

Dead Tank SF6 Circuit Breaker 138000V AC, 3-Pole, Floor Mounted Instruction Manual



INTRODUCTION

With the continuous advancement of society and the ongoing improvements in the technological capabilities of power systems, the demand for power equipment that meets higher resilience standards has grown. Due to the high seismic activity and colder regions in many parts of the country, power systems now require circuit breakers with enhanced shock resistance and low-temperature tolerance. Additionally, modern switchgear needs to integrate current transformers into the design.

Porcelain pillar circuit breakers, due to structural limitations, are unable to meet the performance demands of new power plants or the upgrades of existing facilities.

There is an urgent need for switchgear that offers exceptional shock resistance, low-temperature tolerance, high reliability, and cost-effectiveness.

The MT-DTCB-SF6-R7-3P-AC-DXK high-voltage AC SF6 tank circuit breaker, developed independently by our company, is a new type of switchgear designed to meet these requirements. This product is an outdoor high-voltage circuit breaker that has been developed based on years of experience in high-voltage switching technology, leveraging our expertise in products such as the plug-in combination units and the open-type combination units. The MT-DTCB-SF6-R7-3P-AC-DXK circuit breaker offers excellent application prospects and is an ideal choice for both new power plants and the modernization of older stations.

The MT-DTCB-SF6-R7-3P-AC-DXK high-voltage AC SF6 tank circuit breaker integrates both the circuit breaker and current transformer into a single unit. The arc extinguishing chamber is horizontally mounted within a grounded aluminum alloy casing, and the unit features a CT26 spring mechanism. The design uses fewer parts and offers a simple, compact layout that is durable and robust. It meets the oil-free requirements and delivers superior mechanical properties and high reliability. All critical components are processed using CNC and machining center equipment, with bearings sourced from internationally recognized brands. The mechanical life of the breaker can reach up to 10,000 operations.

This circuit breaker is suitable for outdoor, three-phase AC 50Hz high-voltage applications, and is designed for use in 72.5kV (126kV) power transmission and distribution systems. It can also be used for capacitor bank switching and protection.

This product complies with the U.S. standard ANSI C37.04 for high-voltage circuit breakers and the international IEC 62271-100 standard for high-voltage switchgear and control equipment, Part 100: High Voltage AC Circuit Breakers. The design, production, inspection, and service of the circuit breaker are fully aligned with the ISO 9001 quality management system, ensuring the highest standards of quality throughout the product's lifecycle.

MAIN FEATURES

The MT-DTCB-SF6-R7-3P-AC-DXK high-voltage AC tank circuit breaker is a product developed by our company based on extensive experience in the development of the plug-in combination units and the open-type combination units. This product benefits from our company's years of expertise in designing, researching, and manufacturing switchgear, ensuring its reliability through proven operational experience and rigorous testing.

The main features of the MT-DTCB-SF6-R7-3P-AC-DXK high-voltage AC tank circuit breaker are:

- The circuit breaker and current transformer are integrated into a single unit, offering a compact overall structure with excellent cost efficiency.
- The product is small in size, lightweight, and has a moderate height, making it suitable for compact, efficient transportation. It represents a leading solution in the domestic market.
- The circuit breaker uses a self-energizing arc extinguishing principle combining compressed air and thermal expansion, resulting in high breaking capacity, short arcing times, and a full breaking time of 3 cycles. It also offers long electrical life with up to 20 full-capacity operations, all while maintaining a simple and reliable structure.
- The circuit breaker features the mature CT26 spring operating mechanism, known for its simplicity, compactness, and high reliability. It requires minimal maintenance and has a mechanical life of up to 10,000 operations, meeting the "oil-free" requirement.
- The outer shell is constructed from anti-rust aluminum alloy, while the mechanism box is made of stainless steel. All exposed standard and transmission components are either stainless steel or hot-dip galvanized, ensuring superior corrosion resistance and meeting user demands.
- The product is lightweight, puts minimal strain on foundations, and offers strong corrosion resistance, low eddy current losses, minimal shell temperature rise, and impressive flow capacity.
- On-site installation is straightforward, requiring only the pouring of anchor bolts, making it simple and convenient. The product requires minimal maintenance and ensures ease of operation.
- The unit has strong environmental tolerance, making it suitable for hydro-power stations in harsh conditions, including areas with severe pollution, water fog, hail, frequent earthquakes, dense urban areas, and difficult-to-access mountainous regions.
- The product's sealing performance has been enhanced with a new sealing material designed to withstand high temperatures, low temperatures, and corrosion, ensuring reliable performance in challenging environments.

Compared to porcelain pillar circuit breakers, this model has a lower center of gravity, enhanced shock resistance, and improved pollution resistance. It integrates the current transformer into the design, offering a compact structure with a small footprint. Additionally, it features easy on-site installation and several other advantages.

Special Note: In extremely low-temperature environments, the circuit breaker can operate normally when equipped with a heating jacket and filled with a mixed gas. For specific user requirements, please refer to the supplementary instructions for further details.

TECHNICAL CONDITIONS

Technical and Environmental Conditions

Ambient Temperature: -40°C to +40°C (special request: -50°C to +40°C)

Altitude - Maximum altitude: ≤ 1000m (for special orders, bushings should be adjusted according to altitude).

Air Temperature and Humidity

Relative Humidity - Daily average: not exceeding 95% Monthly average: not exceeding 90% (at 25°C)

Saturated Vapor Pressure:

Daily average: not greater than 2.2×10^{-3} MPa

Monthly average: not greater than 1.8×10^{-3} MPa

Wind Speed - Maximum wind speed: 35 m/s

Ice Coating Thickness - Maximum ice coating thickness: 20mm

Earthquake Intensity - Maximum intensity: up to 8 degrees

Sunlight Intensity - Maximum sunlight intensity: 0.1 W/cm² (at 0.5 m/s wind speed)

Maximum Daily Temperature Difference - Maximum temperature variation: 25K

Nominal Creepage Distance - Creepage distance: 31mm/kV

Environmental Considerations - The circuit breaker should not be installed in locations where there is a risk of flammability, explosion, chemical corrosion, or excessive vibration.

MAIN TECHNICAL PARAMETERS

Main Technical Parameters of the Circuit Breaker - Refer to Table 1 for detailed specifications.

Circuit Breaker Assembly Adjustment Parameters - Refer to Table 2 for the assembly adjustment details.

Table 1 -

Rated voltage			kV	72.5	126
Rated current			A	3150	
Rated short-circuit breaking current			kA	40	
Rated short-circuit making current (peak value)			kA	100	
Rated short-time continuous current (thermal stable current)			kA	40	
Rated peak withstand current (dynamic steady current)			kA	100	
Rated short circuit duration (thermal stabilization time)			S	4	
first pole opening coefficient				1.5	
Cumulative break times at full capacity			Second	20	
Rated out-of-step breaking current			kA	10	
Near zone fault breaking current			kA	30, 36	
Rated switching line charging current			A	31.5	
Nominal operating sequence				points-0.3s-close points-180s-close points	
rated insulation level	Lightning impulse (full wave peak value)	Alternate and ground	kV	350	550
		Fracture	kV	410	550+100
	1 minute power frequency withstand voltage	Alternate and ground	kV	160	230
		Fracture	kV	200	230+70
Rated operating time (at rated voltage)			ms	Opening time 33±6	
				Closing time 85±15	

Table 1
cont. -

full break time		frequency	≤ 3	
Main circuit resistance value of each phase		$\mu \Omega$	≤ 150	≤ 180
radio interference level		μV	≤ 500	
preset pressure		MPa	0.4	0.50
SF6 gas alarm pressure (20° C)		MPa	0.35	0.43
SF6 gas lock-up pressure (20° C)		Mpa	0.3	0.40
Control circuit rated voltage		V	DC220/DC110	
Annual leakage rate of SF6 gas		/年	$\leq 0.5\%$	
Moisture content of SF6 gas (20°C)		$\mu L/L$	≤ 150 (at handover)	
			≤ 300 (running)	
SF6 gas weight		kg	32	40
Mechanical life		Second	10000	
CT26 Agency Opening/closing coil	Voltage	V	DC220	DC110
	Closing coil current/resistance	A/ Ω	2.5/88 ± 3 (20°C)	4.4/25 ± 1 (20°C)
	Opening coil current/resistance		2.5/88 ± 3 (20°C)	4.8/23 ± 1 (20°C)
CT26 mechanism motor	Voltage	V	DC220	AC220
	power	W	600	
Dynamic load	horizontal direction	N	20000	
	vertically up		5000	
	Vertical down		5000	

Table2

Project	Unit	Technical requirements	Test conditions or test methods
Closing synchronization between poles	ms	≤ 5	
Opening synchronization between poles	ms	≤ 3	
Output arm roller and cam clearance	mm	1.2~2.8	Measurement at the opening and closing spring energy storage position
Opening electromagnet core stroke	mm	3.4~5.0	
The gap between the opening electromagnet push rod and the opening detent	mm	0.7~1.2	Measuring at mechanism closed position
Closing electromagnet iron core stroke	mm	4~6	
Gap between pawl and closing pawl	mm	1.0~2.0	Measuring in the open position of the mechanism
Clearance between detent and anti-jump pin	mm	1.0~2.5	

Table3

Rated once Current (A)	Rated secondary Current (A)	Rated output Capacity (VA)	Measuring coil Accuracy	Safety Factor of Measuring Grade Instruments	Protection coil Accuracy
300	5	30	0.5(0.2)	≤ 5	10P15
400		30	0.5(0.2)		10P15
600		30	0.5(0.2)		10P20
800		40	0.5(0.2)		10P20
1000		50	0.5(0.2)		10P20
1250		50	0.5(0.2)		10P20
1600		50	0.5(0.2)		10P20
2000		50	0.5(0.2)		10P20

Note:

A coil with a rated secondary current of 1A is available upon request.

Special technical requirements will be determined through negotiation between both parties.

PRODUCT STRUCTURE

The circuit breaker features a three-phase tank-type structure, with all three phases sharing a common chassis. A CT26 spring operating mechanism is used to achieve three-phase linkage.

The breaker is connected to the overhead line via the outlet bushing.

For a visual representation, refer to Figure 1 and Figure 2 for the basic outline.

INTERRUPTER

The structure of the arc extinguishing chamber is shown in Figure 3.

The static contact is supported at the top of the tank by insulators and consists of the static contact seat, static main contact, and static arc contact, among other components.

