Warning! Before operating this switch cabinet, please read The operation manual carefully to master the operation method and precautions of the switch cabinet, otherwise it is easy to cause misoperation, resulting in system failure, equipment damage or even personal injury.

TENRONY

ELECTRICAL

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ELECTRICAL

Zhejiang Tenrony Electric Co., Ltd

目录

Cause and solution of low voltage trip

01 Summary

KYN28A-12 armored type withdrawable AC metal closed switchgear (hereinafter referred to as switchgear) is suitable for large power plants, substations and industrial and mining enterprises with rated voltage of 3.6 ~ 12kV and rated frequency of 50Hz AC power grid, as a receiving and distributing power.

02 Cabinet structure

2.1. Cabinet

The switchgear features a armored, metal-enclosed structure composed of two main components: the cabinet body and a retractable unit (Chinese-style trolley). The cabinet is divided into four compartments: the trolley compartment, busbar compartment, cable compartment, and instrument compartment. Each of these compartments is equipped with a pressure relief channel and vent at its top. In the event of internal faults, the cabinet's pressure relief window automatically opens to release accumulated pressure, ensuring the safety of both personnel and the switchgear itself (see Figure 1).

The components of the switching equipment are processed by imported aluminum-zinc coated steel plate or high-quality cold-rolled steel plate through FMS flexible processing system, and then welded after bending (the main frame adopts multiple bending). It has high machining precision and mechanical strength.

2.1.1. The instrument room's door panel houses components including microprocessor-based integrated protection devices, measuring instruments, display units, and control switches. Inside the room, relays, control fuses, and secondary terminals are installed to meet requirements for protection, control, measurement, display, and communication. The ceiling features a busbar compartment designed to accommodate fifteen circuit busbars, which can be expanded to twenty circuits when necessary.

2.1.2. The trolley compartment is equipped with specialized guide rails on both sides for smooth sliding and positioning within the cabinet. The static contact box and valve mechanism are mounted on the rear wall of the compartment. When moving from the test position to the working position, the lifting mechanism automatically opens both upper and lower valves. Conversely, when moving in the opposite direction (releasing), the valves automatically close to prevent maintenance personnel from touching live components. An operation port is provided on the compartment door panel, allowing trolley operation even when circuit breaker compartment doors are closed.

2.1.3. The main bus compartment is used for installing the main busbar. The main busbar is vertically arranged, and branch busbars are directly connected to the main busbar and static contact box through bolts, eliminating the need for additional intermediate supports. The busbar passes through adjacent cabinets via wall-mounted insulating sleeves, effectively preventing the spread of internal fault arcs.

2.1.4. The cable room and switchgear are centrally located, so the cable room has a large space. The connection end of the cable (head) is more than 700mm away from the bottom of the cabinet. The current transformer and grounding switch are installed in the cable room, and the lightning arrester is installed in the lower part of the rear compartment.

2.2. Hand carts

The chassis of the handcart is constructed by cold-rolled steel plates bent and riveted through cold working processes, featuring mechanical interlocking mechanisms that ensure safety, reliability, and operational flexibility. Handcarts are categorized into various types such as circuit breaker handcarts, voltage transformer handcarts, metering handcarts, and isolation handcarts based on their applications. Thanks to their unique design, these handcarts allow effortless insertion and removal. Handcarts of the same type demonstrate excellent interchangeability. The handcart is equipped with positioning mechanisms for both working and test positions within the cabinet, along with corresponding locking devices that ensure circuit breakers can only be operated when the handcart remains in designated positions.

2.3. Transfer vehicles

The transfer cart is used to carry out the operation of moving the cart into and out of the cabinet. There are two locking functions of the transfer cart: the lock between the transfer cart and the moving cart and the lock between the transfer cart and the cabinet.

03 Safety reliability and interlocking

3.1. Cart position

The handcart is equipped with two locking positions in the switch cabinet: test position and working position.

3.2. Location of trolley and interlock with circuit breaker

The switch cabinet has a perfect mechanical interlock between the trolley position and the circuit breaker.

3.3. Electrical interlock

The test position and working position switches are installed at the bottom of the test trolley. An electrical interlock is implemented between the isolator trolley and the circuit breaker trolley within the same circuit: The isolator trolley can only be operated when the circuit breaker is in the open position. When the isolator trolley is in the "working" position, the circuit breaker can be closed. If attempts are made to move either the isolator trolley or the circuit breaker trolley away from the "working" position after the circuit breaker has been closed, the interlock will automatically disconnect the circuit breaker before the isolator trolley can be moved. Additionally, an electromagnetic lock is installed in the isolator trolley, interlocked with the circuit breaker of the same circuit. Once the circuit breaker is closed, the electromagnetic lock will immobilize the isolator trolley, preventing movement until the circuit breaker is opened, at which point the isolator trolley can be moved.

