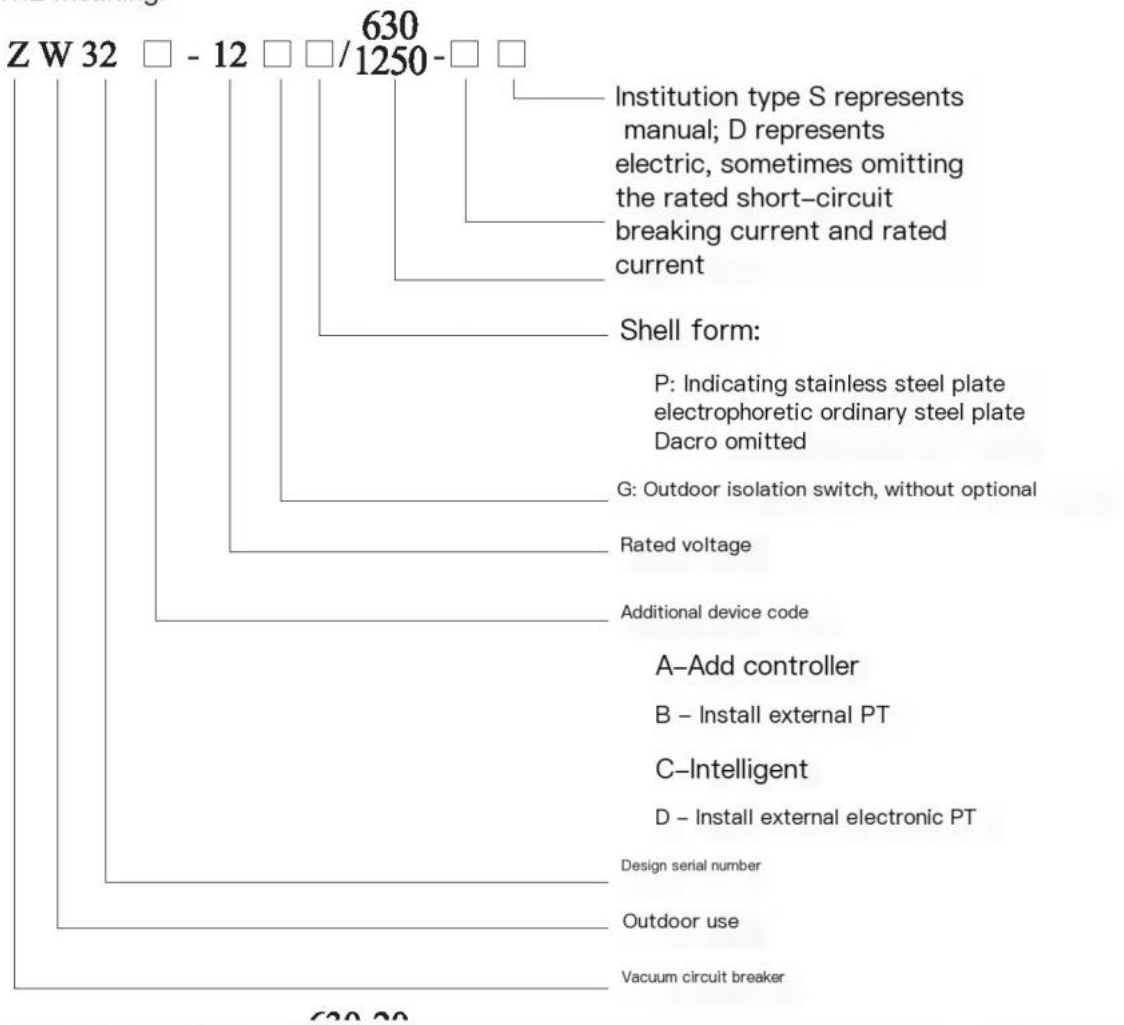
630 ZW32 □ -12/1- □ Outdoor AC High Voltage Vacuum Circuit Breaker (hereinafter referred to as the circuit breaker) is an outdoor distribution equipment with a rated voltage of 12KV and three-phase AC 50Hz. Mainly used for breaking and closing load current, overload current, and short-circuit current in electronic systems. Suitable for protection and control in substations and distribution systems of industrial and mining enterprises, as well as in places with frequent operation of rural power grids. It can also operate the segmented switch of the power grid, and after installing a controller, it can achieve automation of the distribution network.

