

Overview

The GC24-12kV series AC high-voltage vacuum contactor is a new generation of high-voltage vacuum contactors designed by our company for 12kV systems.

1. Product Features

Main Circuit

- Adopts a split-type semi-cylindrical frame structure, which ensures effective insulation while providing sufficient mechanical strength.
- Equipped with vacuum interrupters from renowned domestic manufacturers, featuring proven technology, reliable quality, and strong market reputation.
- Dual moving-end connection via contact surface and conductive clamp ensures low resistance, reduced temperature rise, and higher reliability.
- Durable and aesthetically designed conductive busbars; options for same-direction or reverse-direction wiring at movable and stationary contacts for user convenience.

Electromagnetic System

- Features a unique built-in, high-capacity sealed auxiliary switch, significantly enhancing reliability and operational safety.
- Incorporates an optimized actuation mechanism that reduces coil startup and holding power, resulting in lower temperature rise, longer lifespan, and higher reliability.
- A limit buffer is installed at the limit position of the moving armature's opening stroke to eliminate potential hazards caused by excessive rebound amplitude during contact breaking. Simultaneously, the auxiliary switch actuator is also buffered to reduce operational impact forces and improve the reliability of the auxiliary switch.

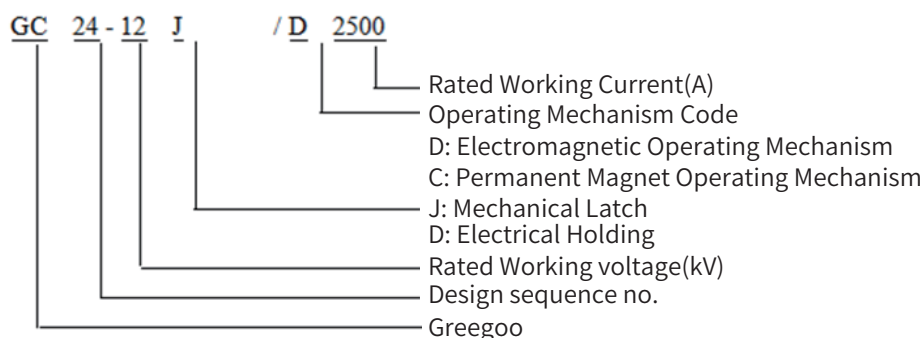
Actuation Mechanism

- The pivot support ensures flexible movement, operates without jamming under force, and features minimal axial play, thereby enhancing operational performance and consistency.
- The well-designed actuation mechanism combined with a double-guided moving end ensures coaxial axial movement of the vacuum interrupter's moving conductive rod, improving overall contactor performance and reliability. This results in superior three-phase synchronization and contact bounce performance compared to similar products.
- Increased main contact pressure enhances electrical performance and operational characteristics, exceeding metrics of comparable products.
- The self-contained mechanical latching device features a rational structure and delivers higher operational reliability.

Ease of Use and Maintenance

- The control circuit terminals feature clear functional markings to prevent wiring errors. Depending on user requirements, the terminal block can be mounted on either side or the front of the unit for convenient wiring access. Additionally, the number of auxiliary contacts can be configured to meet specific application needs.

2. Model Number Structure and Meaning



3. Usage

3.1 Normal Operating Conditions

3.1.1 Ambient Temperature: The maximum surrounding air temperature shall not exceed +40°C, and the 24-hour average shall not exceed +35°C. The minimum surrounding air temperature shall not be lower than -15°C.

3.1.2 Altitude: The installation altitude shall not exceed 1000 meters.

3.1.3 Relative Humidity: The relative humidity of the atmosphere shall not exceed 50% when the ambient air temperature is +40°C. Higher relative humidity is allowed at lower temperatures, with a daily average not exceeding 95%. When the highest monthly average temperature is +20°C, the maximum monthly average relative humidity is 90%, considering condensation on the product surface due to temperature changes.