3.4. Mechanical interlock

3.4.1. When the grounding switch and circuit breaker are in the open position, the trolley can be moved from the "test" position to the "working" position. However, when the grounding switch or circuit breaker is in the closed position, the trolley cannot be moved from the "test" position to the "working" position.

3.4.2. When the trolley is in the "test" position or "separated" position, the grounding switch can be operated, but when the trolley is between the "test" position and the "working" position or when the trolley is in the "working" position, the grounding switch can not be operated.

3.4.3. The circuit breaker can be closed only when the trolley is locked in the "test" position or the "working" position. The circuit breaker cannot be closed when the trolley is in the "test" position to the "working" position.

3.4.4. When the grounding switch is in the closed position, the back door panel of the switch cabinet is allowed to be opened. When the back door panel of the switch cabinet is closed, the grounding switch is allowed to be opened.

3.4.5. When the trolley is in the "working" position or between the "working" position and the "test" position, the moving contact of the secondary plug seat is locked and cannot be pulled out.

04 carry

4.1. The switchgear shall be lifted and unloaded from the packaging chassis by lifting equipment. The lifting shall be carried out by using the lifting ring on the switchgear, and the top angle of the wire rope shall not be greater than 60 degrees.

4.2. When moving the switchgear, a transport cart or steel roller bar should be placed at the bottom of the switchgear. The switchgear should be in a vertical position during transportation, and the inclination Angle should not be greater than 10 degrees. It is strictly prohibited to place the switchgear in a horizontal position and move it sideways, backwards or face downwards.

4.3. The circuit breaker trolley in the cabinet shall be removed during lifting and handling.

05 install

5.1. Installation of foundation: When laying the foundation channel steel for cabinet installation, the distance between the installation hole shall meet the specified size in the drawings, and the straightness and levelness shall not be more than 1mm per meter and 5mm in total length, so as to cast the ground.

5.2. Cabinet Alignment: After installing the switchgear on the ground track, align its front-back and vertical positions with adjacent cabinets. Adjust the base plane levelness of the entire unit, then secure it to neighboring cabinets using interconnecting bolts. Continuously verify and adjust the relative positioning between this row of cabinets and adjacent rows (or incoming line ports) to ensure compliance with construction drawings.

5.3. Installation of Main Busbars: The installation of main busbars should follow the numbering sequence of prefabricated busbar terminals, such as IA1, IA2, IA3... Here, | denotes the section number on the primary system diagram (e.g., Section I), A represents the A-phase main busbar, and 1, 2, 3,... indicate the first, second, third, and subsequent busbars connected to that section respectively.

5.3.1. Precautions for installation of main bus

5.3.1.1. Do not damage the support parts of the main bus.

5.3.1.2. The corresponding support structure shall be installed correctly and completely.

5.3.1.3. When connecting, the bonding surfaces between main busbars and between main busbars and branch busbars should be cleaned and coated with appropriate neutral Vaseline oil except for tin plating (tin plated at the factory). The recommended tightening torque of bolts for connection is shown in the following table:

Order number	Pipette specifications	Torque of rotation (Nm)
1	M16	9.5
2	M18	25

Order number	Pipette specifications	Torque of rotation (Nm)
3	M10	45
4	M12	80
5	M16	200

5.3.1.4. Main Bus Support: The main bus is supported in two configurations: either through wall-mounted bushings between cabinets or via support insulators. For busways extending through cabinet spaces, wall-mounted bushings are used to support the bus, which are then connected to external terminals or other bus connections using support insulators. These insulators are secured to the bus through clamps installed on their upper surfaces.

5.3.1.5. Connection between sections of the main busbar: The manufacturer has pre-assembled the main busbar in segmented form before product shipment. All phase busbar connections between sections must follow the manufacturer's provided numbering markings. The contact surfaces of the busbar have been pre-treated by the manufacturer. If contaminants are found on the contact surfaces during installation, they should be wiped clean and coated with neutral petroleum jelly. Avoid using files or sandpaper for polishing.

5.3.1.6. Connection between main bus and branch bus: The contact surfaces of each phase branch bus in the cabinet have been treated by the manufacturer. If dirt is found on the contact surfaces, they should be wiped clean and then coated with neutral Vaseline. Do not use file or sandpaper to polish them.

5.4. Installation of control busbar: The busbar supplied by the manufacturer shall be grouped according to the cabinet number, and each line shall be numbered and installed accordingly.