1.1 Product Model Name and Meaning

1.1.1 型号：ZW32□-12□□/$\frac{630}{1250}$-□□户外交流高压真空断路器。

1.1.2 Meaning:



Example: ZW32C-12GP/1250-25 represents an outdoor AC high-voltage vacuum circuit breaker, with an outdoor isolation switch, an intelligent controller, an electrophoretic stainless steel casing, an electric mechanism, and a rated breaking current of 20 or 25KA.

1.1.3 Reference standards

GB1984 AC High Voltage Vacuum Circuit Breakers

GB11022 General Technical Conditions for High Voltage Switchgear

GB311.1 Insulation Coordination of High Voltage Transmission and Transformation Equipment

DL/T593 "Technical Conditions for Shared Ordering of High Voltage Switchgear"

DL/T402 Technical Conditions for Ordering AC High Voltage Circuit Breakers

GB2706 "Dynamic and Thermal Stability Test Methods for AC High Voltage Electrical Appliances"

GB3309 "Mechanical testing of high-voltage switchgear at room temperature"

DL403 Technical Conditions for Ordering High Voltage Vacuum Circuit Breakers within 10-35KV

1.1.4 Environmental conditions for use

a. The altitude does not exceed 2000 meters;

b. Surrounding air temperature: -45 ℃~+47.5 ℃; Daily temperature difference: Daily variation of 25 ℃; c. Wind speed not exceeding 35m/s

d. Places without flammable, explosive, hazardous chemical corrosion, and severe vibration.

1.1.5 Main technical parameters (Table 1)

Table 1

Number	project	unit	numerical value
1	Rated voltage	kV	12
2	Rated frequency	Hz	50
3	Rated current	A	630、1250
4	Rated short-circuit breaking current	kA	16、20、25、31.5
5	Rated peak withstand current (peak)	kA	50
6	Rated short-term durability and current resistance	kA	16、20、25、31.5
7	Rated short-circuit making current (peak) mechanical	kA	50
8	life	second	10000
9	Rated short-circuit breaking current breaking frequency	second	30
10	Rated operating sequence	-0.3s on/off -180s on/off	
11	Power frequency withstand voltage (1min): (wet) (dry) Interphase, ground/fracture	kV	34/42/48
12	Lightning impulse withstand current (peak) phase to phase, ground/break	kV	75/85
13	1min power frequency withstand voltage of secondary circuit	kV	2

1.1.6 Mechanical characteristics (Table 2)

Table 2

Number	Parameter Name	unit	numerical value
1	Contact opening distance	mm	9 ± 1
2	Contact overtravel	mm	2 ± 0.5
3	Opening speed	m/s	1.2 ± 0.2
4	Closing speed	m/s	0.6 ± 0.2
5	Contact closing bounce time	ms	≤ 2
6	Center distance between phases	mm	340 ± 1.5
7	Resistance of conductive circuits in each phase due to asynchronous three-phase opening and closing	ms	≤ 2
8		μ Q	≤ 80, with isolation ≤ 120
9	Closing time	ms	25～60
10	Opening time	ms	20～45

2 Structural characteristi
cs

2.1 Structure

The circuit breaker consists of three parts: a pillar, a base, and a suspension for installation, fixation, and lifting.

The external structure and installation dimensions are shown in Figure 1.

2.1.1 The column mounted vacuum circuit breaker equipped with a vacuum arc extinguishing chamber has stable and reliable breaking performance, and is characterized by no combustion and explosion hazards, safety, maintenance free, small size, light weight, and long service life.

2.1.2 The circuit breaker adopts a fully enclosed structure with good sealing performance, moisture-proof and anti condensation performance, and is suitable for use in high-temperature and humid areas.

2.1.3 The closing and opening of circuit breakers can be manually or electrically operated, or remotely controlled.

2.1.4 The operating mechanism is novel, simple, reliable in action, small in size, and has a mechanical lifespan of up to 10000 times. The energy storage motor is a DC permanent magnet motor, with a voltage level of -220V-110V-48V-24, which can be selected from any one. 2.2 Main Performance

2.2.1 Install an external dry type voltage transformer to enable the circuit breaker to have its own operating power supply; And lightning arresters can be installed (according to user requirements, they can be installed on the power supply side or load measurement).

2.2.2 Install outdoor isolation switches and circuit breakers to form an integration, and the circuit breakers and isolation switches are reliable

The mechanical interlocking device.

2.2.3 It can be used in conjunction with the power load monitoring system.

2.2.4 According to user needs, 50/5~600/5 bushing current transformers can be installed. 2.2.5 Install an external electronic PT.

The electrical schematic and wiring diagram of the operating mechanism are shown in Figure 3.