3.1.4 Operating Environment: The location shall be free from rain, snow intrusion, open flames, explosion hazards, chemical corrosion, and severe vibration.

3.1.5 Installation Conditions: The inclination angle of the installation surface from the vertical plane does not exceed 5°.

3.1.6 Pollution Degree: Level III.

3.2 Usage Instructions

3.2.1 Select appropriate technical parameters for the contactor. Neither the main circuit nor the auxiliary contacts shall be overloaded.

3.2.2 Sufficient insulation space shall be maintained around and above the contactor to ensure safe operation.

3.2.3 When connecting the control power supply and there is no action response, immediately disconnect the control power supply and investigate the cause to prevent damage to the electromagnetic coil.

Note: The electromagnetic coil switches from the pickup state to the holding state via a built-in auxiliary switch. If it fails to transition from the pickup to the holding state, the high startup current during pickup will cause rapid overheating and burnout of the coil.

3.2.4 When the contactor is used with inductive loads, it is recommended to employ overvoltage absorption protection devices such as R-C snubbers or varistors to ensure load safety.

3.2.5 The electromagnetic system generates a strong magnetic force. Prevent ferromagnetic materials from being drawn into the unit.

3.2.6 Series or parallel connection of the main circuits is not recommended.

3.2.7 The electrical switches and power supply used to control this unit shall have adequate capacity, particularly for DC control methods.

4. Structure and Principle

4.1 Structure: The contactor adopts an integral insulating frame, with high-voltage circuits and low-voltage control circuits arranged in an upper-lower configuration (see illustration). The overall frame structure is stable, ensuring reliable operation, a compact design, and a small size. The unique built-in design of the auxiliary switch further enhances the unit's safety, reliability, and aesthetic quality.

4.2 Operating Principle:

4.2.1 The vacuum interrupter (vacuum arc-extinction chamber), the core component of the contactor, is a sealed enclosure comprising upper and lower end plates, a ceramic shell, bellows, and moving and fixed conductive rods, which is evacuated to a high vacuum. The inner ends of the moving and fixed conductive rods are fitted with a pair of wear-resistant, low-current-chopping material contacts, forming a high-performance switching contact. The bellows isolate the atmosphere and allow the moving conductive rod to move axially. Since the making and breaking of the main contacts occur within the vacuum, the contactor offers excellent switching characteristics, long service life, and high safety and reliability.

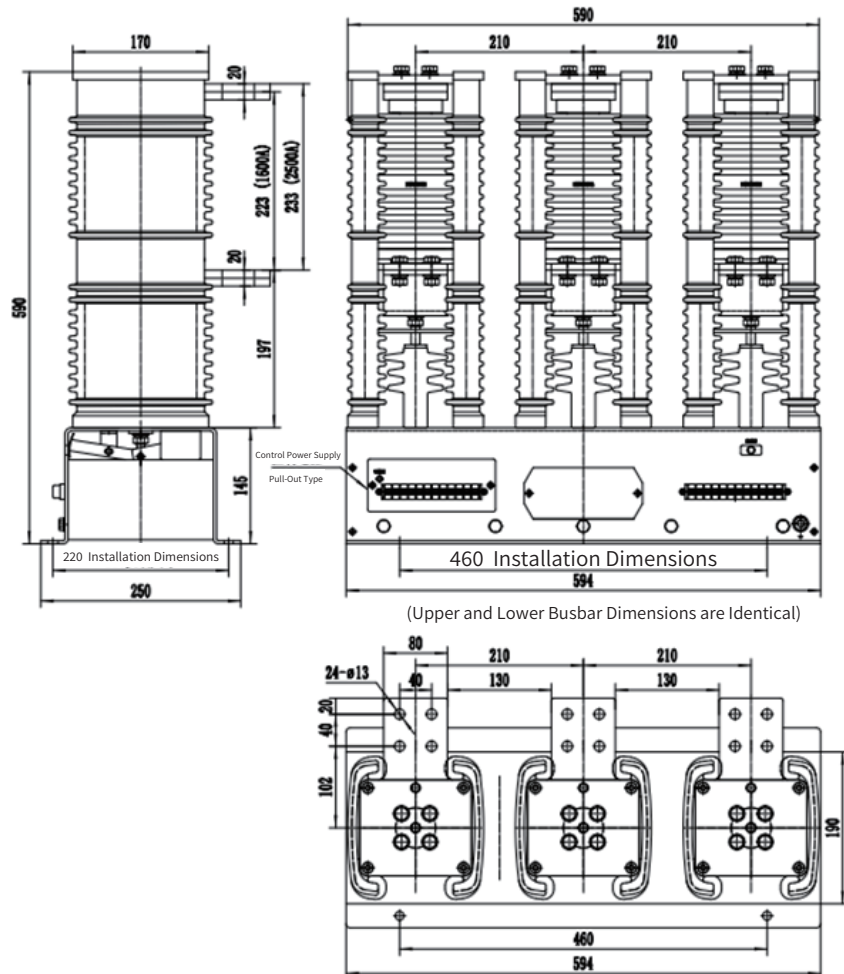
Note: The vacuum interrupter is a high-vacuum cavity and must not be subjected to external mechanical impact. The bellows must also be protected from torsion caused by rotation of the moving conductive rod.

