

ZN65A<4>型超高寿命真空断路器安装使用说明书

一、概述

ZN65A<4>超高寿命型真空断路器为额定电压40.5kV，三相交流50Hz的户内高压电器设备。其突出的特点为机械寿命可达12万次，适用于工矿企业，变电站等输配电系统，作控制和保护开关；尤其适用于冶金、电弧炼钢等需频繁操作的行业，作为控制和保护设备。

本产品符合GB1984-89《交流高压断路器》的标准。

二、引用标准

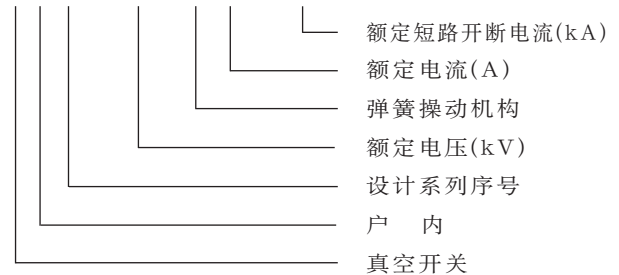
- GB1984-89 《交流高压断路器》
- GB11022-89 《高压开关设备通用技术条件》
- GB3309-89 《高压开关设备常温下的机械试验》
- GB763-90 《交流高压电器在长期工作时的发热》
- GB7675-87 《交流高压断路器的开合电容器组试验》
- GB2706-89 《交流高压电器动、热稳定试验方法》
- GB5273-85 《变压器、高压电器和套管的接线端子》
- JB3855-96 《3.6-40.5kV户内交流高压真空断路器》
- JB8738-1998 《3.6-40.5kV交流开关设备用真空灭弧室》
- GB16927.1-1997 《高电压试验技术》

五、产品使用环境

海拔高度：低于1000m； 环境温度：最高+40℃，最低-15℃； 相对湿度：日平均不大于95%，月平均不大于90%；
地震烈度：低于8级；
无火灾、爆炸危险，无腐蚀性气体及无剧烈振动的场所。

三、产品型号含义

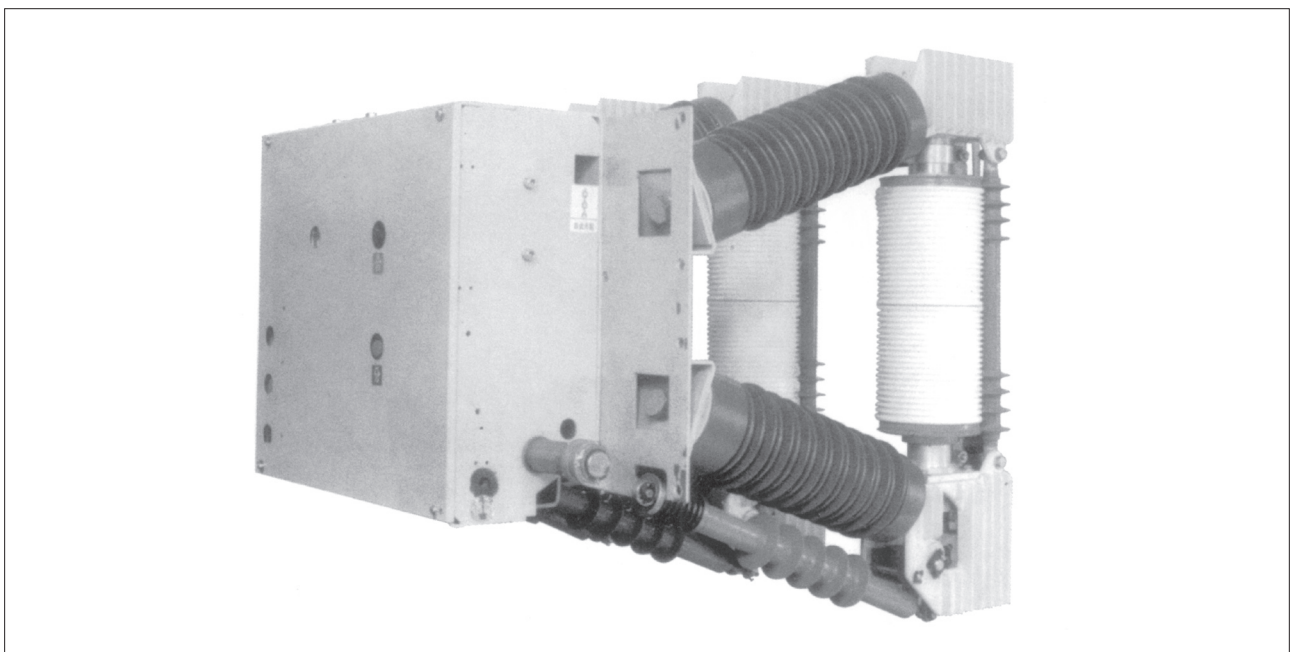
ZN65A-40.5/T2000-31.5



四、产品结构特点

本断路器结构简单，操动机构为弹簧储能式，操作功能极全。可用于交流或直流操作，也可用手动操作。机械寿命长，无爆炸危险，维修简便。

本断路器在设计、零部件选材、表面处理、工艺等方面均采取了有效的措施，如在真空管与上出线的联结上，采用了球面接触形式，使真空灭弧室的受力更合理；在轴销等一些零件上采用了先进的表面处理工艺，使零件更耐磨。在经过了一系列的改进措施后，ZN65A-40.5/T2000-31.5型真空断路器的机械寿命顺利的达到了12万次，在国内属首创产品，填补了我国高寿命真空断路器的空白。



USER'S MANUAL FOR ZN65A(4) LONGLIFE VACUUM CIRCUIT BREAKER

I Product overview

Type ZN65A long mechanical life vacuum circuit breaker for rated voltage of 40.5kv, three-phase, A.C., 50Hz, indoor use, with prominent feature of 120,000 times mechanical life is suitable for control and protection in industrial and mining industry enterprise. It is especially well served in industry of metallurgy and arc steel-making where frequent switching is a must.

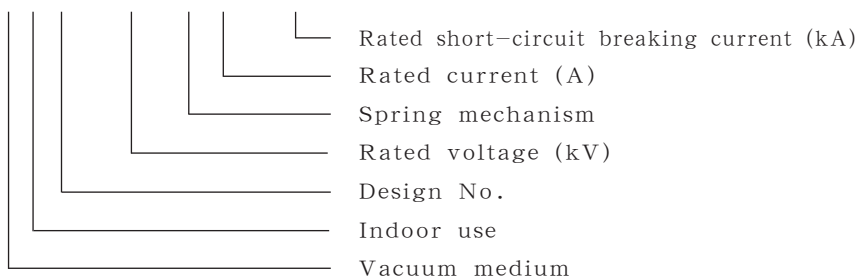
The product is tested to standard of GB1984-89 AC High-voltage Circuit Breaker.

II Applicable standards

GB1984-89	A.C. high-voltage circuit breaker
GB/11022-89	Common technical requirements for high voltage switchgear
GB/T3303-1989	Mechanical test at ambient temperature for high-voltage switchgear
GB763-90	Heating of A.C. high voltage apparatus under long run
GB7675-87	Breaking capacitor bank test for A.C. high voltage circuit breaker
GB2706-89	Dynamic and thermal stability test for A.C. high voltage circuit breaker
GB5273-85	Wiring terminals for transformer, high voltage apparatus and bushing
JB/T3855-1996	Indoor A.C. high-voltage vacuum circuit breaker
JB/T8738-1998	Vacuum interrupter for 3.6-40.5KV AC high-voltage switchgear
GB16927.1-1997	High-voltage test techniques

III Model implication

Z N65A - 40.5 / T2000 - 31.5



IV Salient features

Simple construction, spring operated mechanism and full set of operational performance; Available for AC, DC or manual charging; High mechanical endurance, no risks of explosion, and easy maintenance.