The moving contact seat is fixed at the bottom of the tank via an insulating platform. It includes the moving contact seat, intermediate contact, and guide components, which serve to support, guide, and ensure the proper conductive effect of the moving contact.

The moving contact consists of components such as the nozzle, moving main contact, moving arc contact, cylinder, and pull rod. It is connected to a direct-moving sealing rod via an insulating pull rod. The opening and closing operations are driven by the spring mechanism.

The main conductive circuit follows this path:

Plum blossom contact on the moving side of the driven contact seat → moving contact seat → intermediate contact → cylinder → moving main contact → static main contact → static contact seat → plum blossom contact on the static side.

TRANSMISSION CASE

The transmission box serves as a support component for the transmission system. Its primary function is to transmit the operating mechanism's output action to the air chamber, thereby driving the interrupter body to open and close. The SF6 gas is sealed within the transmission box, and a meter calibration valve is installed on the box. The meter calibration valve remains sealed when the connecting pipe is not in place. When the connecting pipe is connected, the thimble on the pipe pushes the valve port of the self-sealing valve open, ensuring that the three-phase gas chamber is connected.

An SF6 density controller is mounted on the upper section of the side-phase transmission box, allowing users to easily monitor the SF6 gas pressure.

CHASSIS

The bottom frame supports the circuit breaker body and connects to the operating mechanism. It is welded from square tubes and is designed to bear the load generated during the operation of the circuit breaker. Additionally, as the cables pass through the square tubes, they are protected from corrosion.

CT26 SPRING OPERATED MECHANISM

The opening and closing mechanism of the circuit breaker is a CT26 spring operating mechanism, with its structure and operating principle illustrated in Figure 4. The CT26 spring operating mechanism is specifically designed and developed by Larson for high-voltage circuit breakers. It is used in our porcelain column circuit breaker and branch circuit breaker models.

ENERGY STORAGE MOTOR

The energy storage motor uses the HDZ-type AC and DC dual-purpose single-phase series-excited motor. Its main technical parameters are provided in Table 4 below.

Rated working voltage (V)	DC220 AC220
Rated motor current (A)	2.8
Normal working voltage range	85%~110% of rated working voltage
Energy storage time at rated working voltage (s)	less than 15

Table 4

CLOSING ELECTROMAGNET

The closing electromagnet utilizes a solenoid electromagnet. Its technical parameters are provided in Table 5.

Table 5:

Rated working voltage (V)	DC110	DC220
Rated operating current (A)	4.4	2.5
Coil resistance at 20° C (Ω)	25	88
Normal working voltage range	85%~110% of rated working voltage	

OPENING ELECTROMAGNET

The opening electromagnet uses a solenoid magnet and is powered by an independent power supply. Its technical parameters are provided in Table 6.

Table 6:

Rated working voltage (V)	DC110	DC220
Rated operating current (A)	4.8	2.5
Coil resistance at 20° C (Ω)	23	88
Normal working voltage range	65% to 120% of rated voltage, less than 30% of rated voltage for 3 consecutive operations without tripping	

CURRENT TRANSFORMER

The current transformer is an essential component for power measurement and protection within the product. The tank circuit breaker is equipped with an LR(D) type current transformer, which features a single-phase closed design and a core-through structure. The primary coil is integrated into the main circuit conductive rod, while the secondary coil is wound around a toroidal core. A shielding cylinder is placed between the conductive rod and the secondary coil. The primary insulation is provided by SF6 gas, and the secondary coil is insulated with varnish. The lead-out wire of the secondary coil is routed to the outside through an epoxy-cast sealed terminal board.

The current ratio, precision, and load specifications for the current transformer are provided in Table 3.

Different transformation ratios can also be provided based on specific user requirements.

Special attention must be given to the fact that the secondary circuit must never be left open during operation, as this can generate high voltages and potentially damage the equipment.

OUTLET BUSHING

The connection between the tank circuit breaker and the overhead line utilizes either a porcelain bushing or a composite insulating bushing filled with SF6 gas. The specific creepage distance of the outer insulation is 31mm/kV.

Both types have their respective advantages and can be selected based on user requirements.

Main Features of Porcelain Bushing:

Main Features of Porcelain Bushing:

- High mechanical strength
- High-strength porcelain with a high alumina content, offering excellent thermal stability
- Superior insulation performance

Main Features of Composite Insulating Bushing:

- Excellent resistance to ultraviolet (UV) radiation and aging, ensuring long-term reliability of composite insulators
- Strong antifouling capability
- Lightweight design, enhancing product stability
- Good explosion-proof and anti-destructive performance

As altitude increases, the atmospheric density decreases, which in turn reduces the withstand voltage capability of the porcelain bushing. In such cases, the porcelain bushing can be adjusted according to the altitude to maintain its withstand voltage capability and meet the specific requirements of the user.

WORKING PRINCIPLES**Working Principle of Arc Extinguishing Chamber**

The circuit breaker's arc extinguishing chamber uses the self-energy arc extinguishing principle of "compressed air + thermal expansion," as shown in Figure 5.

When a short-circuit current is interrupted, an arc forms between the moving and static arc contacts. The immense energy generated by the arc heats the SF₆ gas between the contacts, causing a rapid increase in both temperature and pressure. The high-pressure SF₆ gas then returns to the cylinder, creating a pressure difference between the inside and outside of the chamber. As the gas is expelled, the hot gas from the arc area is immediately discharged through the nozzle. The expansion of the hot gas downstream of the nozzle causes a rapid temperature drop, and the dielectric strength of the SF₆ gas recovers quickly, exceeding the voltage across the contacts, thus extinguishing the arc at the current zero-crossing point.

For breaking small inductive, capacitive, or load currents, the breaking current and arc energy are smaller. The arc extinguishing relies mainly on the compressed air mechanism. The blowing pressure generated by mechanical gas pressure causes the arc to extinguish when the current crosses zero.

For breaking large currents, the energy generated by the arc causes the high-temperature, high-pressure SF₆ gas to flow back into the compression cylinder, establishing the necessary blowing pressure for arc extinction. Unlike smaller currents, where mechanical compression generates the high pressure, in this case, the arc energy itself establishes the pressure. This results in a very small cylinder diameter and low required operating work. The system can use a compact, highly reliable spring mechanism, ensuring a high degree of operational reliability.

Working Principle of Spring Operating Mechanism**Closing Spring Energy Storage**

When the closing spring (1) is in the released state, the ratchet shaft (6) is connected to the motor via a gear, as shown in Figure 4(A).

During energy storage, the motor drives the pawl shaft (6) to rotate clockwise. The two pawls (5) on the eccentric pawl shaft alternately push the ratchet (3) to rotate counterclockwise. This movement causes the pin and pull rod on the ratchet to pull the switch closed, compressing the spring and storing energy. When the pin reaches the top position on the left side (i.e., when the closing spring is fully compressed), the closing spring actively drives the ratchet to rotate counterclockwise by about 2°. The energy stored on the ratchet holds the pin (4) in place, secured by the detent (15), completing the energy storage.

At this point, the motor is disconnected by the contactor, and the pawl is separated from the ratchet.

Closing Operation

When the circuit breaker is in the open position and the closing spring is charged, as shown in Figure 4(B), the mechanism receives the closing signal. The closing coil is energized, causing the moving iron core of the closing electromagnet to attract. This drives the closing guide rod to hit the closing pawl (13), rotating it counterclockwise and releasing the stored energy. The energy is transferred to the pawl (15), which engages the closing mechanism.

The closing spring then drives the ratchet (3) to rotate rapidly clockwise. The cam (18), which moves coaxially with the ratchet, strikes the roller on the large crank arm (8), causing the output crank arm (7) to move upwards. Through the connecting rod, this movement drives the circuit breaker body to close quickly. Simultaneously, the opening spring (16) is compressed, storing energy for the opening operation.

This entire process can also be manually triggered by striking the guide rod of the closing electromagnet.

After the closing operation is completed, the motor recharges the closing spring, as shown in Figure 4(C), and the mechanism is in its ready state.

Opening Operation

When the circuit breaker is in the closed position, both the closing spring (1) and the opening spring (16) are charged, as shown in Figure 4(C). The mechanism receives the opening signal. The opening coil is energized, causing the moving iron core of the opening electromagnet to attract. This drives the opening guide rod to hit the opening pawl (10), rotating it counterclockwise and releasing the closing holding pawl (9).

The opening brake spring (16) then pulls the crank arm, rotating it clockwise to drive the circuit breaker body to open quickly. Simultaneously, this movement drives the large swing arm (8) downward, pressing the closing holding pawl (9) into place, ensuring the mechanism is in the open position, as shown in Figure 4(B).

This operation can also be manually triggered by striking the guide rod of the opening electromagnet.

ANTI-JUMP DEVICE

This circuit breaker features an anti-jump function, equipped with a mechanical anti-jump device. Additionally, an electrical anti-jump mechanism can be installed in the secondary control circuit, based on user requirements.

Secondary Parts of the Product

The secondary control, measurement, and monitoring devices are centrally installed within the mechanism box. As a result, the mechanism box serves not only as a relay hub for electrical communication but also as a centralized hub for on-site control, monitoring, telemetry, remote control, remote adjustment, and remote signaling of the equipment. It plays a crucial role in ensuring the normal operation of the electrical equipment.

The secondary control cabinet typically provides functionalities such as local operation, signal transmission, protection and relay functions, and monitoring of the circuit breaker's gas chamber. These functions are as follows

Local-Remote Selection Operation: Enables local or remote operation of the primary equipment in the circuit breaker. This functionality allows the primary equipment to be installed in the mechanism box, with the option to switch between local and remote operation.

Monitor Opening and Closing Position: Monitors the status of the circuit breaker's opening and closing position.

Monitor SF6 Gas Density: Monitors whether the SF6 gas density in the circuit breaker's gas chamber is within normal levels.

Monitor Energy Storage Spring: Monitors the energy storage state of the circuit breaker's energy storage spring.

Monitor Control Circuit Power Supply: Ensures that the power supply for the control circuit is functioning normally.

Display Main Wiring and Operating Status: Displays the main wiring form and operational status of the circuit breaker's primary electrical equipment.

Electrical Interlocking: Implements electrical interlocking both within the circuit breaker and between circuit breakers.

Measure Temperature and Humidity: Measures the temperature and humidity within the circuit breaker's mechanism box and automatically activates the heating and dehumidification system if necessary.