4.2.2 Operating Principle

The moving conductive rod of the vacuum interrupter is connected to the translating plate via a guidance mechanism, contact spring, and insulator. Both the translating plate and the moving armature are fixed to the rotating shaft. When closing, the electromagnetic coil is energized, attracting the moving armature, which causes the translating plate to move upward. This motion is transmitted through the insulator and contact spring, pushing the moving conductive rod to close the contacts within the vacuum interrupter. The contact spring simultaneously provides the necessary contact pressure to ensure reliable closure. When opening, the electromagnetic coil is de-energized and the magnetic force ceases, the opening spring moves the moving armature outward. This causes the translating plate to pull the insulator and the moving conductive rod downward, separating the contacts within the interrupter by a specified distance to achieve reliable breaking. Since the electromagnetic system requires high starting power to attract the moving armature, but much lower power to maintain the closed position. The electromagnetic coil requires a transition from the startup to the holding state, which is performed synchronously by an auxiliary switch. This auxiliary switch also provides the necessary contacts for external control requirements. The contactor utilizes a DC electromagnetic system. Its built-in control circuit incorporates a rectifier, allowing the unit to be operated directly with an AC power supply.

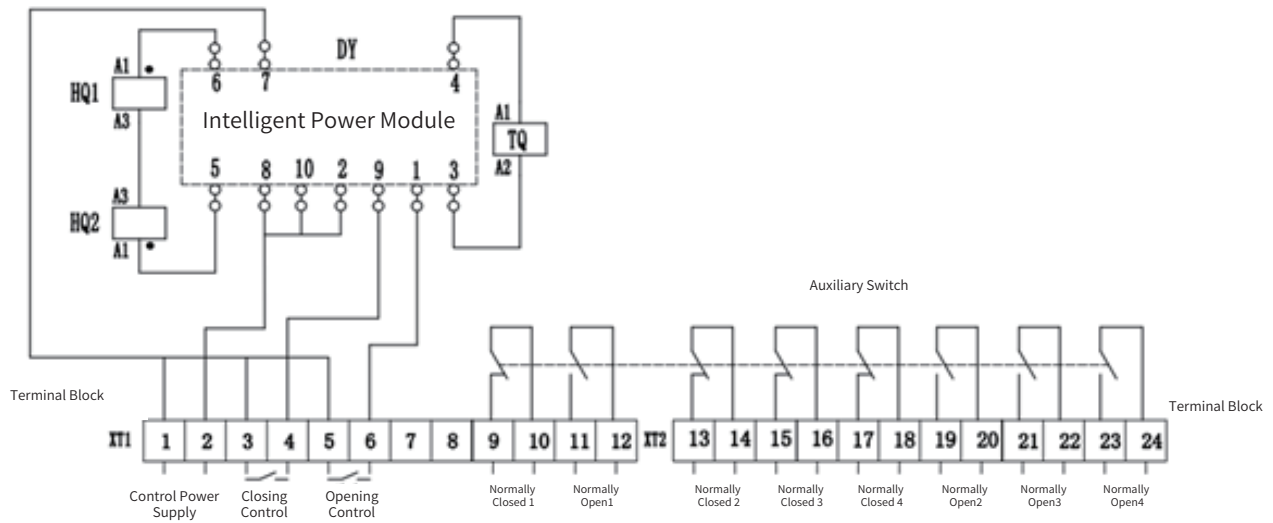
For contactors equipped with a mechanical latch mechanism, the latch itself maintains the closed position after engagement, requiring no electrical power to remain closed. When opening, the trip coil is energized to release the latch. The subsequent process is identical to that described above. Consequently, both the closing and opening coils only require short-term energization. This mechanical latching method is suitable for applications requiring infrequent operation or long-term closing. It offers reliable closing, energy efficiency, and is independent of the control power supply.