Effective measures are taken in design, material selection of components and parts, processing of surface, technique as well as other parts. For example, spherical connection is introduced in connecting interrupter and top terminal which reasonably deals with pressure to interrupter. Advanced technique in processing surface of pin shaft strengthens durability of components. After step by step improvements, ZN65A-40.5/T2000-31.5 favorably and firstly passes mechanical life test of 120,000 times and fills in gaps in long life circuit breaker in china.

V Service conditions

- The altitude does not exceed 1000m;
- Ambient air temperature does not exceed 40°C, and the minimum ambient air temperature is -15°C;
- Average relative humidity: The average value of relative humidity, over a period of 24h, does not exceed 95%; the average value of relative humidity, over a period of one month, does not exceed 90%;
- Seismic degree: Less than 8 degree. The product shall be used in place with no fire, explosion, corrosive gas and severe vibration.

六、基本参数和主要性能指标

序号	参数名称	单位	数值
1	额定电压	kV	40.5
2	雷电冲击耐受电压(峰值)	kV	185
3	1min工频耐受电压	kV	95
4	额定频率	Hz	50
5	额定电流	A	2000
6	额定短路开断电流	kA	31.5
7	额定短时耐受电流	kA	31.5
8	额定峰值耐受电流	kA	80
9	额定短路持续时间	s	4
10	额定短路开断时间	ms	≤90
11	额定短路关合电流	kA	80
12	额定操作顺序		分-0.3s-合 分-180s-合分
13	合闸时间及其上下限	ms	50~85
14	分闸时间及其上下限	ms	40~85
15	额定短路开断电流开断次数	次	20
16	机械寿命	次	120000
17	额定电容器组开断电流	A	630
18	储能电机额定功率	W	275
19	储能电动机额定电压	V	≈220.110
20	储能时间	S	≤15
21	合分闸电磁铁额定电压	V	=220.110
22	失压脱扣器额定电压	V	≈220.110
23	过流脱扣器额定电流	A	5
24	辅助开关额定电流	A	AC10 DC5

注：合、分闸及开断时间为最高、最低和额定操作电压下的操作时间。

七、机械特性调整参数

序号	参数名称	单位	数值
1	触头开距	mm	20±2
2	触头超行程	mm	5±1
3	合闸速度	ms	0.8~1.4
4	分闸速度	ms	1.1~1.8
5	触头合闸弹跳时间	ms	≤3
6	相间中心距离	mm	350±1.5
7	三相触头分闸同期性	mm	≤2
8	每相回路电阻	μΩ	≤45

注：合闸速度为合闸前6mm行程时的平均速度。
分闸速度为半行程时的平均速度。

八、产品结构及工作原理

1. 整体结构

断路器主要由真空灭弧室(4)，操动机构及支撑部分组成，在机构箱上固定6只绝缘子(2)，三只灭弧室通过上、下出线(4)、(5)固定在绝缘子上。下出线端上装有软联接(6)，

其中，软联接的下端分别固定在下出线上。

2. 真空灭弧室(见图3)

断路器的灭弧室由陶瓷外壳、上下法兰、动静触头、动静导电杆及屏蔽罩组成。动、静触头分别与动、静导电杆焊在一起。静导电杆与上法兰相焊，上、下法兰分别与上、下瓷壳封接，上、下瓷壳的中部由屏蔽罩上的金属环封接为一体。由此而形成一全密封腔，动导电杆在运动时，波纹管压缩或伸长，使腔内保持真空状态，在动导电杆下端还装有一绝缘的导向套筒。灭弧室内的气体压力不高于 1.33×10^{-3} Pa。

在真空中由于气体分子的平均自由行程很大，气体不容易产生游离，真空比大气绝缘强度要高得多。当开关分闸时，触头间产生电弧，触头表面在高温下挥发出金属蒸气，由于触头设计为特殊形状，在短路电流通过时，产生与电弧平行的纵向磁场，将电弧约束在磁场内，保持其扩散型，并均匀分布在触头表面，不集聚，因而电弧电压低，燃弧时间短，触头烧蚀甚微，电弧在电流自然过零时就熄灭了。触头间的介质强度又迅速恢复起来。

本灭弧室是中封结构，陶瓷外壳，触头为CuCr50材料，杯状纵磁场结构，采用了一次封排工艺，使灭弧室开断能力较高，截流水平较低，并且有很长的电寿命。

3. 操动机构(见图4)

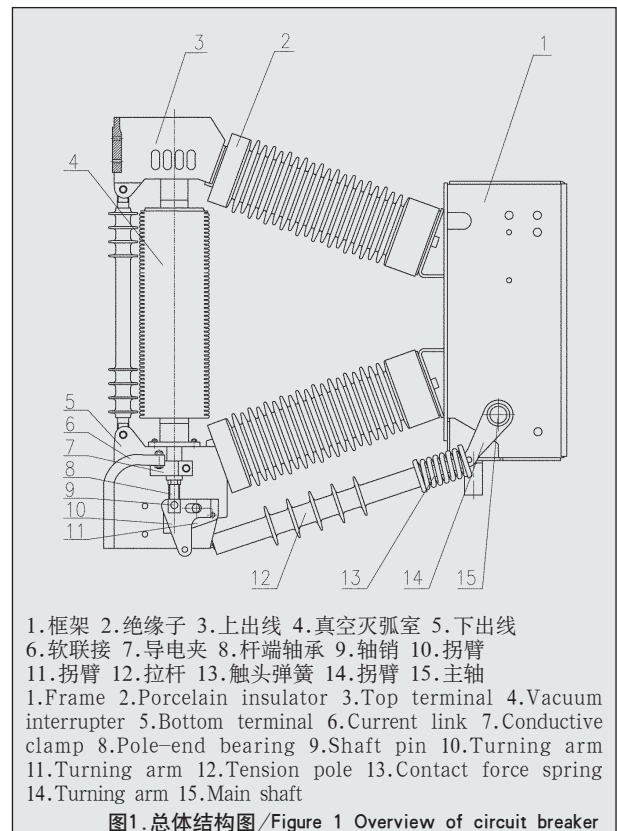


图1. 总体结构图 / Figure 1 Overview of circuit breaker

VI Technical details

No.	Item	Unit	Specification and description
1	Rated voltage	kV	40.5
2	Rated impulse test voltage, kV peak	kV	185
3	Imin Rated power frequency withstand voltage	kV	95
4	Rated frequency	Hz	50
5	Rated current	A	2000
6	Rated short-circuit breaking current	kA	31.5
7	Rated short time withstand current	kA	31.5
8	Rated peak value withstand current	kA	80
9	Rated short-circuit duration	s	4
10	Rated short-circuit breaking time	ms	≤90
11	Rated short-circuit making current	kA	80
12	Duty cycle		O-0.3s-C O-180s-CO
13	Closing time	ms	50~85
14	Opening time	ms	40~85
15	Rated breaking times of short-circuit	times	20
16	Mechanical life	times	120000
17	Rated breaking current of capacitor bank	A	630
18	Rated frequency of motor	W	275
19	Rated voltage of motor	V	≈220.110
20	Spring charged time	S	≤15
21	Rated voltage of closing and opening electro-magnet	V	=220.110
22	Rated voltage of loss-of-voltage release	V	≈220.110
23	Rated current of over-current release	A	5
24	Rated current of auxiliary switch	A	AC10 DC5

Note: Closing, opening and breaking time is the operation time for the highest, lowest and rated voltage of the circuit breaker.