Relay Terminal Box: Acts as the relay terminal box for control and signal transmission between various components of the circuit breaker and the main control room, receiving and sending signals. Refer to Figure 6 and Figure 7 for the secondary control schematic diagram and wiring diagram of the circuit breaker.

A. Energy Storage Circuit

When the closing spring is in a non-energy storage state, the energy storage micro switch contact is closed, energizing the contactor (KM). This closes the normally open contact of KM, powering the energy storage motor (M) to begin charging the brake spring. Once the closing spring has completed its energy storage, the micro switch contact opens, cutting off the power supply to the energy storage motor and ending the energy storage process.

During energy storage, the normally open contact of the micro switch is opened, cutting off the closing circuit. This electrical interlock prevents the circuit breaker from malfunctioning when the closing spring is not fully charged.

B. Closing Circuit

The circuit breaker closing circuit is composed of the circuit breaker's auxiliary contact and the closing coil.

C. Electrical Anti-Jump Circuit

As shown in the diagram, after the circuit breaker is reliably closed, its auxiliary contact closes, energizing the anti-jump relay (CJX). This relay becomes self-maintained through its contact. The CJX's normally closed contacts then open, de-energizing the closing circuit and preventing breaker tripping.

SF6 Gas Monitoring and Temperature Compensation

The circuit breaker is equipped with an SF6 density controller pressure gauge that includes an automatic temperature compensation monitoring function. The gauge not only displays the SF6 gas pressure but also automatically corrects for the effects of temperature on pressure changes. When the gas pressure in the circuit breaker drops below the alarm value, the pressure gauge contact closes to send an alarm signal. If the gas pressure falls below the blocking value, the pressure gauge sends a blocking signal.

This monitoring method eliminates the need to refer to temperature-pressure force curves, as the pressure values are automatically corrected to a standard temperature of 20°C.

PACKING, TRANSPORT, ACCEPTANCE, AND STORAGE

After the MT-DTCB dead tank circuit breaker passes the factory test, it is packaged and transported as a complete unit. The product packing list should clearly indicate the number of units and the contents of each packaging unit.

Prior to packaging, the inside of the MT-DTCB tank circuit breaker should be filled with 0.02–0.05 MPa SF6 gas or high-purity nitrogen gas (N2).

The product should be transported on roads of at least Class 3 quality, maintaining a constant speed. During transportation, loading, and unloading, severe vibrations and impacts must be avoided. The packaging boxes should not be flipped or turned upside down.

Upon arrival at the construction site, the user and manufacturer should immediately verify the goods against the product packing list to check the condition of the packaging. If the product is installed by the manufacturer, the user should only verify the number of packaging units. If the user handles the installation and commissioning, they should open the package and inspect the contents to ensure that all parts are complete and in good condition.

During unloading, care must be taken to handle the product gently. Rough handling is strictly prohibited. The inflatable gas cylinder should be carefully lifted down or slowly slid down, and it must not be allowed to roll down directly. When using a crane for hoisting, four equal-length slings must be used. Lifting should be slow and steady, and horizontal movement should ensure that the interval between slings does not exceed 20 cm.

If the product is not installed immediately upon arrival at the site, it should be stored in a dry, clean, and well-ventilated area, free from pollution.

INSTALLATION & PRE-RUN INSPECTION

Preparation for Installation

A. According to the foundation drawing provided by the manufacturer or design unit, verify that the foundation construction at the installation site meets the drawing requirements. The height difference between the two sides of the foundation should not exceed 2mm. The foundation must also ensure sufficient strength and rigidity based on local soil conditions to prevent excessive vibrations. The circuit breaker should withstand a 20 kN upward dynamic load and a 20 kN downward dynamic load.

B. The user must provide the necessary equipment support, including but not limited to a 10T crane, vacuum pump, resistance meter, and micro water meter.

Installation

-Disassemble the delivery tooling components.

-Lift the four brackets to the foundation according to the engineering drawings. Place them correctly, pass the anchor bolts through, install the spring washer nuts, but do not tighten them yet.

-First, use slings to secure the porcelain sleeves on both the moving and static sides of the side phase. Take care to protect the porcelain sleeves. Use a crane to carefully lift the slings. According to the engineering drawings, remove the middle M20 bolts from the side phase body and the small support on the bottom frame. Loosen the two M20 bolts that connect the body and the small support, remove the remaining bolts, and rotate the side phase body into the running state. Insert the removed bolts back into place and tighten all bolts, torque to 30 N•m.

-Rotate the other side into the running state as described in 2.2, and tighten all bolts.

-Once rotation is complete, hoist the switch body onto the pre-placed bracket foundation. Connect the 16 M16 bolts between the body and the bracket, ensuring they are securely fastened. Adjust the switch position as needed to align with the base's reserved hole. After adjustment, proceed with secondary pouring while tightening the anchor nuts.

-Connect the transmission rod and the gas pipeline. Each phase's transmission box is equipped with positioning pins and corresponding pin holes. The opening and closing positions are pre-fixed before leaving the factory. After adjustment by the manufacturer, do not change the positions of these pin holes during installation.

Connection Mechanism:

During transportation, the mechanism and output rod are integrated and only need to be connected to the outer crank arm of the side phase.

Pull the outer crank arm of the side-phase transmission box to the opening position until the opening positioning pin aligns with the opening positioning pin hole.

Connect the output rod of the mechanism to the side-phase crank arm. If necessary, adjust the length of the output rod to ensure proper connection.

Connect the Connecting Rod Between Phases:

Pull the outer levers of the other two phases to the opening position until the opening positioning pin aligns with the positioning pin hole.

Connect the right-handed threaded joint of the horizontal connecting rod to the outer crank arm of the side phase using a pin. Screw the right-handed threaded end of the horizontal connecting rod into the M14 nuts and joints, ensuring the length is no less than 18mm.

Screw the left-handed M14 nut and joint onto the other end of the horizontal connecting rod. Adjust the length of the connecting rod so that the joint aligns with the pin hole of the outer crank arm, then connect with the pin.

Final Adjustments:

Insert the pressing piece onto each drive pin and fasten it with screws. Tighten the locknuts on the tie rod and connecting rod, and apply anaerobic adhesive to all threaded connections.

Connect the Gas Line:

Install the meter calibration valve on the upper part of the transmission box. Remove the protective nut from the valve, as well as the protective screw plug from the connecting pipe. Tighten both ends of the connecting pipe simultaneously to prevent moisture intrusion into the pipeline, which could lead to excessive micro-water in the circuit breaker.

Inflation: (Please refer to <https://www.youtube.com/watch?v=LS1UHUIOHRg> for FULL gas filling procedure)

Inflate the circuit breaker according to the following steps:

A. Place the sulfur hexafluoride (SF₆) gas cylinder, connect the oxygen pressure relief valve, and attach the inflation tube to the pressure relief valve (see Figure 8).

B. Open the cylinder valve, then open the pressure-reducing valve. Adjust the low-pressure side to a pressure of 0.02–0.04 MPa. Deflate for 5-10 seconds to flush the pipeline.

C. Unscrew the plug on the side-phase transmission box of the circuit breaker, connect the inflation pipe, and slowly open the pressure relief valve to begin inflating the circuit breaker. While inflating, the pressure difference between the low-pressure side of the pressure relief valve and the circuit breaker should not exceed 0.05 MPa. Continue inflating until the gas pressure in the circuit breaker approaches the rated pressure.

Inflation should be done slowly to avoid overpressurizing the circuit breaker.

D. Once the gas in the circuit breaker reaches the rated pressure, close the pressure-reducing valve. First, remove the inflation tube from the circuit breaker interface, then screw the plug back onto the interface. Next, unscrew the connection between the connector and the inflation tube (see Figure 8). Close the cylinder valve, remove the pressure-reducing valve, and store both the pressure-reducing valve and cylinder in a dry place for future use.

After the circuit breaker is inflated to the rated pressure, all sealing surfaces should be tested for leaks using a halogen leak detector with a sensitivity of 10⁻⁶. There should be no leaks detected by the instrument.

Moisture Content Detection of SF₆ Gas in the Circuit Breaker: Moisture detection should be performed 24 hours after the circuit breaker is inflated.

The inflatable interface is connected to a tapered needle pressure-reducing valve to control the gas flow, and moisture content is measured using a trace moisture detector. The measured data should be recorded and monitored to ensure that the moisture level is within the acceptable range.

According to the ambient temperature and referring to the moisture content-temperature curve in Figure 9, the moisture content should not exceed 150 µL/L (at 20°C) during on-site handover. During operation, the moisture content should not exceed 300 µL/L (at 20°C).

The manual energy storage operation of the circuit breaker is shown in Figure 10. After the circuit breaker is installed and filled with sulfur hexafluoride gas, operation and debugging can begin. However, the power supply must be cut off before starting the process.

When the motor is not powered on, use special wrench I (see Figure 10) to insert it into the hexagonal head of the ratchet shaft. By rotating the wrench, the closing spring can be charged.

Warning!!

The on-site installation and commissioning of the tank-type device must be carried out under the guidance of the service engineer arranged by our company.

Without the permission of our company's service engineer, the user is not allowed to perform on-site installation and commissioning. Any damage caused by unauthorized installation and commissioning will not be the responsibility of our company.

Our company does not assume responsibility for any equipment failures or accidents.

OPERATION CHECK (ACCEPTANCE CHECK)

Leak Detection

Use a sulfur hexafluoride (SF₆) leak detector to check flange connection surfaces, connecting pipe joints, and welds. No leaks above 10⁻⁶ atm·m³/s should be detected. Leak detection should be performed 24 hours after inflation. The annual air leakage rate should not exceed 0.5%.

Moisture Measurement

The measurement method is the same as described in 5.5.3. Control the gas flow and measure the moisture using a micro-water tester. The measured data should be compared with the curve in Figure 9 based on the ambient temperature. The moisture content should not exceed 150 µL/L (at 20°C) during acceptance and should not exceed 300 µL/L (at 20°C) during operation.

Flexibility of Opening and Closing Iron Cores

When the opening and closing buttons are manually pressed, the buttons and iron cores should move smoothly without jamming.

Main Loop Resistance Measurement

The resistance of the main circuit is measured between the incoming and outgoing terminals using the voltage drop method. The measurement result should be compared with the factory value, and the error should not exceed 20% to be considered qualified.