2.2.7 The energy storage motor adopts a unidirectional permanent magnet DC motor (with rectifier bridge for AC), and its technical data is shown in Table 3:

Table 3

model	53ZY-CJD01B	53ZY-CJD02B	53ZY-CJD03B	53ZY-CJD04B
Rated working voltage (V)	-220	-110	-48	-24
Rated electrical power (W)	40			
Normal working voltage range rated working current (A)	85%~110%			
	0.5	1.0	1.8	3.6
Energy storage time (S)	≤8			

2.2.7.1 The manual energy storage operation adopts the energy storage handle matched with the mechanism for normal operation (with a rectifier bridge that can be used for both AC and DC), and its operating force is less than 100N. m.

2.2.8 The closing/opening electromagnet adopts a spiral tube type electromagnet, and its technical parameters are shown in Table 4

Table 4

额定工作电压(V)	~220	~110	~220	~110	~48	~24
Rated working current (A)	1.7	4.4	1.69	3.4	10	6.8
Rated electrical power (W)	374	484	372	374	480	165
Coil resistance value at 20 ℃ (Q)	56	15	130	33	4.8	3.5
Normal operating voltage range	Open 60% to 120% of the rated working voltage, and do not open when it is less than 30% of the rated working voltage, Closing 85%~120% of rated working voltage					

2.2.9 The technical parameters of the overcurrent release are shown in Table 5:

Table 5

Rated current 5A	20 ℃ coil DC resistance value 2.50
Normal operating current range	Reliable opening at 90% -110% rated current, must not trip below 90% rated current

2.2.10 The technical parameters of the isolation switch are shown in Table 6:

Table 6

Number	entry name	unit	parameter
1	Rated voltage	kV	12
2	Rated current	A	630 1250
3	Thermal stable current (effective value) Dynamic stable current (peak value)	kA	16、20、25、31.5
4		kA	50
5	1min power frequency withstand voltage	kV	42
6	Resistance of each phase circuit	uΩ	≤ 60
7. Different stages of blade contact and deviation in the position of rigid closure		mm	≤ 2

3. Installation, use, and maintenance

3.1 After unpacking, the insulation pillar of the circuit breaker on the column should be checked for any cracks, the product nameplate and certificate of conformity should match the purchase order, and the packing list should match the actual product.

Before putting the column mounted circuit breaker into operation, it is necessary to carefully check whether the rated voltage and rated current of each operating componen match the actual situation. And use the closing and opening methods of the mechanism to check whether each indicator is correct.

3.3 Circuit breakers can be installed on a single pole or on parallel bars. (As shown in Figure 2)

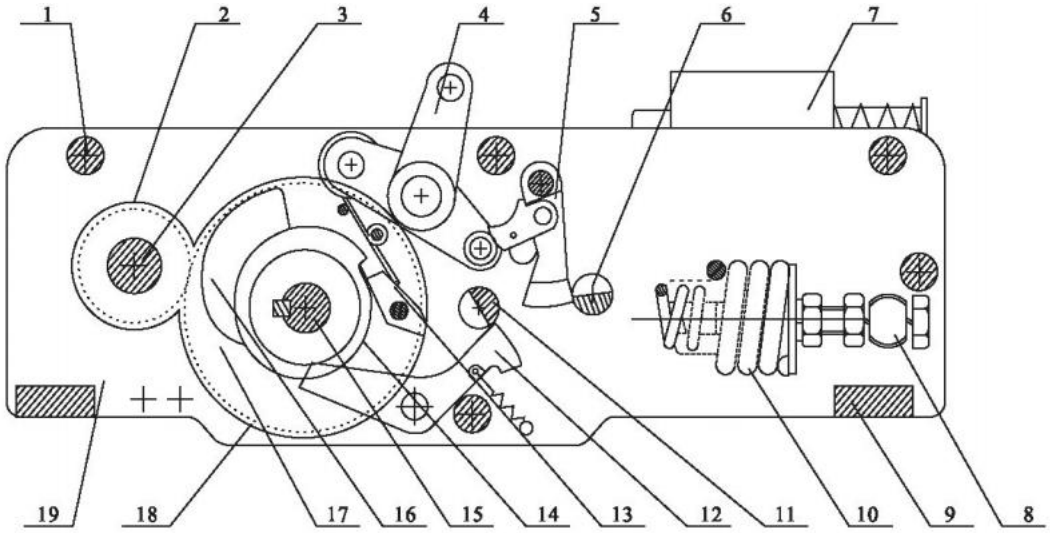
3.4 The water column circuit breaker, due to its special design structure, ensures that users are maintenance free for a long time during use.