VII Adjustable parameters of mechanical characteristics

No.	Item	Unit	Data
1	Clearance between open contacts	mm	20±2
2	Over travel of contacts	mm	5±1
3	Closing speed	ms	0.8~1.4
4	Opening speed	ms	1.1~1.8
5	Contact bounce time	ms	≤3
6	phase-to-phase spacing	mm	350±1.5
7	Opening simultaneity of contacts	mm	≤2
8	Circuit resistance of each phase	μΩ	≤45

Note: Closing velocity refers to average velocity in the first 6mm stroke.

Opening velocity refers to average velocity in half stroke.

VIII Product construction and service principal

1. Overall structure

The circuit breaker (See Fig.1) mainly consists of vacuum interrupter (4), operating mechanism and supporter. Six sets of porcelain insulators (2) are fixed on mechanism box and three interrupters are fixed on insulators via

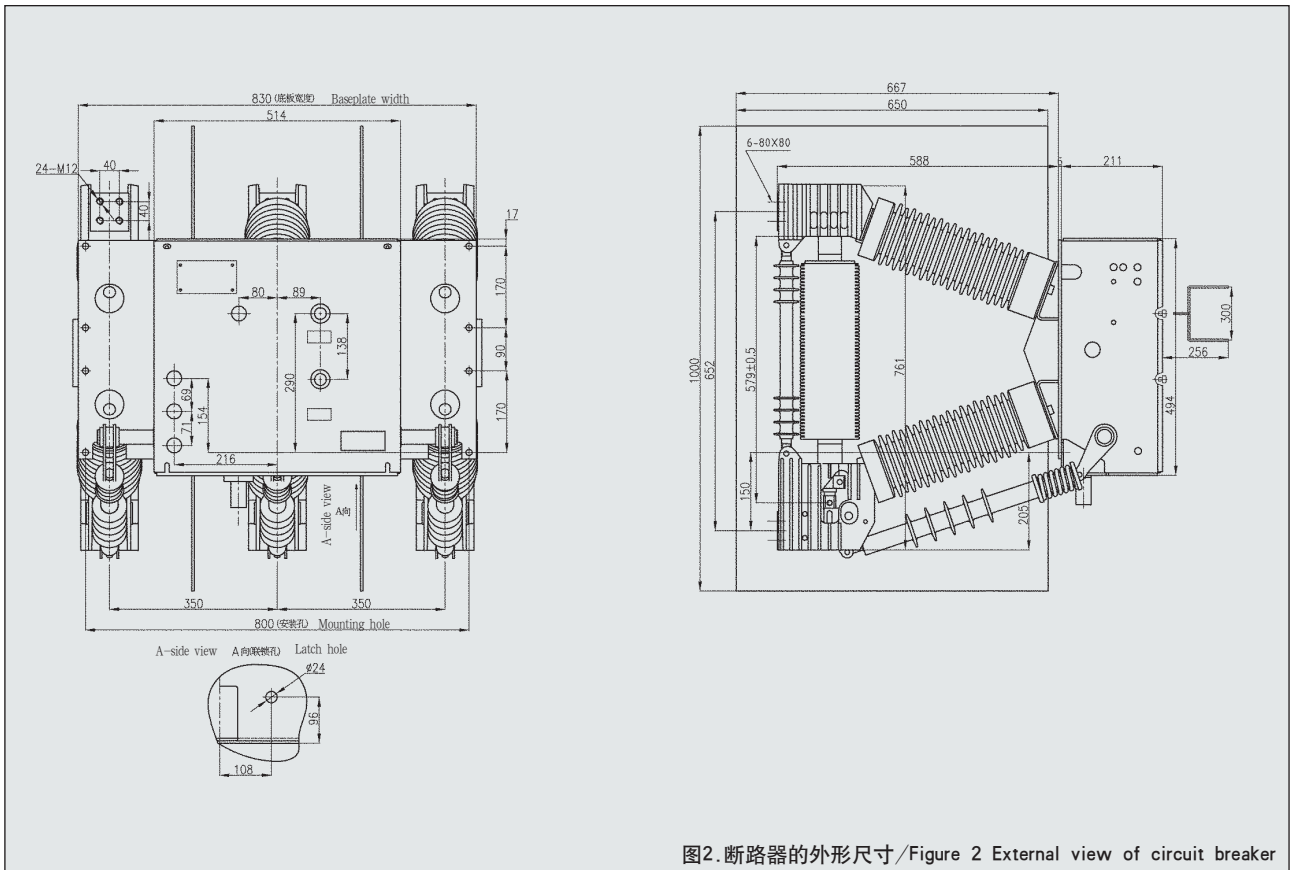


图2. 断路器的外形尺寸 / Figure 2 External view of circuit breaker

(1) 机构原理

操动机构主要由储能机构，锁定机构(合分闸掣子)、分闸弹簧、主轴、缓冲器及控制装置组成。

储能机构由减速器、储能电机和储能弹簧组成。储能机构主体是一个外壳为铸铝的减速箱，减速箱内是两套蜗轮蜗杆，储能轴横穿减速箱中，与蜗轮蜗杆无机械联系，储能轴上套一轴套，此轴套用键连在大蜗轮上，轴套上有一轴销，上面装一棘爪；在储能轴的右端装有一凸轮，凸轮上有一缺口，棘爪通过此缺口来带动凸轮转动，在储能轴的左端装有一曲柄，合闸弹簧一端挂在此曲柄上。减速箱的轴销上装有一个三角形的杠杆，杠杆上装一滚针轴承，凸轮将合闸弹簧的能量传给此轴承上，三角形杠杆的另一孔中用轴销与一连杆连接，该连杆的另一端装在主轴拐臂上，形成一四连杆机构，合闸力通过该机构传递给开关主轴，减速箱的轴销上还装有一滚针轴承，作为锁住合闸掣子用。

在开关主轴的拐臂上装有分闸弹簧，主轴上还有三对拐臂，其中两对分别作用在合闸橡皮缓冲器和分闸油缓冲器上，另一对拐臂上装一滚针轴承作为锁住分闸掣子用。该产品的合、分闸掣子完全相同。(如图4所示)