Insulation Inspection

A. After the circuit breaker is installed and commissioned on-site, a power-frequency withstand voltage test is generally not required, as the manufacturer has already performed this test before shipment. However, if the user deems it necessary to retest, the main circuit can be tested by applying 80% of the rated power frequency withstand voltage value.

For a 126 kV tank circuit breaker, the test voltage should be 184 kV (230 kV × 0.8) for 1 minute.

For a 72.5 kV tank circuit breaker, the test voltage should be 128 kV (160 kV × 0.8) for 1 minute.

During the inspection, the secondary terminals of the current transformer should be short-circuited and grounded.

B. Apply a power frequency voltage of 2000V for 1 minute to the secondary circuit, testing motors, various relays, density controllers, and other components. Apply 1000V for 1 minute to other parts. There should be no breakdown, flashover, or any abnormal phenomena during the test.

Current Transformer Test

Check the polarity, accuracy, and volt-ampere characteristics of the secondary coil of the current transformer. Measure the insulation resistance of each secondary coil to ground, ensuring that it is greater than 1 MΩ.

Operation Test

The following operation tests should be conducted and performed successfully:

A. Apply 30% of the rated opening voltage continuously for three cycles. The breaker should not open during these tests.

B. Apply 85% and 110% of the rated closing voltage and 65% and 120% of the rated opening voltage, performing "closing" and "opening" tests twice each. The circuit breaker should reliably open and close.

Note: If the operating voltage at the installation site does not reach the specified upper limit, this test can be replaced with the highest achievable operating voltage during the test.

C. Under the rated opening and closing voltage, perform the following tests:

"Close - 0.3 seconds - Close" and "Close - 0.3 seconds - Close - Open" tests, each repeated twice.

Perform "Close" and "Open" operations three times.

If the circuit breaker is used and re-closing is not required, you can perform "Close and Open" four times and "Close and Open" seven times, respectively.

Opening and Closing Time Measurement

Measure the opening and closing times, synchronization, and opening and closing speeds (a light oscilloscope or switch characteristic tester can be used). The measurement should be carried out under the rated operating voltage.

Definition of Opening and Closing Speed

Opening Speed: The average speed within the first 40% of the trip after the first opening break in all three phases.

Closing Speed: The average speed within the first 40% of the stroke before the first closing break occurs in all three phases.

Test Equipment:

An optical oscilloscope with wire resistance or a switch characteristic tester capable of measuring linear velocity and performing manual velocity analysis can be used.

If an angular velocity sensor is used to measure the angular velocity of the rotating shaft of the circuit breaker, corresponding conversion must be performed to convert it into the linear velocity of the moving contact.

Note: Since the manufacturer has already conducted this test before shipment and recorded the test results on the product Certificate of Conformity, this test is not mandatory on-site. The manufacturer guarantees the reliability of the data provided in the certificate.

PRIMARY BUS CONNECTION OF THE MAIN CIRCUIT

The incoming and outgoing wires of the primary bus are connected to the terminal board at the upper end of the porcelain bushing. The connection method should be determined by the user based on the site conditions.

When wiring, use a white cloth soaked in alcohol to wipe off any dirt on the wiring board. The wiring board has a silver-plated layer, so do not polish it harshly with emery cloth to avoid wearing off the silver-plated surface.

Once the cleaning is complete, the site can be prepared for operation.

OPERATION, MAINTENANCE, AND REPAIR OF CIRCUIT BREAKERS

Daily Maintenance of the Circuit Breaker

The SF6 circuit breaker is designed to be a low-maintenance device, with minimal daily maintenance required. A weekly inspection is generally sufficient. The inspection should include the following:

- A. Observe whether the gas pressure is normal and record the findings.
- B. Check whether the opening and closing indication positions are correct and make a record.
- C. Listen for any abnormal sounds or signs of excessive heating inside the circuit breaker. If any issues are found, investigate the cause and assess whether it significantly impacts operation. If necessary, stop operation immediately for inspection and maintenance.
- D. Verify whether the mechanism operates correctly.
- E. Check whether any fastening nuts are loose.

ANNUAL INSPECTION OF THE CIRCUIT BREAKER

Annual Inspection and Maintenance

Circuit breakers should be inspected annually to ensure their continuous and reliable operation. In addition to the daily maintenance tasks, the following inspections and maintenance should be performed during the annual check. Power should be cut off for a short period, and the control power supply should also be disconnected during the inspection.

Check whether the porcelain sleeve is dirty and clean the surface if necessary.

Measure and record the moisture content of the gas inside the circuit breaker. The method for measuring moisture content is the same as described in 5.6.2.

Inspect whether any fastening bolts and nuts are loose. If any are found to be loose, retighten them.

Check the upper and lower wiring boards for signs of overheating or discoloration. If any issues are detected, lightly wipe the surface using less than 400# fine sandpaper, then re-tighten the busbar connections.

Note: The above annual inspection tasks can be performed simultaneously and do not need to follow a specific order.

OVERHAUL

Overhaul Requirements

The circuit breaker should undergo an overhaul under the following circumstances. During the overhaul, the power supply and control power supply must be disconnected for an extended period:

- A. The circuit breaker has been in operation for 10 years.
- B. The number of operations has reached 10,000 (mechanism overhaul).
- C. The circuit breaker has performed 20 full-capacity breaking operations (40 kA) or fewer, or breaking operations of less than 25 kA, with the cumulative breaking current reaching 3000 kA.

When the circuit breaker is overhauled, please notify the manufacturer, and the manufacturer will assist in handling it. The overhaul requires a long period of power outage and disassembly of the circuit breaker. Maintenance also includes annual inspection items.

Precautions for Maintenance:

The "closing" and "opening" operations of the circuit breaker are not allowed in a vacuum state, as this could damage the components of the arc extinguishing chamber and affect the normal operation of the circuit breaker. The circuit breaker should only be operated ("closed" and "opened") within the allowable range of the rated pressure for operation testing.

Apply an appropriate amount of lubricating oil to the transmission arm of the circuit breaker and all rotating parts of the mechanism.

During regular maintenance, the mechanism should release the energy stored in the closing spring. The closing spring can be released by performing a "close" and "open" operation of the circuit breaker. Ensure the motor's power supply is disconnected during this operation to prevent the spring from being recharged.

Table 9 Torque Standards for Bolts and Nuts

Thread specification	Steel Bolt Torque (N.m)			Non-ferrous metal bolt torque (N.m)		
	upper limit	standard	lower limit	upper limit	standard	lower limit
M8	14	12	10	9.5	6	5.5
M10	24	20	16	14.5	12	9.5
M12	55	45	35	36	30	24
M16	115	95	75	70	60	50
M20	210	180	150	130	110	90
M24	500	420	340	230	190	160

Applicable tools and devices to be prepared for circuit breaker installation and maintenance:

General tools:

- a. 10t crane
- b. Wooden ladder (2m)
- c. Crowbar (1.5m)
- d. Torque wrench
- e. Socket wrench and socket (M4, M6, M20)
- f. Hex wrench (M10, M12, M20)
- g. Screwdriver (large, medium, small)
- h. Needle nose pliers
- i. Wire strippers
- j. pliers
- k. Loop Resistance Tester
- l. Test transformer (250kV)
- m. Small transformer (5kV)
- n. Test equipment (for acceptance test)

Consumable Materials:

- White cloth
- High-quality, non-shedding fiber toilet paper
- Alcohol
- Acetone
- Fine sandpaper (grade 400# or higher)
- Vacuum silicone grease
- Anaerobic adhesive
- Silicone rubber gasket sealant
- Waterproof adhesive
- SF6 gas (required for the initial inflation during installation)

ORDERING INSTRUCTIONS AND ACCOMPANYING DOCUMENTS**Ordering Procedure for Tank Circuit Breaker****(1) Preparation Before the Contract**

The user (or engineering design unit) should refer to this installation manual and propose written technical conditions based on the specific requirements of the project, including the technical parameters for each component. The factory will then design the circuit breaker based on the technical conditions provided by the design unit. After obtaining the user's (or design unit's) approval, the design department will prepare confirmation drawings.

Once the project is awarded, the parties (or three parties) will sign a technical agreement outlining the provision of drawings, materials, and the scope of product supply.

(2) Technical Preparations After the Contract

Once the contract is in effect, the factory will provide the following documents within 30 days:

- Outline drawing
- Basic drawing
- Secondary schematic drawing
- Secondary wiring diagram

These documents will be handed over to the user (or design calculation unit). After reviewing and confirming, the two parties will sign off on the project confirmation drawing, which will serve as the final basis for the factory supply.

(3) The scope and quantity of spare parts and auxiliary equipment required by the user must be specified in the technical agreement or supply contract.

(4) If the user requires the manufacturer to provide technical training or installation services, this should be clearly outlined in the contract.

(5) The user is responsible for preparing the general tools and common materials needed for installation and maintenance.

The following contents must be indicated when ordering:

- A. Circuit breaker model and mechanism model
- B. Rated parameters (voltage, current, breaking current, etc.)
- C. Environmental conditions of use
- D. Secondary circuit type
- E. Spare parts, accessories, abbreviations, codes, and quantities
- F. Operating voltage of the opening and closing coil of the operating mechanism and the energy storage voltage of the motor

APPENDIX: SUPPLEMENTARY EXPLANATORY MATERIALS FOR CT26 SPRING OPERATING MECHANISM**Features of the CT26 Spring Operating Mechanism**

The CT26 spring operating mechanism is a new type of high-voltage circuit breaker mechanism, independently developed by our company based on international advanced technology. It is used in our self-energy circuit breaker and combination circuit breaker. The mechanism has the following key features and advantages:

Simple Overall Design

The design structure is simple, with high integration and fewer parts, resulting in higher transmission efficiency. The transmission link of the mechanism mainly includes two shafts and three wheels, as shown in Figure 4. These components are the energy storage shaft (19), output shaft (17), ratchet (3), cam (18), and roller (big crank arm 8). The compact size and fewer intermediate links contribute to higher efficiency.

Lightweight and Rigid Frame

The mechanism frame is made of a single, integral cast aluminum alloy part, which provides both light weight and excellent rigidity.

High-Precision Parts Processing

The mechanism frame is clamped onto an advanced imported CNC machining center, allowing for five-sided machining. Additionally, important mechanical parts such as ratchets, cams, detents, and crank arms are processed using CNC machines, including wire cutting, ensuring high dimensional and positional accuracy, as well as excellent interchangeability.