Outline Drawing

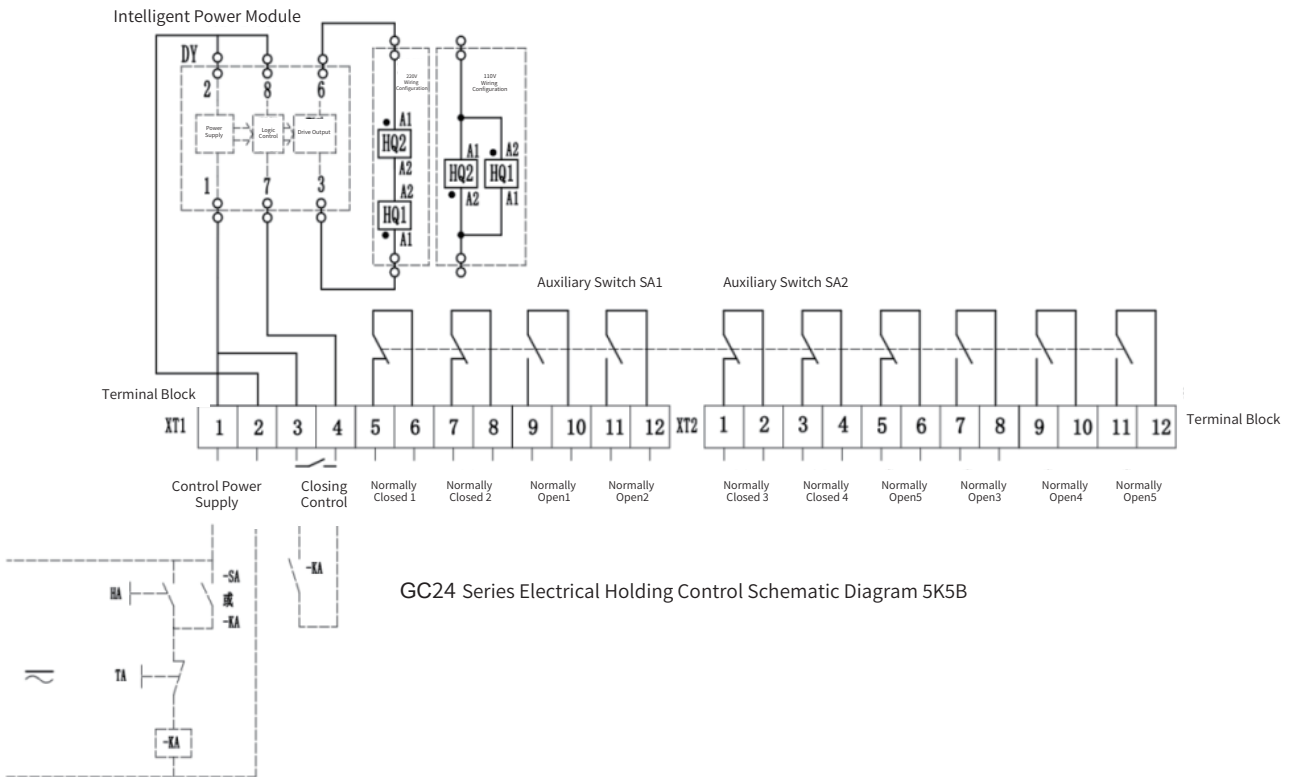


Wiring Diagram

Mechanical Holding



Electrical Holding



GC24 Series Electrical Holding Control Schematic Diagram 5K5B

5. Maintenance

5.1 Users are advised to establish a periodic maintenance schedule to ensure the contactor remains in optimal condition. Regularly clean the insulated frame, vacuum interrupters, and electrical circuits to maintain proper insulation and ensure correct operation.

5.2 Inspect all fasteners for tightness and check structural components for any abnormalities.

5.3 The auxiliary switch should operate correctly, with its contacts making good electrical connection.

5.4 Verify that the contact gap and overtravel meet specified requirements, as these parameters affect the reliability of contactor closing and opening operations.

5.4.1 Contact Gap: This is the separation distance between the main contacts when open, measurable by the travel of a point on the moving conductive rod. An insufficient gap compromises dielectric strength and opening reliability. The gap may change during service due to contact erosion.

5.4.2 Overtravel: Also known as contact overtravel. During closing, after the contacts have touched and the moving conductive rod can no longer advance, the translating plate continues to compress the contact spring. This additional travel is the overtravel. It is a critical factor in ensuring reliable contact pressure and stable operation. Overtravel also diminishes with contact wear and must be inspected regularly. The inspection Method is as follows: Below the translating plate is a universal joint ring and a hemispherical seat. The actual overtravel is equal to the distance between this universal joint ring and the translating plate when the contactor is closed. This distance can generally be measured using a feeler gauge or a designated template.

5.5 Check all electrical connections for tightness. All connections must be tightly fastened.

5.6 Checking the vacuum degree of the vacuum interrupters is crucial. It is generally evaluated using a power-frequency withstand voltage test. The withstand voltage value obtained should be not less than half (1/2) of the rated withstand voltage value.