5.5. Installation of primary cable: The primary cable passes through the primary cable cover plate of the cabinet chassis and the fog sequence current transformer into the cable room. During installation, holes are opened on the cable cover plate according to the diameter and number of cables.

5.6. Installation of Secondary Cables: The secondary cables pass through the cabinet's bottom cover plate and ascend along the left-side cable trough to reach the instrument room. During installation, remove the secondary cable box cover plate (located on the left side of the cabinet trolley compartment). Guide the cables into the

switchgear through the cable trench, secure them within the secondary cable box, seal the cable entry port, and reattach the cover plate.

5.7. Grounding of switchgear:

5.7.1. Connect the grounding bus of each cabinet together with the preset connection row.

5.7.2. Connect all the leads that need to be grounded inside the switchgear.

5.7.3. Connect the basic frame to the grounding bar. If there are more than 10 switch cabinets, there must be more than two grounding bars.

5.7.4. Connect the grounding wire of the grounding switch to the main grounding busbar of the switch cabinet.

06 Check up

The inspection contents specified in this chapter apply to all primary switchgear.

6.1. Integrity check

Check whether the primary and secondary components in the cabinet are installed. Check whether the relevant accessories are complete.

6.2. Check the rated values

Check the nameplate of the switch cabinet and all primary and secondary components in the cabinet, and check whether the rated value of the components conforms to the requirements of the corresponding drawings.

6.3. Check fasteners

Check fasteners, especially those related to the transmission part and those connected to the main circuit, and retighten any loose fasteners found.

6.4. Operational inspection

6.4.1. Inspection of cabinet doors: Check whether the opening, closing and locking of upper and lower cabinet doors are flexible and accurate; check whether the components, Windows, locks and other accessories installed on the cabinet doors are complete and correct; check whether the marks and symbols on the cabinet doors are correct.

6.4.2. Check of grounding switch lock

6.4.2.1. When the grounding switch is in the open state, the back door of the switch cabinet should not be opened.

6.4.2.2. When the grounding switch is in the closed state, the circuit breaker trolley (or other component trolley) should not be pushed from the test position to the working position.

6.4.2.3. When the circuit breaker trolley (or other component trolley) is in the working position, the grounding switch should not be closed.

6.4.2.4. When the circuit breaker trolley (or other component trolley) is in the test position, or removed from the cabinet, the grounding switch should be able to operate normally.

6.4.3. Correctness of trolley position and interlock inspection:

6.4.3.1. Check of trolley position: The circuit breaker trolley (or other component trolley) in the cabinet should have three positions: either in the test position, or in the working position, or in the middle position. In this case, the trolley should be reliably locked when it is in the test position or working position.

6.4.3.2. Test location interlock inspection

6.4.3.2.1. When the trolley is in the test position, the secondary plug should be inserted reliably.

6.4.3.2.2. When the trolley is in the test position, the circuit breaker can be operated to open and close.

6.4.3.2.3. When the trolley is in the test position, the grounding switch can be closed and opened.

6.4.3.2.4. When the trolley is in the test position, the cabinet door can be completely closed or opened conveniently by normal methods.

6.4.3.2.5. When the trolley is in the test position, the trolley can only be pushed forward when the circuit breaker has been opened and the grounding switch has been opened. Otherwise, the trolley will be prevented from being pushed forward.

6.4.3.2.6. After the secondary plug is inserted, the secondary circuit on the trolley should be reliably connected.

6.4.3.2.7. When the trolley is in the test position, the corresponding position switch node should be in the correct state.

6.4.3.3. Check of interlock during trolley advance or withdrawal.

6.4.3.3.1. When the grounding switch is in the closed state, the trolley will be locked by the closing locking mechanism of the grounding switch and cannot be pushed from the test position to the working position.

6.4.3.3.2. When the circuit breaker is in the closed state, the trolley shall be locked in the test position or working position, and cannot be pushed forward or withdrawn.

6.4.3.3.3. The secondary plug shall be locked during the process of trolley advance or withdrawal and shall not be removed.

6.4.3.3.4. During the process of trolley pushing or pulling out, the corresponding position switch node should be in the correct state.

6.4.3.4. Inspection of workplace interlocks

6.4.3.4.1. When the trolley is in the working position, the secondary plug should be reliably inserted without loosening, and the secondary plug should be locked and cannot be pulled out.

6.4.3.4.2. When the trolley is in the working position, the circuit breaker can be opened and closed.

6.4.3.4.3. When the trolley is in the working position, the grounding switch can not be closed.

6.4.3.4.4. When the trolley is in the working position, the corresponding position switch contact should be in the correct state.