Minimal Adjustment Requirements

The high-precision components of the CT26 spring operating mechanism significantly reduce the need for adjustments during the assembly process. This minimizes the potential for manual errors and ensures consistent quality throughout the entire machine. As a result, the workload for operation and maintenance is greatly reduced.

Leading Spring Mechanism

The advanced design concept and strict production standards have made the CT26 spring mechanism a leading solution in the industry. When assembled in the circuit breaker, it is capable of withstanding 10,000 mechanical operation cycles, ensuring high reliability and performance.

Precautions for Using the CT26 Mechanism

Do not open and close the arc extinguishing chamber of the circuit breaker in a vacuum state, as this may damage the arc extinguishing chamber and the components of the mechanism.

The anti-movement pin serves as a protective measure to prevent malfunction during transportation or maintenance. It prevents the circuit breaker from opening and closing. During normal inspection and maintenance of the mechanism, the energy stored in the opening and closing springs should be released (after cutting off the motor power, the circuit breaker should be opened and closed once). The anti-movement pin should then be inserted. In special cases, repairs can be made with power on, but the anti-movement pin must be inserted.

After the overhaul is completed, the anti-movement pin must be pulled out before operating the mechanism, otherwise the mechanism will not be able to move or may even burn out the coil. After the anti-movement pin is pulled out, it should be placed in the mechanism box. There is a sign on the key ring at the end of the anti-movement pin that reads: "The anti-movement pin must be pulled out before operation!"

When the circuit breaker is running, all secondary circuits (control circuit, motor circuit, and heating circuit) should be fully charged.

The rotating and transmission parts should be coated with lubricant once a year to ensure the mechanism is in optimal condition.

CT26 MECHANISM FAULT ANALYSIS AND TREATMENT

Send close signal but not close (refuse to close) Or send the opening signal without opening (refuse to open)	Closing spring does not store energy or energy storage is not in place
1) The control loop is not connected. Check control loop. 2) The voltage drop of the power supply is too small to reach the specified value of the coil. 3) The auxiliary switch is not switched or is in poor contact. Adjust auxiliary switch lever or replace auxiliary switch. 4) The opening (or closing) brake coil is disconnected or burnt out. Replace the opening (or closing) brake coil in time. 5) The opening (or closing) gate iron core is stuck. Check and adjust. 6) The gap between the detent on the opening (or closing) gate core and the detent on the opening (or closing) gate is too large. Adjust the gap according to the requirements of the certificate.	1) The motor power is not connected. Check motor control loop. 2) The limit switch is cut off too early. Adjust the travel switch in time. 3) The energy storage motor is burnt out. Replace the motor. 4) The contacts of the contactor are poorly connected or burned. timely replacement contactor.

SUPPLEMENTARY INSTRUCTIONS FOR LOW TEMPERATURE DEAD TANK CIRCUIT BREAKERS

Ambient Temperature and Special Requirements

The ambient temperature range for the dead tank circuit breaker is -32°C to +40°C. The rated pressure is 0.5 MPa, the alarm pressure is 0.43 MPa, and the lockout pressure is 0.4 MPa. The rated breaking current of the circuit breaker is 40 kA.

The SF6 gas inside the circuit breaker will not liquefy within the temperature range of -32°C to +40°C. This product is widely used in various regions and performs well under normal conditions.

If there are special requirements for operation in high-altitude regions where the temperature is lower than the liquefaction point of SF6 gas, our company can provide the following solutions:

For the Secondary Components in the Mechanism Box:

The mechanism box is equipped with three 80W heaters, totaling 240W, which ensures the proper operation of the circuit breaker mechanism in low-temperature environments.

The inside of the mechanism box features thermal insulation sponge boards, reducing heat loss and preventing the internal temperature from dropping too low, ensuring all components remain functional.

For the Interrupter of the Circuit Breaker:

A heating and insulation device is installed on the outside of the circuit breaker tank. This device ensures the circuit breaker can operate normally in low-temperature environments, preventing SF6 gas from liquefying at the lowest temperatures. It is designed for use in alpine regions without requiring mixed gas or reduced rated parameters, which would otherwise affect the insulation and arc extinguishing capabilities of the circuit breaker. The installation of this heating device is simple and convenient, minimizing the on-site workload.

This method has been successfully used in several units, with good operational results. Below is an image showing the heating device used in the dead tank circuit breaker for a project in a high-altitude region.



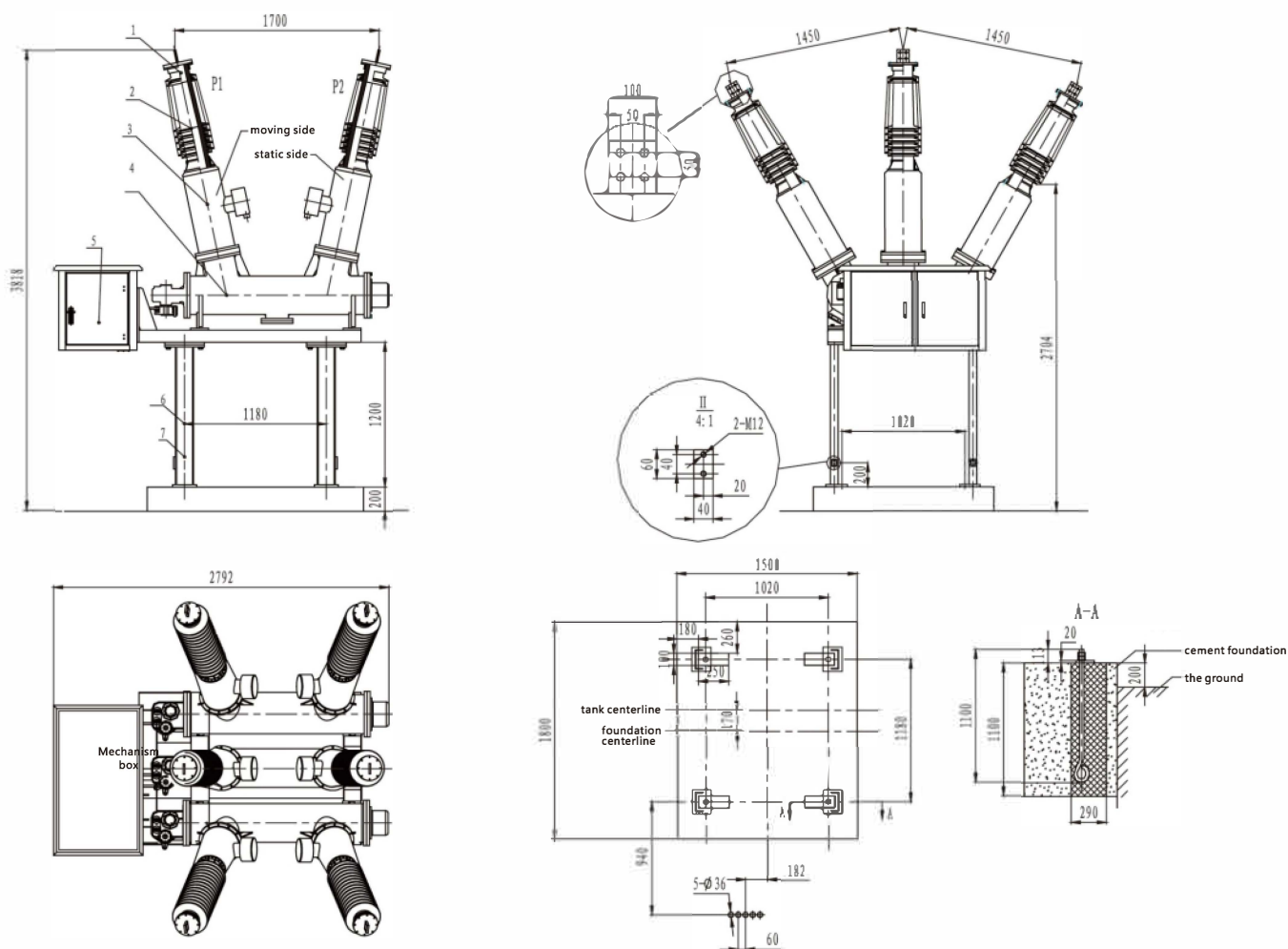
Unit uses an SF6/CF4 mixed gas filling method. The rated short-circuit breaking current is 40 kA, the rated gas pressure is 0.4 MPa, and the applicable ambient temperature range is -40°C to $+40^{\circ}\text{C}$, with special configurations available for operation down to -50°C .

In addition, appropriate design measures have been implemented to help ensure reliable product performance under low-temperature conditions.

Low temperatures can cause conventional lubricants to thicken, become brittle, or fail, which may increase friction in the transmission components and reduce opening and closing speed. In severe cases, this may cause the mechanism to bind or become stuck, affecting overall product performance.