(2) 操作

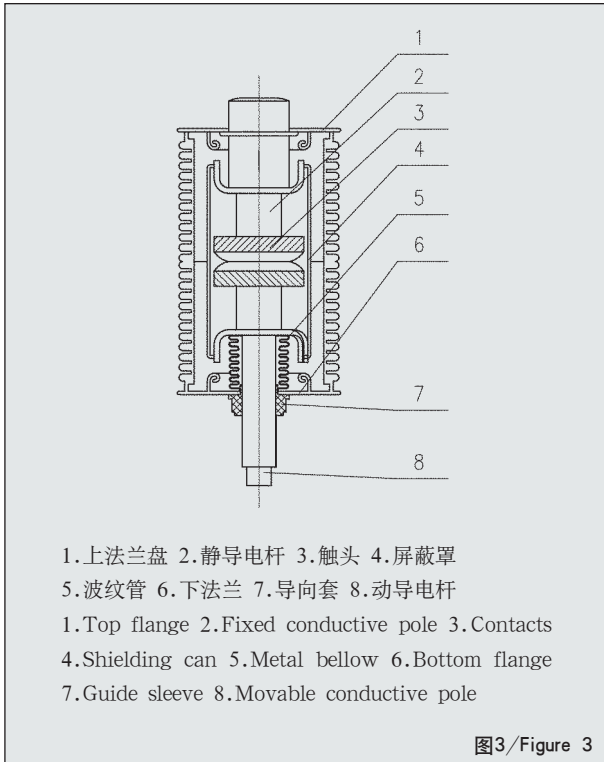
a. 储能

电动储能：接通电动机电源，轴套由减速箱中的大蜗轮带动使其转动，轴套上所安装的棘爪迅速进入凸轮上的缺口，这时，带动储能轴转动，合闸弹簧被拉起而储上能。当合闸弹簧被拉到最高点后被合闸掣子锁住，曲柄上的小连杆带动弯板压下微动开关，电机电源被切断，储能指示，显示在面板孔中，整个储能时间小于15s。

手动储能：将手摇把插入减速箱前方孔中，顺时针摇转约25圈，这时，棘爪进入凸轮缺口带动储能轴转动，再继续用力摇转手把约25圈，合闸储能完毕，卸下手把。

b. 合闸：接通合闸电磁铁电源或用手按压合闸按钮(红色)，合闸掣子被解脱，储能轴在合闸弹簧力的作用下逆时针转动，这时，凸轮压在三角杠杆上的滚针轴承上，杠杆上的连杆将力传给开关主轴，主轴带动绝缘拉杆、动导电杆，导电杆向上运动。主轴约转60度时被分闸掣子锁住，开关合闸。在合闸的同时，分闸弹簧被储上能，绝缘拉杆上安装的触头弹簧，亦被压缩，给触头施加了一个压力，“合闸指示”显示在面板孔中。

c. 分闸：接通分闸电磁铁电源或用手按压分闸按钮(黑色)，分闸掣子解脱，主轴在分闸弹簧和触头弹簧力的作用下逆时针旋转至主轴上的拐臂压死油缓冲器，断路器处于



top and bottom terminals. And the end of current link is fixed on the end of bottom terminal.

2. Vacuum interrupter

The vacuum interrupter is composed by the ceramic housing, top and bottom flange, movable and fixed contacts, movable and fixed conductive poles and shielding can. The movable and fixed contacts are separately welded with movable and fixed conductive poles. Fixed conductive pole is welded with top flange, and top flange and bottom flange are sealed respectively with top and bottom ceramic housing to form a sealed vacuum cavity. Metal bellow is compressed or prolonged to keep vacuum while movable conductive pole moves. Guide sleeve is installed under the bottom end of movable conductive pole. The pressure of gas inside of interrupter is not higher than 1.33×10^{-3} Pa.

The average mean-free of gas molecule is larger in vacuum and the gas is not subject to be dissociated, so dielectric strength of vacuum is higher than that of the air. While opening, arc occurs between contacts, and metal vapor is volatilized off the

surface of contacts. Longitudinal magnetic field, paralleling with arc occurs while short circuit passing through contacts of special design and confines arc within it and keep it evenly diffused on the surface of contacts. With voltage declining and time of arcing shortened, there is little damage on contacts and arc will go out when the circuit goes zero naturally. After that, dielectric strength will restore quickly.

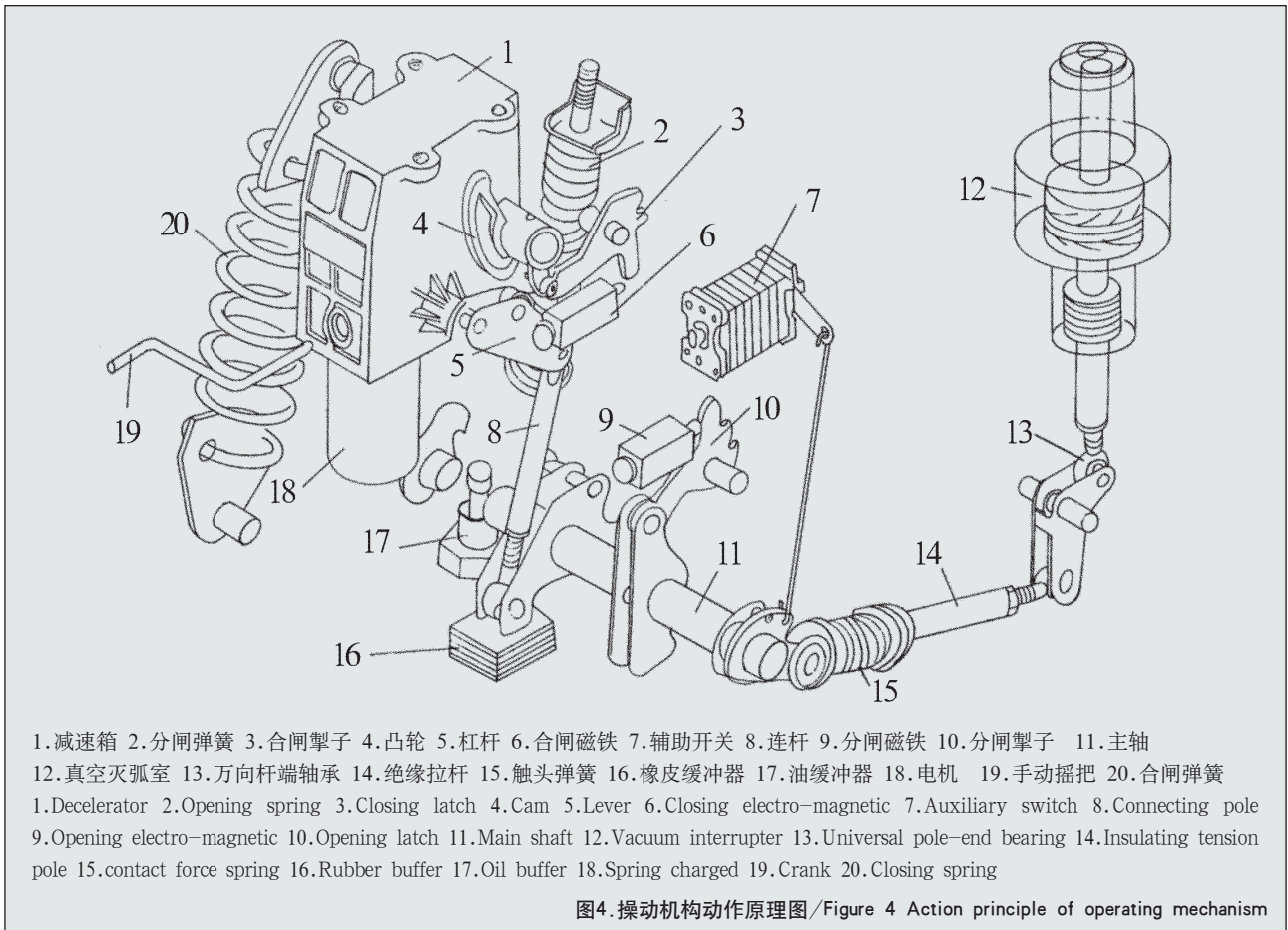
Middle-sealed structure, ceramic housing and contacts in copper-chromium composite material, cylindrical longitudinal magnetic structure as well as one-seal technology adopted ensure higher breaking capacity and bottom chopping current and longer electrical life.