6.4.4. Operation, control and protection function check

In addition to the checks on the interlocks for the location of the trolley specified in Article 6.4.3, the following checks shall be carried out: The operation, control and protection functions of the switchgear shall be checked against the relevant engineering drawings to confirm their correctness.

6.5. Insulation level check

Check the insulation resistance and power frequency withstand voltage of relevant parts of the switchgear to confirm the insulation level of the switchgear.

Table 1 Main technical parameters of KYN28A-12

Project		Unit	Data
Rated voltage		kV	3、6、10
Maximum operating voltage		kV	3.6、7.2、12
Rated insulation level	Power frequency with stand voltage (1min)	kV	42
	Lightning impulse withstand voltage		75
Rated frequency		Hz	50
Rated current of main bus		A	630、1250、1600、2000、2500、3150、4000
Rated current of branch bus		A	630、1250、1600、2000、2500、3150、4000
4S thermal stability current (effective value)		kA	16、20、25、31.5、40、50
Rated steady current (peak)*			40、50、63、80、100、125
Levels of protection		The housing is IP4X, and the compartment and circuit breaker chamber door is open IP2X	

Note: The short-circuit capacity of the current transformer should be considered separately.

Table 2 Main technical parameters of VS1-12 vacuum circuit breakers

Project	Unit	Data
rated voltage	kV	10
maximum voltage	kV	12
rated current	A	630 ~ 4000
Yan Ding short circuit breaking current	kA	25 ~ 40
Rated short-circuit closing current	kA	63-100

Project	Unit	Data
4S thermal stability current (effective value)	kA	20 ~ 40
Rated steady current (peak)	kA	40 ~ 125
Rated short circuit current breaking times	Next	274
Rated operating sequence		0-0.3s-C0-180s-CO
Power frequency withstand voltage (1min)	kV	42
Lightning impulse withstand voltage (peak)	kV	75
mechanical life	Next	30000
Rated breaking current per capacitor bank	A	630
Rated back-to-back capacitor group breaking current	A	400
Rated operating voltage of opening/closing coil	V	AC220、110;DC220、110
Power of opening/closing coil	W	245
Rated voltage of energy storage motor	V	DC110、220
Energy storage time at rated voltage	s	≤15
Different phase separation of three-phase	ms	< 2
Contact closure bounce time	ms	< 2
closing time	ms	< 50
Time of disconnection	ms	< 45
arc time	ms	≤15
Average disconnector speed	m/s	0.9 ~ 1.2
Average closing speed	m/s	0.6 ~ 0.8
Resistivity per phase main circuit	ms	< 40

6.6Inspection completed

After the inspection, the trolley should be locked in the test position, the circuit breaker should be opened, the grounding switch should be opened, and the cabinet door should be closed and locked. The cabinet door key should be handed over to the management personnel for unified management.

07operate

Warning! The operation of the switch cabinet should be carried out by full-time personnel who have been specially trained, otherwise it is very easy to cause misoperation, resulting in system failure, equipment damage or even personal injury.

Because the operator must operate the circuit breaker cabinet during normal operation, this chapter only introduces the detailed operation of the circuit breaker cabinet.

7.1. Push the trolley from outside the cabinet to inside the cabinet

7.1.1. Confirm that the circuit breaker is in the open position

7.1.2. Place the trolley on the transfer cart and lock it to it

7.1.3. Open the door with a key. The door should be opened more than 90 degrees.

7.1.4. Position the transfer cart with trolley in front of the cabinet. Adjust four handwheel heights to align the pallet connection point with the cart's guide rails. Insert the left/right guide rods and central locking rod into the cabinet's lateral guide holes and central locking hole respectively. The locking hook automatically engages the cabinet partition via tension spring force, securing the transfer cart to the cabinet.
7.1.5. When pushing the trolley: First manually unlock the locking rod handle and pallet by inward movement. Then directly push the circuit breaker trolley into the circuit breaker compartment, release both hands, and lock it in the test position; (Figure 2).

7.1.5. Insert the secondary plug into the secondary socket and lock it:

7.1.6. Move the lock hook handle plate to the left, release the lock hook between the transfer cart and the switch cabinet, move the transfer cart away, close the door of the switch cabinet and lock it

7.2. Push the trolley from the test position to the working position

7.2.1. Confirm that the circuit breaker and grounding switch are in the open position

7.2.2. Insert the trolley operating handle and turn it clockwise to shake the trolley to the working position. After the trolley reaches the working position, the

handle can not be shaken, accompanied by a locking sound, and the corresponding position indicator light also indicates its position.