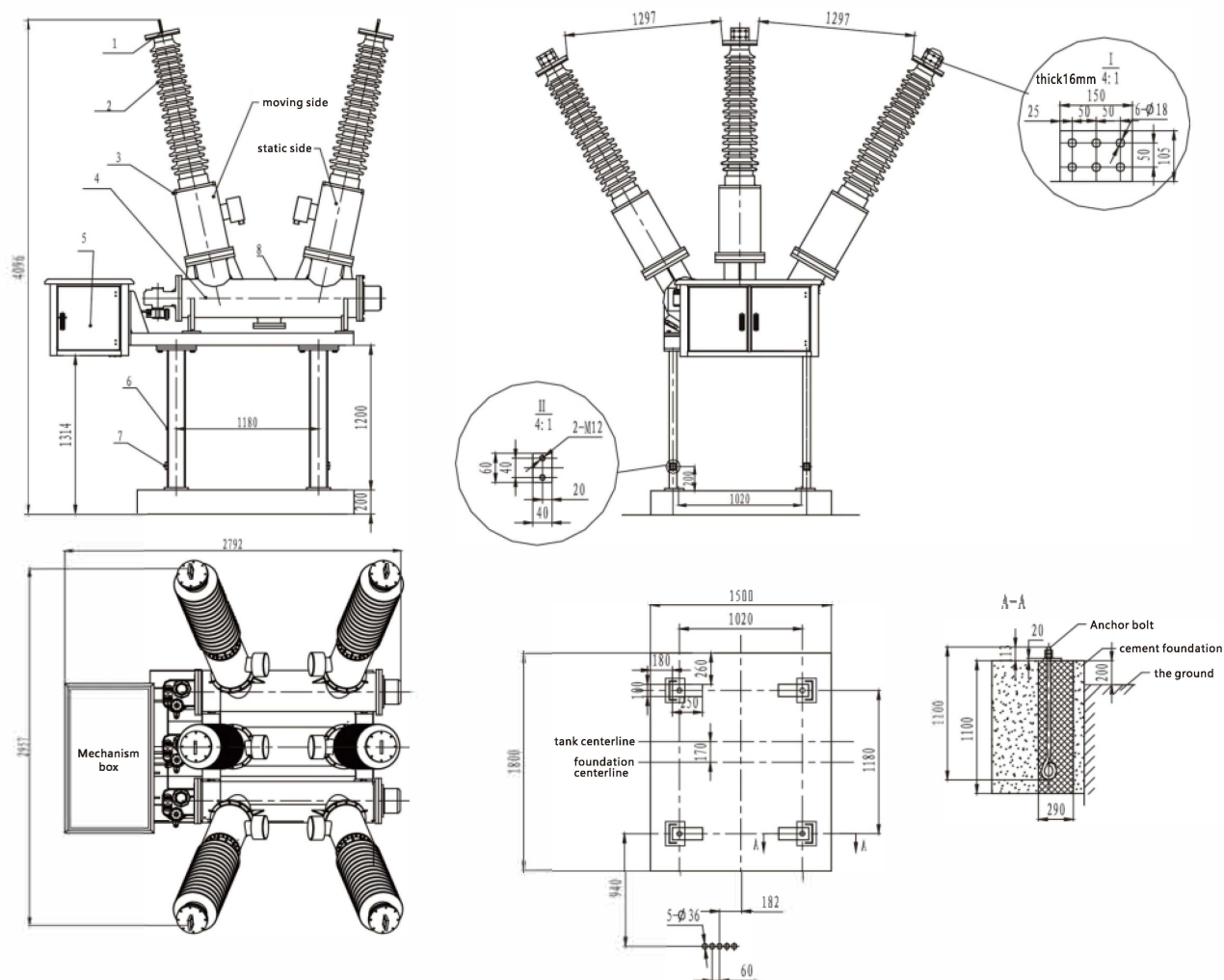
To address this, the product uses wide-temperature lubricating grease designed to maintain proper lubrication at temperatures as low as -60°C , helping ensure reliable mechanism operation in extreme cold environments.

The unit also uses high-quality sealing rings with strong anti-aging performance, helping maintain reliable sealing performance during long-term operation in low-temperature conditions.



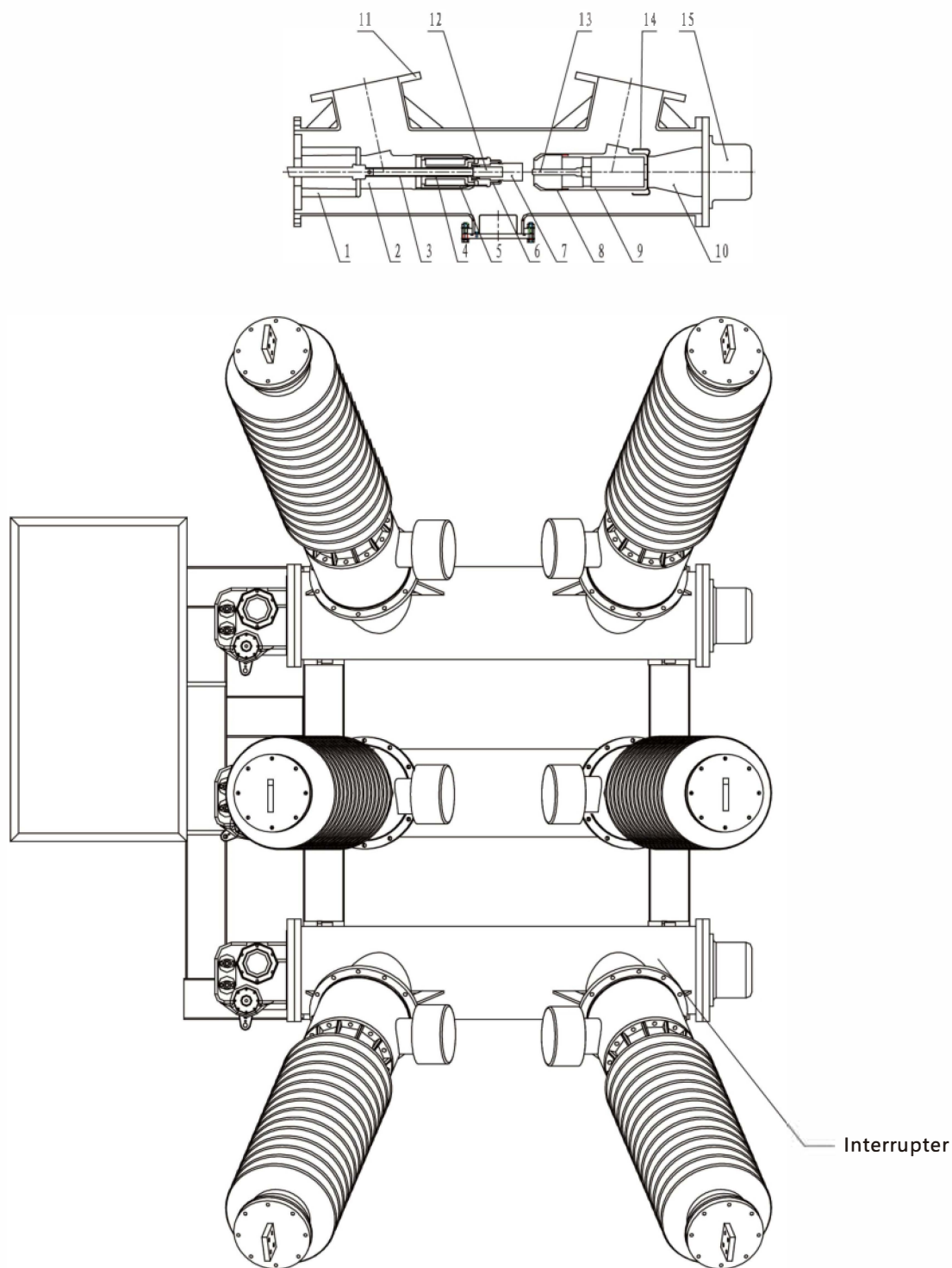
Number	name	Remark
1	primary wiring board	Aluminum silver plated
2	72.5kv outlet bushing	High Strength Aluminum Porcelain (Brown)
3	Built-in CT	Through the heart casing
4	Interrupter	floor tank
5	Mechanism box	Including operating mechanism and secondary board
6	Channel steel bracket	1200mm
7	ground block	4 locations

Fig. 1 Basic appearance diagram of dead tank circuit breaker



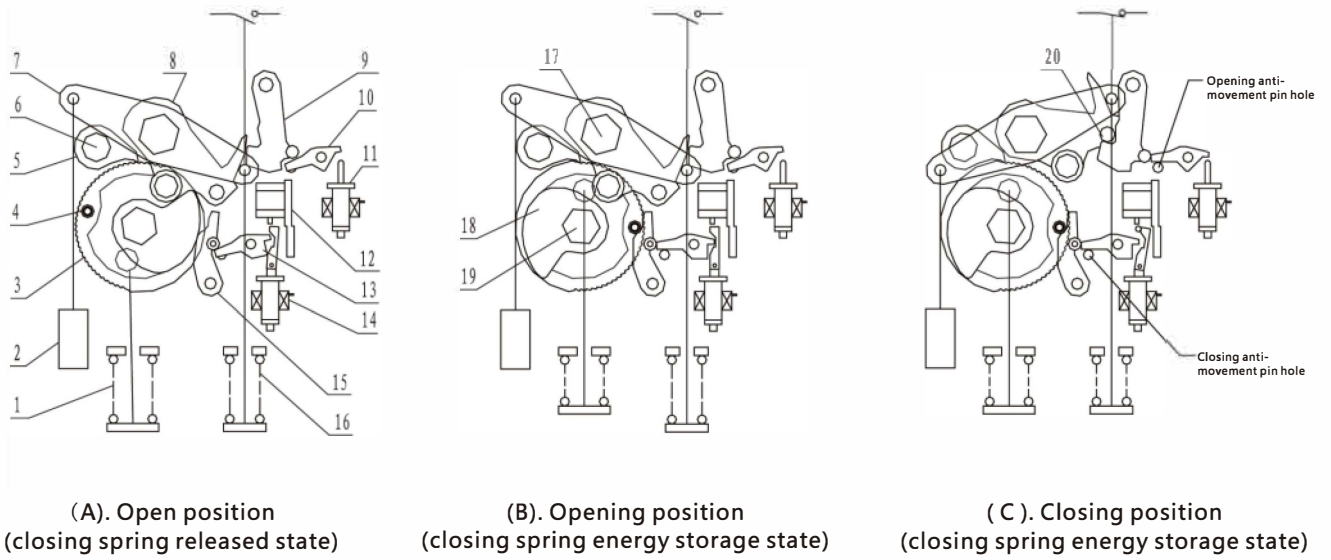
Number	name	Remark
1	primary wiring board	aluminum alloy
2	Outlet bushing	High Strength Aluminum Porcelain
3	Built-in CT	Through the heart casing
4	Interrupter	floor tank
5	Mechanism box	Including operating mechanism and secondary board
6	Channel steel bracket	Height 1200mm
7	ground block	1 piece per bracket
8	heating jacket	Configure according to ambient temperature

Fig. 2 Basic appearance diagram of dead tank circuit breaker



- | | | |
|------------------------|------------------------|--------------------------|
| 1. Insulation table | 6. Moving contact | 11. Tank body |
| 2. Moving contact seat | 7. Spout | 12. Moving arc contact |
| 3. Tie rod | 8. Static contact | 13. Static arc contact |
| 4. Piston | 9. Static contact seat | 14. Gas shield |
| 5. Cylinder | 10. Insulation table | 15. Adsorption cartridge |

Figure 3 Circuit breaker appearance and assembly diagram of arc extinguishing chamber



- | | | |
|---------------------------|---------------------------------|-------------------------|
| 1.closing spring | 8.big arm | 15.energy storage latch |
| 2.oil buffer | 9.Closing holding detent | 16.Opening spring |
| 3.ratchet | 10.Opening detent | 17.Output shaft |
| 4.Energy storage hold pin | 11.Opening solenoid | 18.cam |
| 5.pawl | 12..Mechanical anti-jump device | 19.Energy storage shaft |
| 6.Pawl shaft | 13.Closing detent | 20.Closing holding pin |
| 7.output arm | 14.Closing solenoid | |

