil damper should operate flexibly without jamming or oil leakage.

V. Inspect Auxiliary Switches, Microswitches, and Secondary Circuits

1. Auxiliary switches and microswitch springs should be free from rust, breakage, and insufficient elasticity; contacts should be free from dirt and severe burns, and have good and reliable contact.
2. Auxiliary switches and microswitches should reliably switch circuits, rotate flexibly, and without jamming.
3. Secondary circuit wiring screws should be tight and free from oxidation and rust.
4. Secondary plug sockets should be free from deformation and burns, and plug contacts should be good and reliable. To ensure the switches are not damaged by third parties during operation, regular maintenance should be performed 1-2 times per year.