7.3. Pull the trolley from the working position

7.3.1. Confirm that the circuit breaker is in the open position

7.3.2. Insert the trolley operating handle and turn it counterclockwise to shake the trolley to the test position. After the trolley reaches the test position, the handle can not be shaken, and the corresponding position indicator light will also indicate its position

7.4. Pull the trolley out of the cabinet

7.4.1. Confirm that the circuit breaker is in the open position

7.4.2. Open the door with a key. The door should be opened more than 90 degrees

7.4.3. Pull out the secondary plug;

7.4.4. Position the transfer cart with trolley in front of the cabinet. Adjust the four handwheels to align the pallet alignment height with the cart's guide rails. Insert the left/right guide rods and central locking rod into the cabinet's left/right guide holes and central lock hole respectively. The locking hook automatically engages the cabinet partition via a tension spring mechanism, securely fastening the transfer cart to the cabinet structure.

7.4.5. First, manually push the lock rod handle inward to unlock the switch cabinet body, then pull out the circuit breaker trolley directly to the transfer car, and release both hands and lock it in the locking position of the transfer car.

7.4.6. Move the lock hook handle plate to the left, release the lock hook between the transfer cart and the switch cabinet, move the transfer cart away, close the door of the switch cabinet and lock it.

7.5. Circuit breaker opening and closing

7.5.1. The panel of the trolley is equipped with a manual button for the use of debugging personnel when debugging the circuit breaker.

7.5.2. Circuit Breakers in operation Under normal circumstances, the opening and closing of circuit breakers cannot be directly operated by human beings.

7.6. Combined and split grounding switches

7.6.1. The operating shaft end of the grounding switch is located at the right front of the cabinet. The operation of the grounding switch should be performed using the dedicated operating handle provided by the manufacturer. Before performing the closing operation of the grounding switch, first confirm that the trolley has been retracted to the test position or moved outside the cabinet. Check the live indicator readings to confirm that the cables are de-energized, verify that the rear door panel of the switchgear is not open, and confirm that the grounding switch is in the open position. Insert the dedicated operating handle into the shaft end of the grounding switch and turn it clockwise to complete the closing operation.

7.6.2. Before performing the opening operation of the grounding switch, first confirm that the rear door panel of the switchgear is fully closed and that the grounding switch remains in the closed position. Insert the dedicated operating handle into the shaft end of the grounding switch's operating shaft. By turning the handle counterclockwise, the opening operation of the grounding switch can be completed.

7.7. Open the back door of the switch cabinet

7.7.1. Before opening the back door of the switch cabinet, the grounding switch should be closed first.

7.7.2. Install the back door of the switch cabinet

Before installing the back door panel of the switch cabinet, the grounding switch must be in the closed state, otherwise, the installation cannot be carried out. Before installing the back door panel of the switch cabinet, special attention should be paid to check whether the debris in the cable room is cleaned up.

08 Maintenance and servicing

8.1. Maintenance content of switchgear

The switch cabinet should be repaired regularly, usually once a year (except for fault repair), and the contents are as follows

8.1.1. Maintenance and maintenance of circuit breaker cabinet

8.1.1.1. Pull out the circuit breaker trolley, clean the dust and oil stains in the cabinet and on the trolley

8.1.1.2. Check whether the contact of the isolation contact is flexible and whether the spring plate is deformed. Wash the contact surface with gasoline or alcohol and then apply clean Vaseline oil

8.1.1.3. Add appropriate amount of lubricating oil to the rotating parts of the operating mechanism and switch, as well as the rotating parts of the propulsion mechanism:

8.1.1.4. Check whether all screws and pins on the cabinet and car body are loose and tightened.

8.1.1.5. The fault maintenance content shall be determined according to the fault condition. After repair or replacement of the other parts of the faulty part and passing the debugging, the original handcart of the cabinet shall be pushed into the cabinet for operation.

8.1.2. Lubrication of relevant parts of the switchgear should be carried out regularly. The lubrication should be carried out when the primary and secondary circuits of the switchgear are not live. The main parts to be lubricated are:

8.1.2.1. All transmission parts of the circuit breaker including the operating mechanism.

8.1.2.2. Transmission parts related to cart propulsion on the cart and cabinet.

8.1.2.3. Transmission parts related to the operation of the grounding switch.

8.1.2.4. Transmission part of interlock between trolley cabinet

8.1.2.5. Movement part of the valve:

8.2. Maintenance inspection

8.2.1. Check the fasteners, especially those related to the transmission part and those connected to the main circuit. If loosening is found, retighten them.