3. Operating mechanism: (See Fig.4)

(1) Principle of mechanism

The operating mechanism is mainly composed of charging mechanism, latch mechanism (closing and opening latches), opening spring, main shaft, buffer and controlling device.

Charging mechanism is made up of decelerator, stored energy motor, spring charging motor and charging spring. The main part of spring charging device is a cast-in aluminum decelerator, in which there are two sets of worm gears that have no mechanical connection with charging shaft going through accelerator. A shaft sleeve sheathed on the charging shaft and keyed to worm gears has a shaft pin with a paw running with the cam fixed on the right end of the shaft via the gap on the cam. Closing spring is hanged on the crank fixed on the right side of the shaft. The cam passes the force of closing spring to the needle bearing of the triangle level fixed on the shaft pin. The other hole of the level is linked to a linking pole, one side of which is fixed on the turning arm of main, forming a four-linking mechanism through which the closing force is finally passed on to main shaft. A needle



分闸状态，“分闸指示”显示在面孔中。

d. 断路器在合闸后，电动机立即给合闸储能，也可用手动再次储能。

(3) 本断路器可根据用户要求安装不同规格、数量的控制部件。

a. 合、分闸电磁铁：为尺寸、数据完全相同的螺管式直流电磁铁。

b. 储能式脱扣器：

储能式脱扣器有过流和失压两种，过流脱扣器与失压脱扣器的结构略有不同。

过流脱扣器在开关合闸时，脱扣器铸铝壳内的弹簧被储上能，掣子被锁住，开关分闸时，线圈带电，电磁铁动作，掣子解脱，脱扣器冲击杆在弹簧力作用下弹出，冲击机构的分闸掣子使开关分闸。

失压脱扣器的线圈长期带电，脱扣器的掣子处于锁死状态。当电压降至一定时，线圈的吸合力减小到不能克服弹簧的拉力，掣子解脱，冲击杆在弹簧力的作用下弹出，冲击机构的分闸掣子使开关分闸。

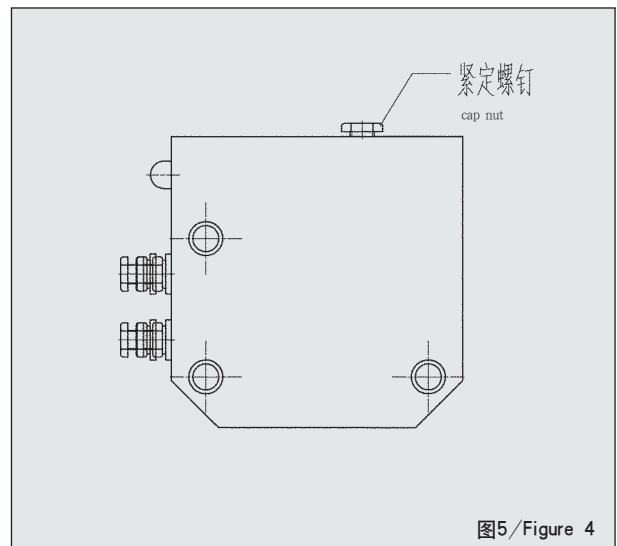
装有脱扣器的断路器，在检验合格出厂前，要将脱扣器的冲击杆压缩至死，并锁紧脱扣器外壳上的紧定螺钉，

使冲击杆被锁死，断路器到现场安装调试时，要将紧定螺钉放开(见图5)。

断路器最多可安装两个脱扣器，具体实施方案应按用户的要求进行。

c. 辅助开关有五对常开、常闭和十一对常开、常闭接点两种，其最大通过电流为10A。

d. 本断路器可带有一微型整流器，供无直流电源的用户使用。



bearing as a closing latch is installed on the shaft pin of accelerator.

Opening spring is fixed on the turning arm of main shaft. There are three pairs of turning arms, two pairs of which work, respectively, on closing rubber buffer and opening oil buffer, and one pair of which is installed by needle bearing as a lock opening latch. Closing and opening latches of the product are of the same specifications. (See Fig.4)

(2) Operation

a. Spring charging

- By motor: While powered on, shaft sleeve wheels prolonged by worm gears in the accelerator, and the paw rapidly goes into the gap of the cam, meanwhile, the shaft wheels and the spring is elongated. The spring will be latched at the highest point by closing latch, and sensitive switch will be pressed, and then motor stops work. Spring charged indication will appear on the hole of the panel, the whole time is less than 15s.

- By manual: Insert the handle into the hole in front of the accelerator and roll it clockwise twenty five circles, and at this time the paw goes into the gap to pull the shaft to roll, and continue for another twenty five circles when it means spring charging is finished and then take off the handle.

b. Closing: Power on closing electro-magnetic or press closing red button to release closing latch, and the shaft rolls counter clockwise under the force of spring. At this time, cam is pressing on the needle bearing of the triangle level and the connecting pole passes the force to the main shaft to drag insulating tension pole, movable conductive pole, and the conductive pole to move upwards. The main shaft will be locked at 60° angle by opening latch, switch closes. Meanwhile, opening spring is charged, and the contact force spring on insulating tension pole is pressed to press on contacts, closing indication appears on the hole.

c. Opening: Power on opening electro-magnetic or press opening black button to release opening latch, under the force of opening spring and contact force spring, main shaft rolls counter clockwise to the turning arm and press still the oil buffer. Opening indication appears inside of the hole.

d. After closing of circuit breaker, the closing spring shall be charged motor-driven or manually.

(3) Wide range of specifications and quantity of controlling components are available as requested:

a. Closing and opening electro-magnetic are of the same specifications and descriptions solenoid D.C. electro-magnetic.

b. Charging release

There are two kinds of releases, one is called over-current and the other is no-voltage release. And there is a little difference between the releases said above.

While closing, the spring inside the cast-in aluminum shell is pressed and the latch is locked. While opening, the coil is electrified and the electro-magnetic acts, the latch is released. The impulse pole is flipped off under the force of spring, and the opening latch of impulse mechanism help open.

Coil of no-voltage is electrified all the time, and the latch of release is locked dead. When the voltage descends to some extent and the attract force can not overcome the pull of spring, the latch is then released. The impulse pole is flipped off under the force of spring, and the opening latch of impulse mechanism help open.