3.5 Operators should have a preliminary understanding of the performance, installation, adjustment, and maintenance knowledge of the mechanism. Any issues during operation should be recorded, and the manufacturer should be notified if necessary.

4. Structure and Action Principles

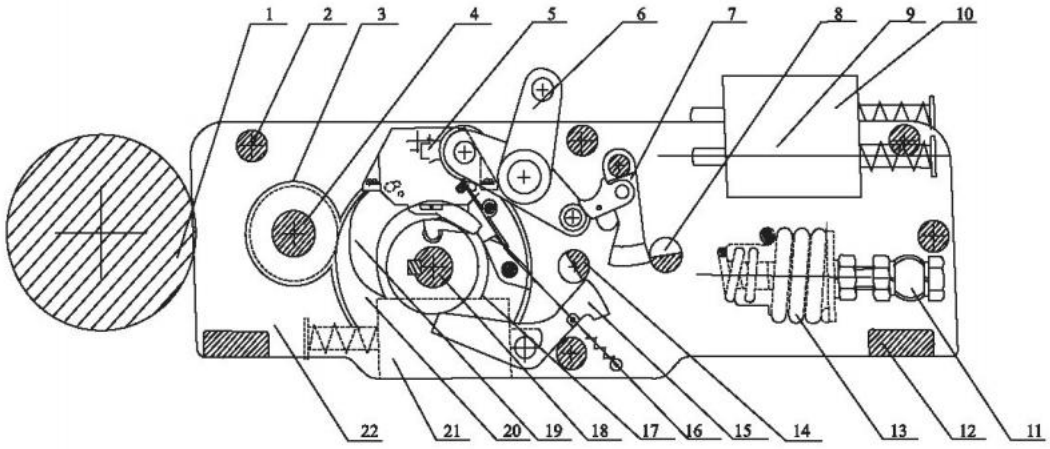
The structure of CTB-D mechanism is shown in Figure 1

The structure of CTB-S organization is shown in Figure 2



CTB–S type spring operating mechanism (Figure 1)

1. Support rod
2. Pinion
3. Axis
4. Output crank arm
5. Opening switch 9, installation of blocks
6. Opening half axis
7. Overcurrent coil
8. Hanging spring shaft
10. Closing spring
11. Closing half axis
12. Closing switch
13. Energy storage claw
14. Eccentric wheel
15. Energy storage shaft
16. Cams
17. Big gear
18. Closing coil
19. Front and rear clamping plates



CTB–D type spring operating mechanism (Figure 2)

1. Motor 5, Travel Switch
2. Support rod 6, output crank arm 10, overcurrent coil
3. Pinion 7, release switch 11, hanging spring shaft
4. Gears
8. Opening half axis 12, according to the installation of blocks
9. Opening coil
13. Closing spring
14. Closing half axis
15. Closing switch 19, cam
16. Energy storage claw
17. Eccentric wheel
18. Energy storage shaft
20. Big gear
21. Closing coil
22. Front and rear clamping plates

Figure 1 CT37–D

4.1 Energy storage principle of institutions:

The energy storage principle of the mechanism is shown in Figure 3 (Energy Storage Principle Diagram of the Mechanism). The drive block 7, cam 17, and energy storage crank arm 9 in the figure are all connected to the energy storage shaft 6 through a flat key. The drive claw 5 is installed on the large gear 4 and fitted onto the energy storage shaft 6 through a composite shaft sleeve. The gear shaft 3 is equipped with a one-way bearing. When the motor is powered on and rotates, it drives the small gear 2 to rotate clockwise. The small gear 2 drives the large gear 4 and the driving claw 5 to rotate counterclockwise. The movement of the driving claw 5 drives the driving block 7, cam 17, energy storage shaft 6, and energy storage lever 9 to rotate counterclockwise outward. The energy storage lever 9 rotates counterclockwise to drive the closing spring 15 to store energy. When the energy storage reaches a certain position, the switching pin opens the driving claw 5, and at the same time, the travel switch switches. The motor stops rotating, and the spring passes through the middle force and chronic force, causing the roller on the driving block to act on the energy storage holding lever 10. The other end of the energy storage holding lever 10 acts on the closing half shaft 11, making the system under stable force. The institution is in an energy storage state. The energy storage status is shown in Figure 4 (c, d).

The energy storage principle of CTB-S is the same as the manual energy storage principle of CTB-D. Pull the energy storage handle and use the one-way bearing installed on the gear shaft 3 to drive the gear shaft and small gear to rotate clockwise. The rest is the same as the energy storage of the motor.