5.7 Common Fault Handling: Refer to the table below for details.

Fault Phenomenon	Cause of Failure	Troubleshooting Method
1. No response upon energization or electromagnetic noise without closing. (Immediate power-off required)	1.No power supply, incorrect AC/DC or low voltage 2. Break in the control circuit 3. Auxiliary switch NC contacts are not conducting 4. Rectifier failure 5. Mechanical jamming	1. Verify power supply and wiring 2. Inspect all wiring connections 3. Adjust the auxiliary switch actuator or replace the auxiliary switch 4. Replace the power supply board 5. Check for foreign object ingress, inspect for jamming of insulators or tubes; try operating mechanisms individually
2.Fails to remain closed, presenting a chatter condition	1. Faulty power supply board. 2. Faulty coil. 3. Foreign object on the iron core surface. 4. Incorrect conversion position of the auxiliary switch.	1. Replace the power supply board 2. Replace the coil 3. Remove the foreign object 4. Adjust the position of auxiliary switch actuator
3.Excessive noise during operation	1. Uneven mounting surface or deformation 2. High tension on incoming/outgoing wires causing unit deformation 3. Uneven engagement of the electromagnetic system	1. Level using shims 2. Ensure connected busbar dimensions are correct; avoid forcing with bolts 3. Clean engagement surfaces or adjust for levelness
4. Coil overheats or burns out	1. Supply voltage too high 2. Auxiliary switch conversion contacts failed to open 3. Coil insulation breakdown 4. Unit failed to operate	1. Check supply voltage 2. Adjust the actuator or replace the switch 3. Replace coil 4. Check for mechanical jamming

6. Technical Parameters

6.1 Main Parameters: Refer to the table below

6.2 Control and Auxiliary Circuits

6.2.1 Control Circuit

6.2.1.1 Rated Voltage (Ua): AC & DC 110V, 220V, or customized according to user requirements.

6.2.1.2 Control Power: Electrical Holding: Starting <1500W; Holding <30W.

Mechanical Holding: Closing <1600W; Opening <700W.