After certified routine test and before delivery, the impulse pole of release shall be pressed till anchoring point and the bolt and nut shall be firmly locked to secure the impulse pole is deadlocked. The bolts can only be loosed at site commissioning. (See Fig.5)

The circuit breaker can be installed as much as two releases, and the scheme shall be implemented against users' requirements.

c. There are two kinds of auxiliary switches, one

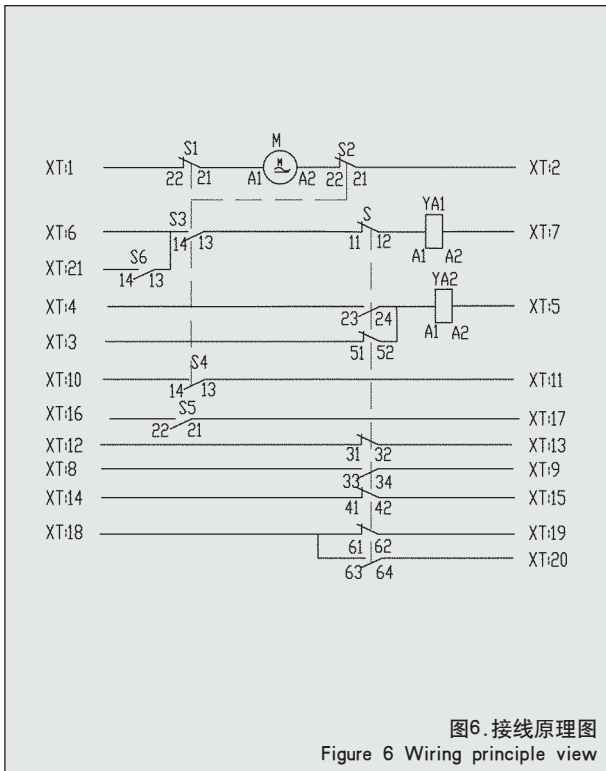


图6.接线原理图
Figure 6 Wiring principle view

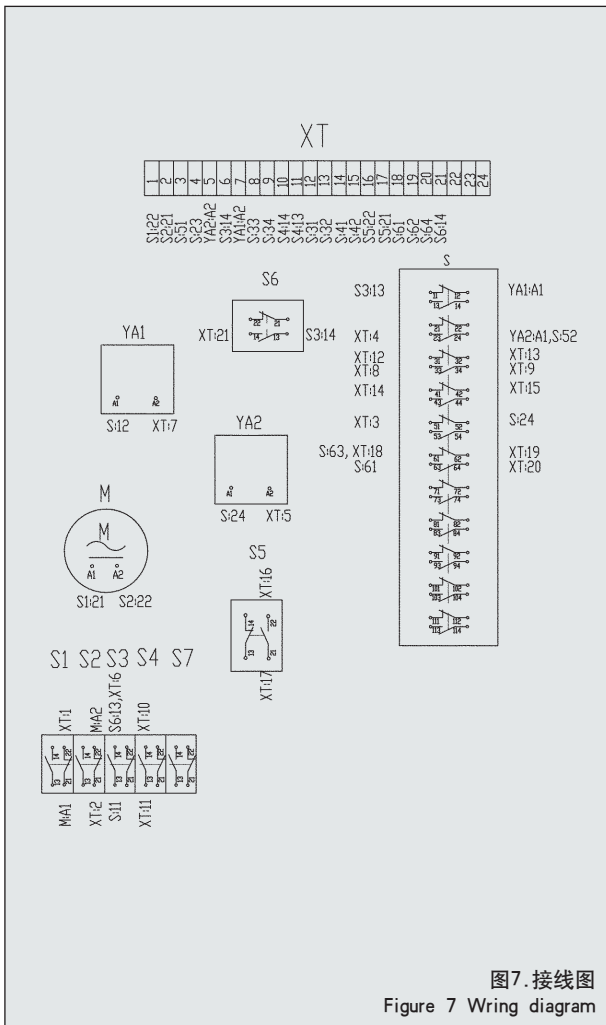


图7.接线图
Figure 7 Wring diagram

九、运输、验收及储运

1. 断路器在出厂时为合闸状态，合闸弹簧不得储能。
2. 断路器安装在手车上时与开关柜一起包装，如果单独供货则按包装规范包装。
3. 断路器在运输时处于合闸状态，不得倾斜及受强烈振动或雨淋。
4. 用户收到断路器时应进行以下工作：
 - (1) 检查包装是否损坏和受潮。
 - (2) 开箱取出装箱单，并对照其检查装箱文件是否齐全。
 - (3) 检查断路器铭牌上的技术参数是否符合订货要求。
 - (4) 检查附件及备品是否齐全。
 - (5) 检查断路器是否受潮，如果已受潮则需将绝缘隔板与绝缘拉杆拆下放入70~80℃的烘箱中烘烤48H。
 - (6) 断路器长期不用时，需在导电面上涂以工业凡士林油，并用清洁油纸包上绝缘件。
 - (7) 断路器应放在通风干燥的室内储存，垂直放置，不得叠放。
 - (8) 在机构箱的两侧带有起吊用的孔洞，作为起吊时挂钩用。不得钩住绝缘子或断路器的其他部位起吊。

十、安装

1. 导电部分用钢刷刷出金属光泽后用干布擦净，涂上工业凡士林油。
2. 带失压脱扣器的断路器需放松脱扣器的自锁螺母(见图5)。
3. 将机构箱侧面的接地孔锉出金属光泽并涂以工业凡士林再接地线。
4. 用手动使开关分、合闸。检查“储能”、“合闸”、“分闸”指示是否开确。
5. 用机构箱上的安装孔安装，外形图见图2。

十一、运行前的准备

1. 运行前用户无需对断路器进行任何调整，仅需检查各部位螺钉有无松动现象，若有则紧固；
2. 断路器各转动部分涂以润滑油；
3. 绝缘件表面擦拭干净；
4. 断路器通电进行试操作，无异常现象时即可投入运行。

十二、使用、维修与检修

1. 当断路器安装在海拔1000m以上，但不超过4000m时，其试验电压应按本标准规定的额定耐受电压乘以系数Ka。

$$K_a = \frac{1}{1.1 - H \times 10^{-4}}$$

式中：H—安装地点的海拔高度

has five pairs of NO and NC and the other has eleven pairs of NO and NC. The allowable current is 10A.

d. A mini rectifier is attached for users having no D.C. power supply.

IX Transportation, acceptance and storage

1. Circuit breaker shall be closed before delivery, and the closing spring shall not be pressed.

2. The circuit breaker installed on the trolley shall be packaged together with switchgear. If delivered separately, it shall be packaged according to package guide.

3. The closed circuit breaker on delivery shall not be inclined, severely vibrated or watered.

4. The following items shall be considered on arrival of the circuit breaker:

- a. Whether the package is damaged or wetted.
- b. Check documents, equipment, spare parts and auxiliary parts against packing list attached to be sure all parts have been received.
- c. Whether parameters on nameplate of circuit breaker comply with requirements of contract.
- d. If the circuit breaker is wetted, the insulating screen and the insulating tension pole shall be removed and baked in the oven under temperature of 70℃ ~ 80℃.
- e. If the circuit breaker is not put into operation immediately, petroleum jelly shall be daubed on conductive surface and the insulating parts shall be packed by purified oilpaper.
- f. The circuit breaker shall be vertically placed in ventilating and dry room, lapping over is not permitted.
- g. Special lifting device shall be installed on mechanism box for lifting and insulators, and other parts of circuit breaker shall not be hooked.