4.2 Closing

See Figure 3 (Energy Storage Principle Diagram of the Mechanism). After the energy storage of the mechanism is in place, pull the closing handle by hand or power the closing coil to push the closing half shaft to rotate counterclockwise. The energy storage holding switch loses balance and rotates counterclockwise. The energy storage state is released, and the closing spring releases energy, driving the cam to rotate counterclockwise. The cam acts on the roller of the output crank arm, causing the output crank arm to rotate clockwise. After the cam is fully activated, the output crank arm rotates approximately 43 degrees, no longer continuing to rotate clockwise. Instead, it rotates counterclockwise for 3 degrees under the force of the opening spring, and is balanced by the opening system composed of the opening half shaft, fastener, and opening switch. The mechanism is in a closed state. See Figure 4 (c, d).

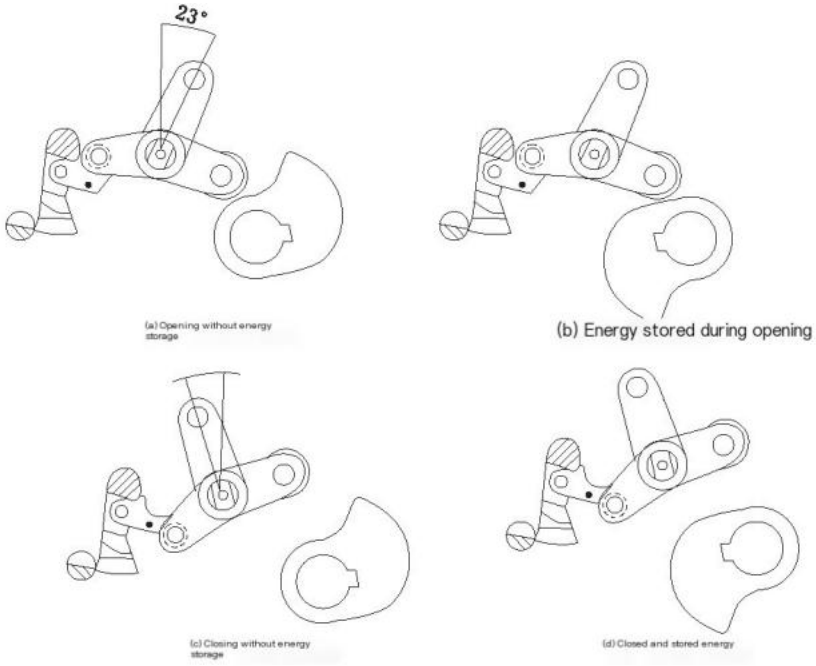


Figure 4 Location and schematic diagram

4.3 Opening and overcurrent tripping

As shown in Figure 4 (c, d), the circuit breaker and mechanism are in a closed state. Pull the 3 manual opening handle or power on the opening coil, push the opening half shaft to rotate clockwise, the fastener loses balance, the closing state is released, and the output lever arm rotates counterclockwise under the force of the opening spring, and the mechanism opens.

The electrical principle of overcurrent tripping is shown in the schematic diagram of overcurrent protection for mechanism six. When the specific current of the current transform er reaches a certain value, the overcurrent trip circuit is connected, and the overcurrent coil is energized, pushing the opening half shaft clockwise to open the mechanism.

4.4 Reclosing

When the mechanism is in a closed but not stored energy state (see Figure 4 (c)), the mechanism can continue to store energy, making it a closed and stored energy state (see Figure 4 (d)). At this point, the reclosing operation of "opening –0.3S closing" can be achieved.

5. Electrical control and overcurrent tripping

The principle of overcurrent protection circuit is shown in Figure 5

The principle of the control circuit is shown in Figure 6

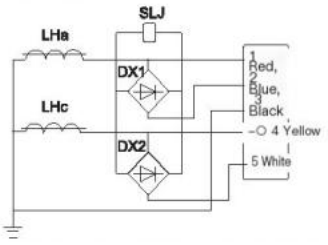


Figure 5 Schematic diagram of overcurrent protection for mechanism

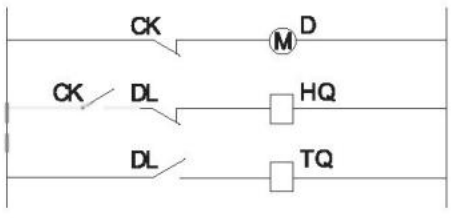


Figure 6 Schematic diagram of mechanism control