Figure 4. CT26 spring operating mechanism

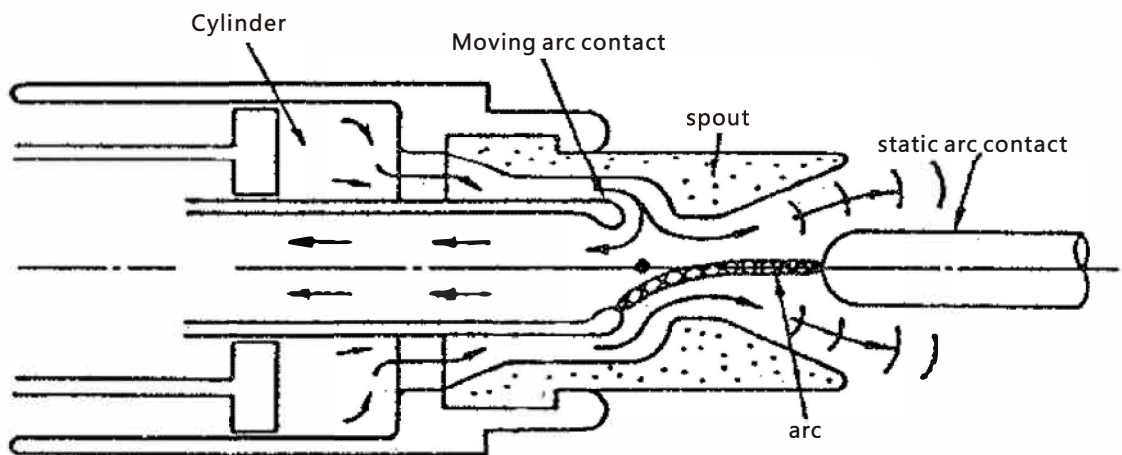
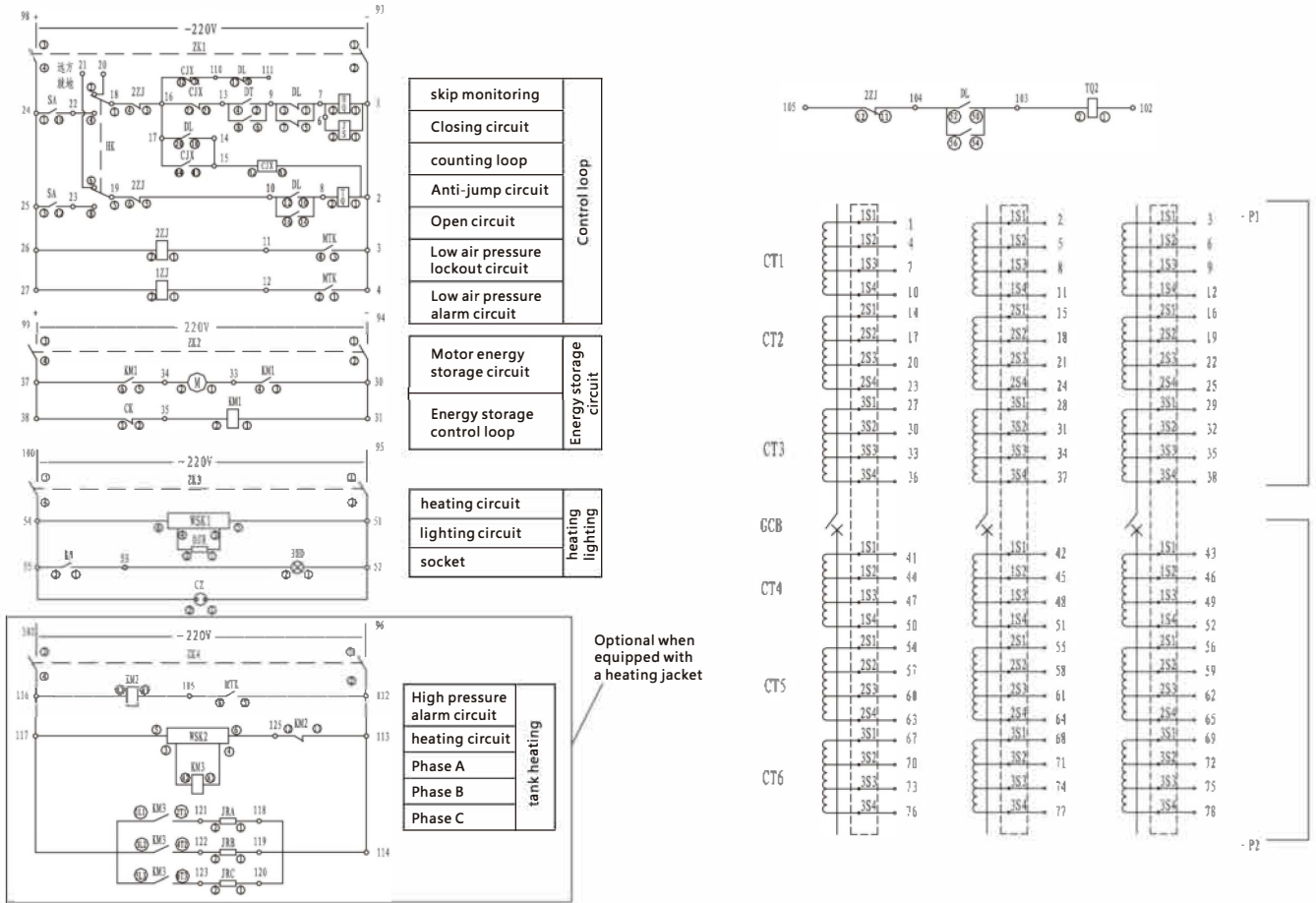
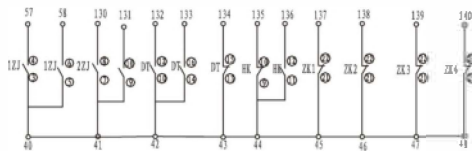


Figure 5 Schematic diagram of arc extinguishing



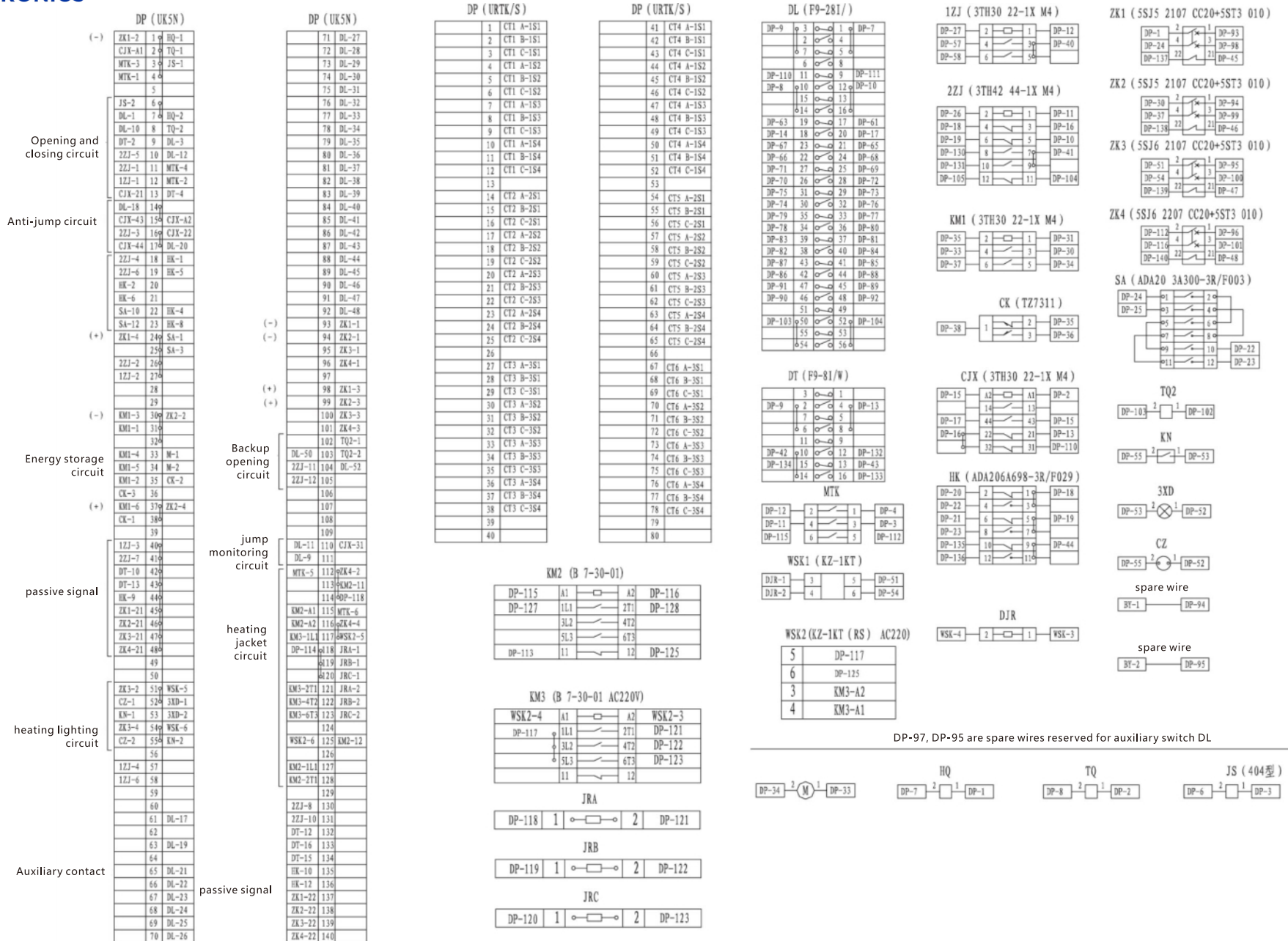
Signal								
barometric pressure alarm	air lock	Spring energy	Spring not charged	Far away	Control circuit power down	Energy storage circuit loses power	Heating and lighting circuits lost power	Heating mantle circuit de-energized