8.2.2. Precautions during maintenance

During maintenance, special attention should be paid to the following: When repairing cabinets and carts, users should minimize excessive disassembly and reassembly. For all fog components requiring removal, pre-design assembly methods, procedures, and positioning techniques must be established before disassembly to ensure correct reassembly. If irreversible damage occurs during maintenance, seek

assistance from the manufacturer to prevent performance degradation or product failure caused by improper reassembly.

09 Installation and commissioning of circuit breakers

The installation, debugging and operation of the switch shall be carried out by specially trained professionals who have a detailed understanding of the performance of the switch. Corresponding protection and preventive measures must be considered during the work.

9.1. Integrity check

9.1.1. Check whether the circuit breaker is damaged, whether it is damp, and whether there is dirt on the surface (especially on the surface of the insulation). If so, it should be removed in advance and restored to the normal state.

9.1.2. Check whether the connection of primary and secondary circuits and the connection of grounding body are correct.

9.2. Debugging operation (before energizing the primary circuit)

9.2.1. The circuit breakers in the switchgear are equipped with interlocks corresponding to the cabinet body. See section 6.4 "Operation Check" in this manual for details.

9.2.2. Instructions for manual opening and closing operations

Manual operation functions: manual energy storage, manual closing and manual opening are only used in no-load debugging and testing of circuit breakers.

9.3. Internal interlock of circuit breaker

9.3.1. Interlock between energy storage state of circuit breaker and electrical circuit of closing electromagnet coil

This interlock enables the electrical circuit of the closing electromagnet coil to be connected only after the energy storage spring has been fully stored.

9.3.2. Interlock between the main circuit state of the circuit breaker and the electrical circuit of the tripping electromagnet coil.

This interlock can realize that when the circuit breaker is in the open state, the electrical circuit of the open electromagnetic coil is cut off.

9.3.3. In addition to the internal interlock of the above circuit breaker, this circuit breaker is also provided with an interlock interface for external use. Through the connection with the external electrical circuit through the interface, interlock can be realized when the circuit breaker is in a certain state and the closing operation cannot be performed.

9.4. Maintenance

9.4.1. This circuit breaker features a compact and durable design, ensuring an exceptionally long service life. Models rated for short-circuit currents ≤31.5kA demonstrate over 30,000 mechanical cycles, while those rated for 40kA short-circuit currents exceed 20,000 cycles.

9.4.2. After 5 years of operation of the circuit breaker, the operating mechanism, reduction and force increasing mechanism should be checked, and an appropriate amount of lubricating oil should be injected into the reducer gear (every 5 years, see Figure 3 for the cross section of the circuit breaker).

9.4.3. For circuit breakers: (a) those rated up to 31.5kA; (b) rated up to 40kA; and (c) rated up to 15000 operations (or 12000 operations for those rated up to 25kA); when operating 15 years or 15,000 cycles after short-circuit current interruption ≤25kA, and 12,000 cycles after 15,000 operations (or 8,000 cycles for 40kA-rated units), the design must account for component wear and aging. To ensure reliable operation, the following maintenance procedures shall be implemented:

9.4.3.1. After the circuit breaker is opened, pull it to the test position and cut off the power supply of the energy storage motor, then manually operate the circuit breaker to open and close the spring energy release.

9.4.3.2. Re-lubricate the surfaces of the latch, support bearing, sliding and rolling bearings. Re-lubricate the reducer gears after cleaning (removable).

9.4.3.3. Check whether the fasteners such as screws, spring washers and retaining rings are loose.

9.4.3.4. Check whether the operating mechanism is normal and test its mechanical characteristics.

9.4.4. It is recommended to spot check the vacuum degree of the arc extinguishing chamber when the circuit breaker has been in operation for 20 years or the storage period exceeds 20 years.