X Installation

1. The conductive parts shall be daubed on petroleum jelly after burnished by steel brush and wiped off.

2. The self-locking nut installed on the circuit breaker needs loosed. (See Fig.5)

3. The earthing hole on side of mechanism box shall be daubed on petroleum jelly and then earthed.

4. Close and open by manual to check out correctness of the signal "Energy storing", "Close" and "Open".

5. Install by the fixing hole on the mechanism, please refer to figure 2.

XI Preparation before delivery

1. No need to regulate circuit breaker, but to fasten bolts and nuts.

2. Movable parts of circuit breaker shall be painted by petroleum jelly.

3. The surface of insulators shall be wiped off.

4. The circuit breaker shall only be put into operation after successful pre-commissioning.

XII Usage, maintenance and repair

1. Test voltage of circuit breaker shall be calculated by multiplying rated power frequency test voltage specified in the document by coefficient Ka, if it services at altitude of higher than 1000m, but bottom than 4000m.

$$K_a = \frac{1}{1.1 - H \times 10^{-4}}$$

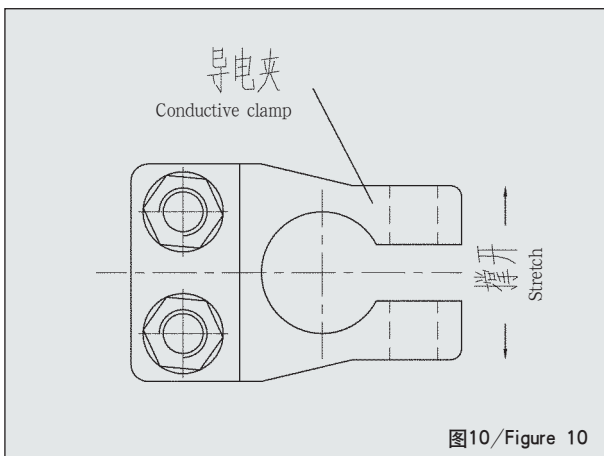
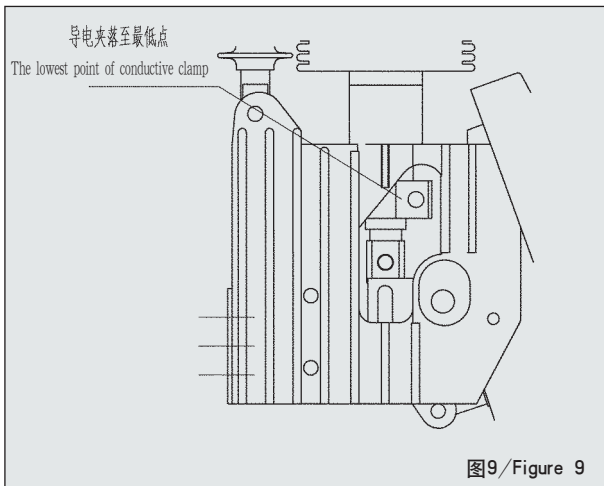
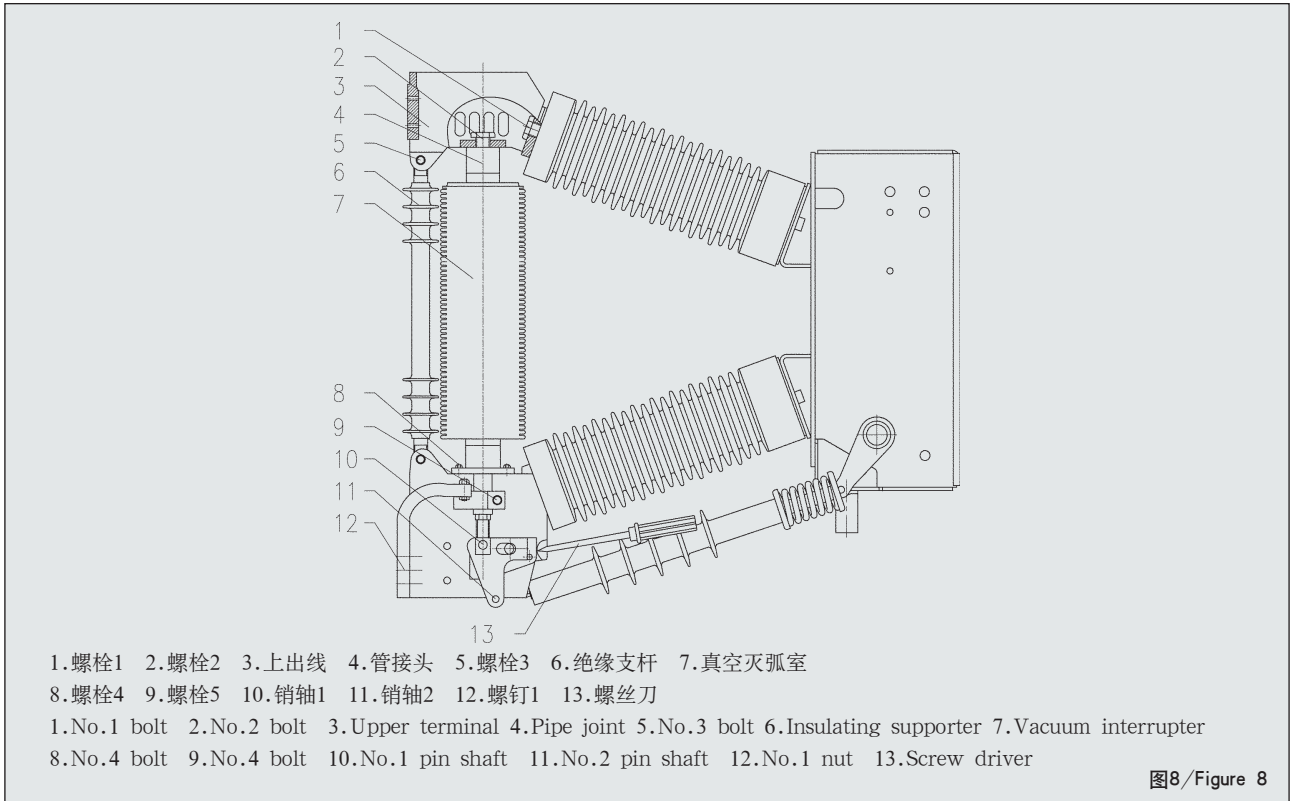
Where H (m) is the altitude of service place.

2. The circuit breakers of different Ir and Isc feature different electrical life.

3. The circuit breaker shall be lubricated and at an interval of 10 years operation or after 2000 times operation, and the bolts and nuts shall be refastened. Check and regulate travel and over-travel of contacts.

4. The vacuum interrupter shall be replaced if the following items occur:

- (1) After twenty years service.
- (2) More than breaking operations of rated short-circuit current specified in technical parameter table.



2. 断路器的额定电流和短路开断电流不同时，其电寿命不同。
3. 断路器在使用10年或操作达到2000次后，应上润滑油一次，并紧固各部位螺钉。检查调整行程和超行程。
4. 真空灭弧室在满足下列条件之一时，需进行更换。
 - (1) 使用20年；
 - (2) 达到技术参数中规定的短路电流开断次数；
 - (3) 达到技术参数中规定的机械寿命。
5. 更换灭弧室时，首先将断路器分闸，合闸簧不储能，与断路器相联的电源都断开，然后按以下顺序进行(见图8)。
 - (1) 拆去紧定螺钉1和螺栓5，将导电夹落至最低点(如图9)。
 - (2) 拆去销轴2的挡卡，按图所示用螺丝刀撬动与销轴2相连的拐臂后，拆下销轴2。
 - (3) 拆去销轴1的挡卡和垫圈，抽出销轴1。
 - (4) 用松开4条紧定螺栓4。
 - (5) 用24#套筒扳手松开螺栓2，22#套筒扳手松开螺栓1。
 - (6) 拆下螺栓3，并取下绝缘支杆。
 - (7) 拆下螺栓1、2，取下上出线和真空管上的接头。
 - (8) 取下真空灭弧室。
 - (9) 将导电夹取下装在新灭弧室的动导电杆上，验证动导电杆是否能自由装入导电夹内。如果电夹与导电杆配合紧密，可将导电夹张口撑大至能自由套入导电杆上(见图10)。
 - (10) 在安装新灭弧室之前，需将上出线、管接头、灭弧

(3) Achieved mechanical life required in technical details table.