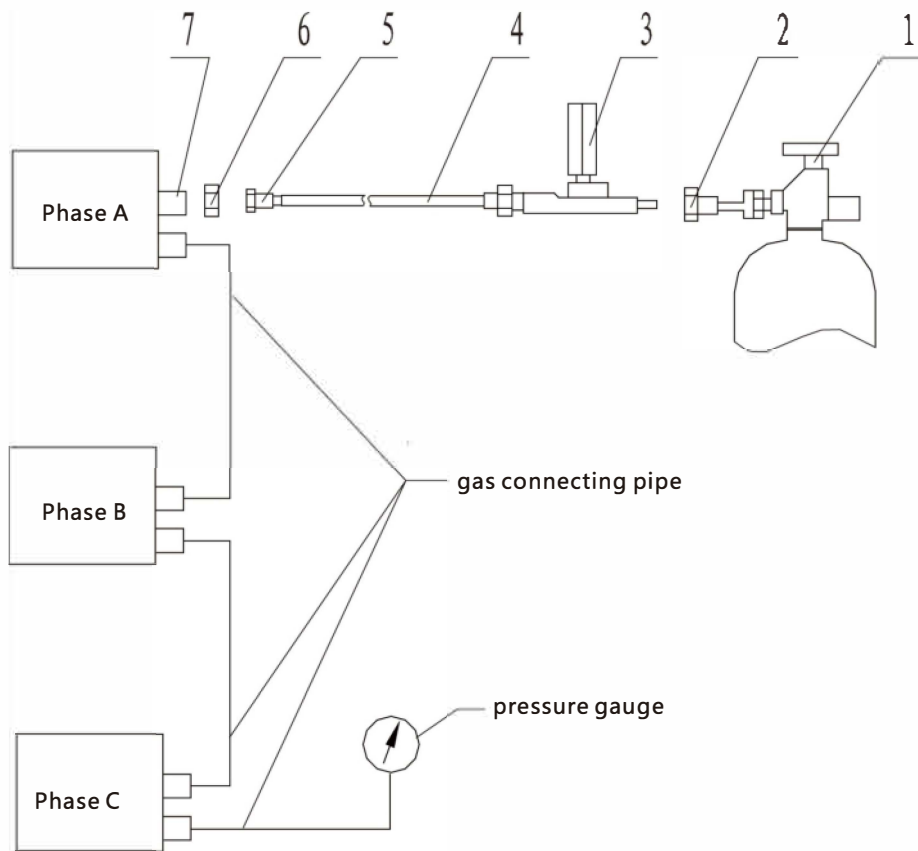


WSK1	Temperature and humidity controller	1	Starting temperature: -10°C Starting humidity: 90%	DJR	heater	3	Rated power: 80W
WSK2	Temperature and humidity controller	1	Start temperature: -30°C Return temperature: -20°C	JRA	Electric heaters	3	Including JRA/JRB/JRC, one set per phase
CK	Limit switch	1	Rated current: 5A	CZ	socket	1	
KM	contactor	1	Rated current: 6A Conventional heating current: 16A	XD	signal light	1	
MTK	Density controller	1	Rated pressure: 0.5MPa, 1 pair of overpressure alarm contacts (126) Rated pressure: 0.38MPa (72.5)	KN	toggle switch	1	Rated current: 5A
JS	Electromagnetic counter	1	Rated voltage: DC220V	CJX	Anti-jump relay	1	Rated current 6A Conventional heating current: 16A
DT	small auxiliary switch	1	Rated current: 10A	ZJ	Intermediate relay	2	Rated current 6A Conventional heating current: 16A
DL	auxiliary switch	1	Rated current: 10A	DP	Terminals	120slice	Maximum working voltage: 600V Rated current: 30A
TQ	Opening coil	2	Rated current: 2.5A	HK	transfer switch	1	Rated voltage: 220V Conventional heating current 10A
HQ	Closing coil	1	Rated current: 2.5A	SA	Operation switch	1	Rated current: 5A
M	Energy storage motor	1	Power: 600W	ZK	automatic switch	4	
code name	Name	quantity	The main parameters	code name	Name	quantity	The main parameters

Figure 6 Secondary schematic diagram

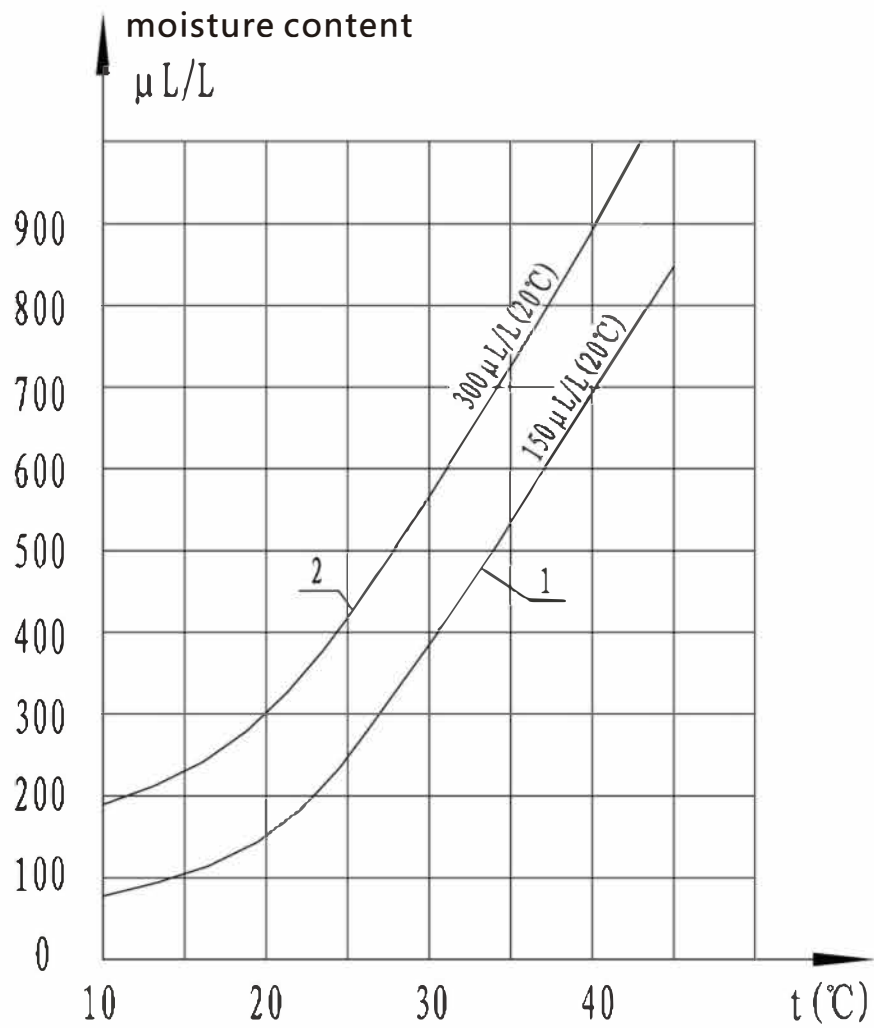
Figure 7 Secondary wiring diagram





- | | |
|--------------------------------------|------------------------------|
| 1. Cylinder valve | 5. Inflatable pipe connector |
| 2. Pressure reducing valve connector | 6. Protective nut |
| 3. Pressure reducing valve switch | 7. Inflation valve |
| 4. Inflatable tube | |

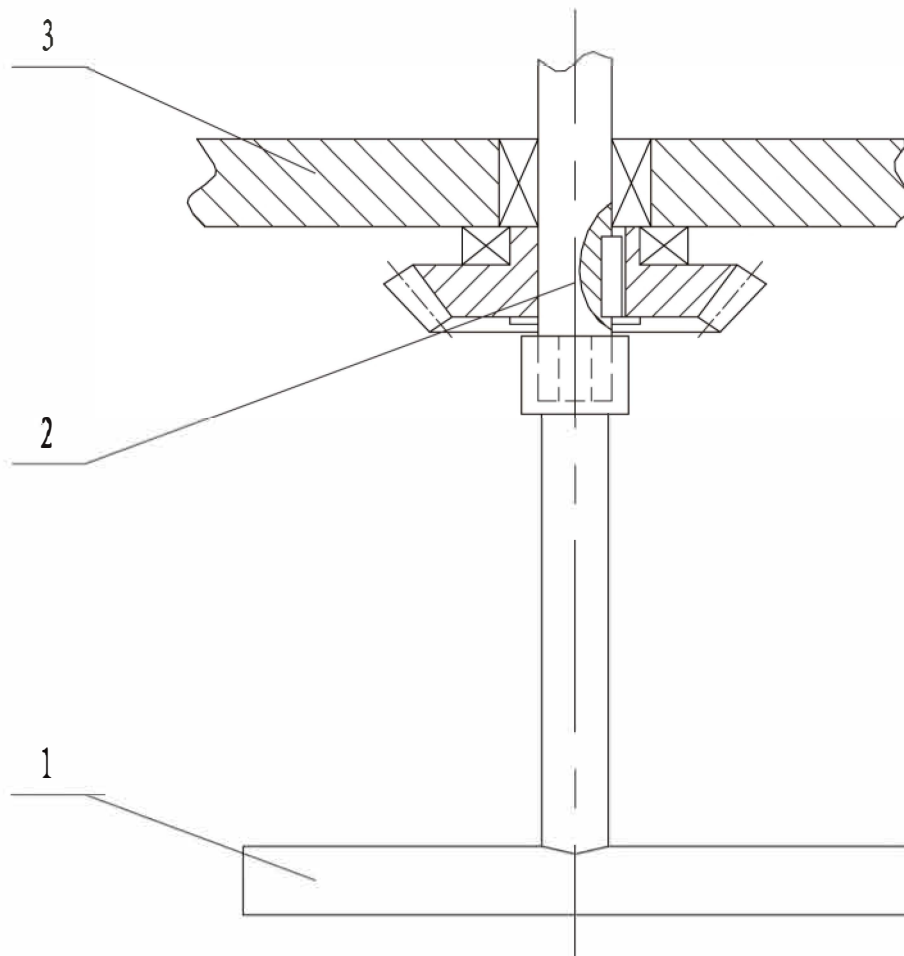
Figure 8 Schematic diagram of the connection of the inflatable tube



1. Permissible water content of SF6 gas during transfer test - temperature curve

2. Permissible water content of SF6 gas in circuit breaker operation - temperature curve

Fig.9 Moisture content-temperature curve of SF6 gas in SF6 circuit breaker



- 1. Energy storage wrench
- 2. Pawl shaft assembly
- 3. Agency House Siding

Figure 10 Schematic diagram of manual energy storage