KYN28A-12 cross section

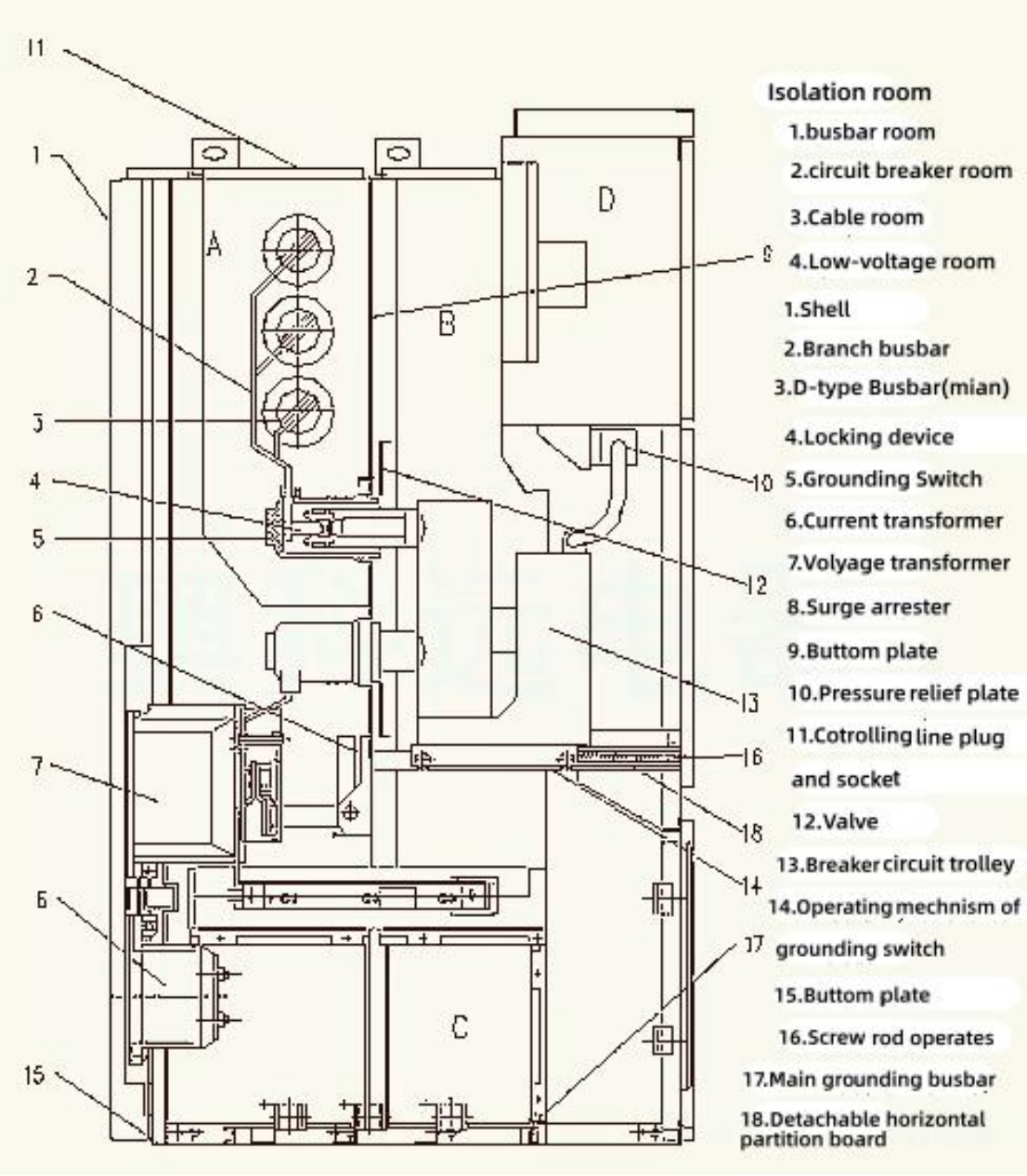

Figure 1 KYN28A-12 switchgear structure diagram

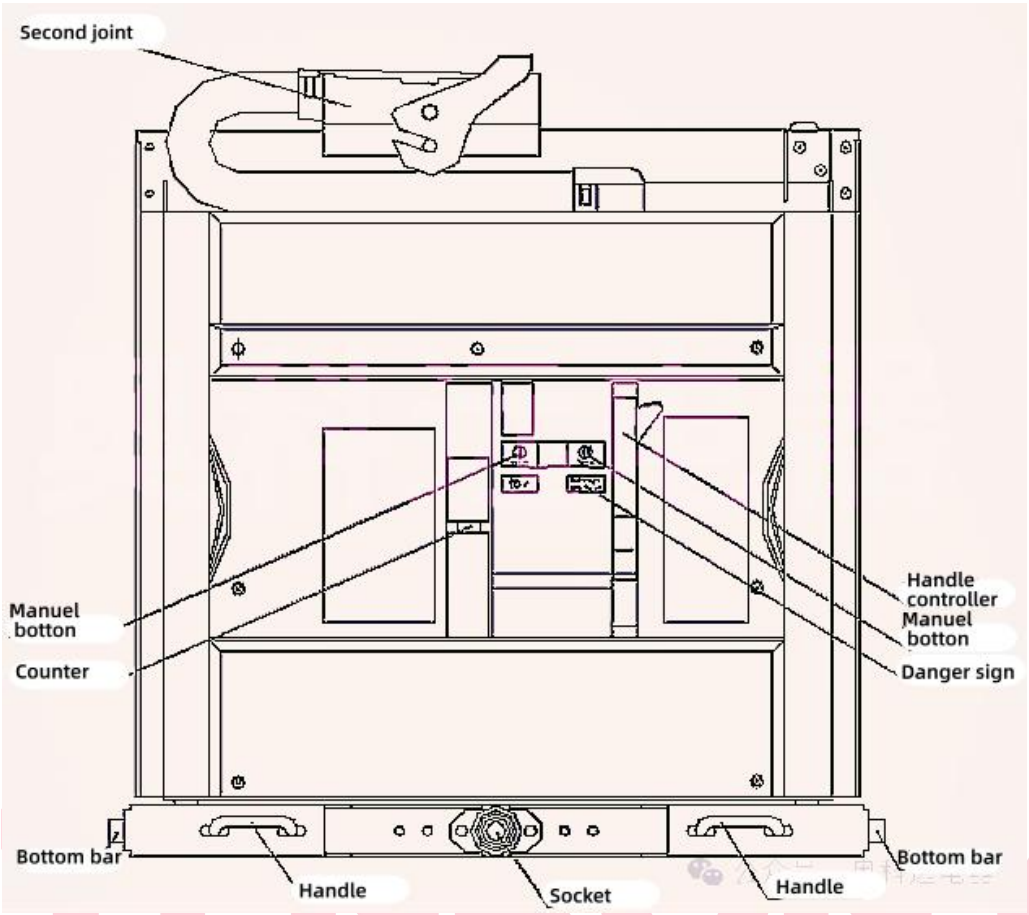