6.2.2 Auxiliary Circuit

6.2.2.1 Quantity: Up to 9 combinations of NO (Normally Open) and NC (Normally Closed) contacts; 8 combinations for mechanical holding type; 10 combinations for models using electronic control modules.

6.2.2.2 Rated Conventional Thermal Current: AC380V 6A; AC220V 10A.

6.2.2.3 Auxiliary Contact Rated Making & Breaking Current: AC380V 1A, AC220V 2A, DC220V 0.1A.

6.2.3 Power Frequency Withstand Voltage: 2kV (excluding components).

6.3 Operating Characteristics

6.3.1 Opening and Closing Time: Closing time $\leq 120\text{ms}$; Opening time $\leq 80\text{ms}$.

6.3.2 Three-phase Synchronization $\leq 2\text{ms}$.

6.3.3 Minimum Pickup Voltage $\leq 85\%$ Ua; Maximum Drop-out Voltage=10%~75% Ua.

Performance Parameter			Units	12/1600	12/2000	12/2500
Rated Working Voltage(Ur)			kV	12		
Rated Working Current (Ie)			A	1600	2000	2500
Rated Making Capacity (Im)			kA	6.3	6.3	6.3
Rated Breaking Capacity (Ic)			kA	5	5	5
Rated Overcurrent Withstand Capacity			kA/s	12/1	15/1	18/1
Rated Short-Time Withstand Current (Ik)			kA	6.3	6.3	6.3
Rated Peak Withstand Current (Ip)			kA	16	16	16
Rated Short-Circuit Time (tk)			s	4		
Rated Insulation Level	Rated Power Frequency Withstand Voltage	Vacuum break	kV	42		
		Phase to phase	kV	42		
		Phase-to-Earth	kV	42		
	Rated Lightning Impulse Withstand Voltage (Peak)	Vacuum break	kV	75		
		Phase to phase	kV	75		
		Phase-to-Earth	kV	75		

Main Circuit Contact Resistance		$\mu\Omega$	≤ 80	≤ 80	≤ 60
Rated Operating Frequency		cycles/hour	120		
Mechanical Latching Operating Frequency		cycles/hour	30		
Mechanical Endurance (Mechanical Life)		10,000 cycles	30 (For mechanically latched models, the latching device must be replaced every 100,000 operations.)		
Electrical Endurance (Electrical Life)	AC3	10,000 cycles	25 (Making current: 4kA, Breaking current: 2.5kA)		
	AC4	10,000 cycles	10 (Making current: 4kA, Breaking current: 4kA)		

7. Transportation and Storage

7.1 The contactor frame and vacuum interrupter enclosure are made of plastic and ceramic, which are fragile materials with a precision structure. Therefore, during handling, throwing or collisions are strictly prohibited. During transportation, the product must not be inverted, rolled, or subjected to severe vibration. Ingress of rain or snow must also be prevented.

7.2 The product should be stored in a warehouse without water intrusion, free from corrosive or combustible gases, with adequate ventilation, dry conditions, and an ambient temperature between -30°C and +40°C. When stored, the product should be covered with a plastic bag to prevent moisture and oxidation.

7.3 Products stored for more than 6 months should be inspected before use.

8. Ordering Instructions

When placing an order, the following must be specified:

- (1) Product name, model, and specifications.
- (2) Rated operational voltage and rated operational current.
- (3) Rated control voltage and type (AC or DC).
- (4) Number of normally open (NO) and normally closed (NC) contacts.
- (5) Other special requirements, such as inclusion of DC ports.