Figure 2 Schematic diagram of high voltage circuit breaker structure

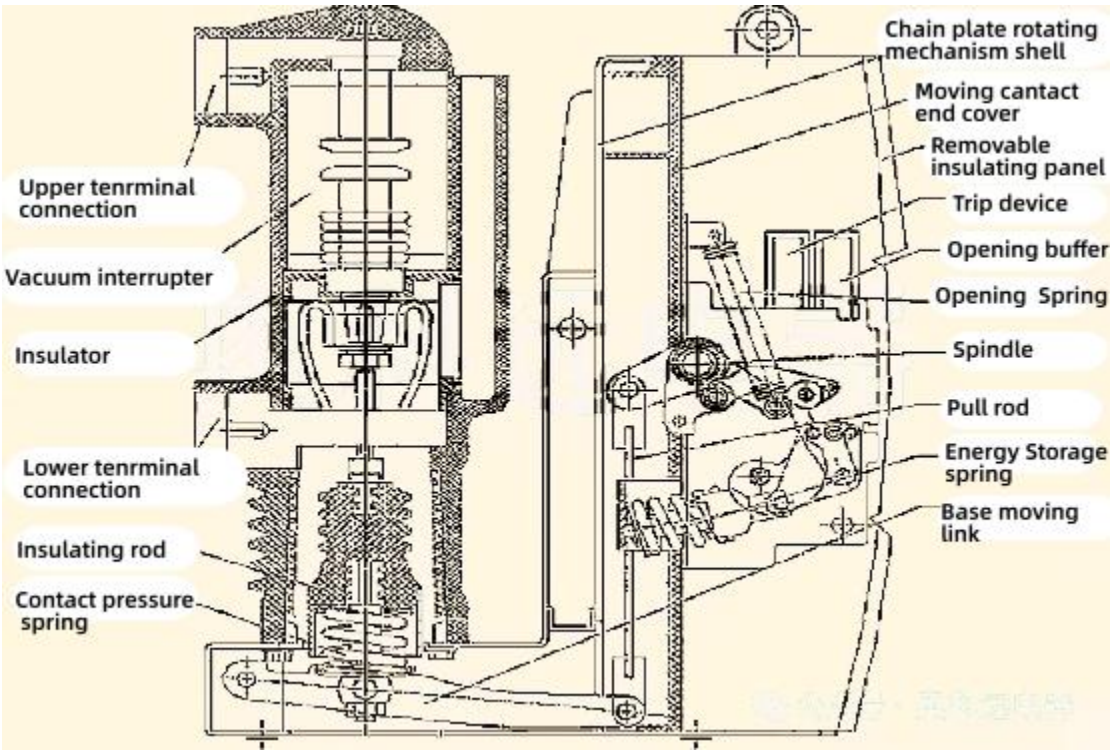

Figure 3 Schematic diagram of vacuum circuit breaker