5. While replacing interrupter, firstly, operation of closing and the closing spring shall not be compressed, the circuit breaker shall be powered off, finally proceed as the follows: (See Fig.8)

(1) Screw off No.1 cap nut and No.5 bolt, descend the conductive clamp to the lowest point. (See Fig.9)

(2) Remove baffle of No.2 pin shaft, and remove No.2 pin shaft while prizing turning arm connected with No.2 pin shaft, finally remove the pin shaft.

(3) Take down the baffle and washer of No.1 pin shaft, and then draw out the pin shaft.

(4) Loosen four No.4 cap nuts.

(5) Screw off No.2 bolt and No.1 bolt separately by wrench socket size of 24# and 22#.

(6) Screw off No.3 bolt and take off the insulating pole.

(7) Screw off No.1 and No.2 bolts, and then take off upper terminal and joint of interrupter.

(8) Take off interrupter.

(9) Take off the conductive clamp and install it on conductive pole of new interrupter to check whether movable conductive pole can be smoothly inserted into the clamp. If not, mouth of clamp shall be opened a bit until receiving smooth entry. (See Fig.10)

(10) Conductive parts of top terminal, joint, interrupter and conductive clamp shall be wiped off by clean cloth wetted by dehydrated alcohol before installation of new interrupter. All shaft pins shall be lubricated.

(11) Place conductive clamp under top terminal (See Fig.7), install interrupter, and then have conductive clamp encased on movable conductive pole.

(12) Install joint and top terminal, and screw No.1 and No.2 bolts to some extend.

(13) Install insulating pole, and No.3 bolt shall not

be screwed deady.

(14) Turn around vacuum interrupter until No.1 shaft pin, washer, and baffle are installed, and indication burning and damage shall face out.

(15) No.5 bolt and No.1 nut shall be fasten up after right installation of current link and conductive clamp.

(16) Fasten up bolts and nuts of all parts.

(17) Install No.2 pin shaft and baffle by screw driver.

(18) Check correct installation of all the parts and then close and open several times manually.

(19) Measure stroke and over-travel of circuit breaker by depth gauge and slide gauge, respectively, as is shown in figure 11.

Stroke of circuit breaker = $L_{\text{close travel}} - L_{\text{open travel}}$

Over travel of circuit breaker = $L_{\text{over-open}} - L_{\text{over-close}}$

$L_{\text{close travel}}$ means travel of circuit breaker when closing. $L_{\text{open travel}}$ means travel of circuit breaker when opening.

$L_{\text{over-open}}$ means over travel of circuit breaker when opening. $L_{\text{over travel}}$ means over travel of circuit breaker when closing.

(20) When regulating stroke and over travel of circuit breaker, firstly, screw off the cap nut and then screw off terminal of articulated bolt following up (2), if screw articulated bolt inward, travel will be lengthened, over-travel will be shortened, and it will be completely different if screw outward. Finally, install tension pole and remeasures it till the data is satisfied and then fasten up all parts.

6. Replacement of the motor (See Fig.12)

(1) The closing spring is not charged and the circuit breaker is powered off and on opening state.

(2) Draw out the terminal of the micro-gap switch (Users do not understand wiring diagram shall write down the position for later wiring), remove No.1 baffle, and then remove No.1 shaft, finally remove

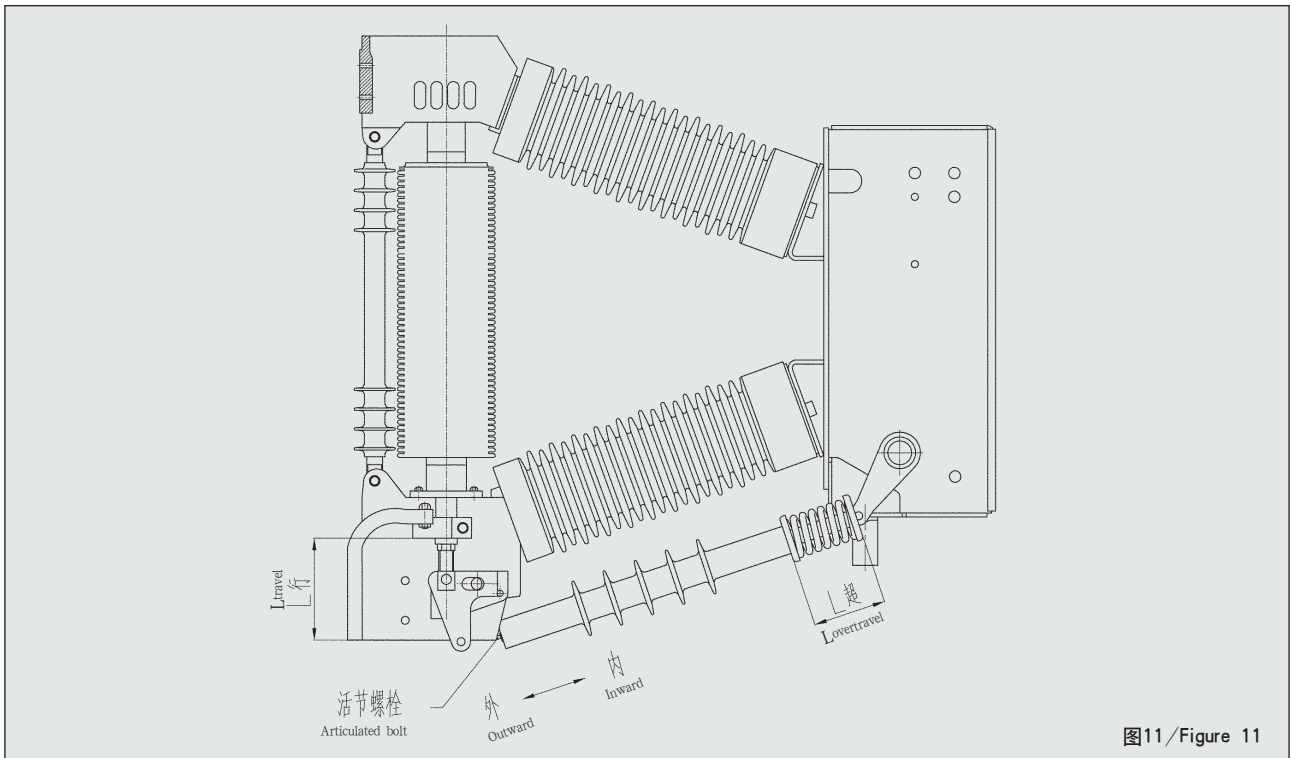


图11/ Figure 11

室、导电夹的各导电部分用干净的布加无水酒精擦干净。各轴销涂润滑油。

(11) 将导电夹如图7放在下出线上，装上真空灭弧室，并将导电夹套在灭弧室的动导电杆上。

(12) 装上管接头和上出线，并将螺栓1、2旋入一定的深度。

(13) 装上绝缘支杆，螺栓3不紧死。

(14) 转动灭弧室至装上轴销1及垫圈和挡卡，注意导电杆上烧损标记要朝外。

(15) 装上螺栓5和螺钉1，把软联结和导电夹装正后将它们紧死。

(16) 把各部分的螺栓都紧死。

(17) 借住螺丝刀装上轴销2及挡卡。

(18) 检查各部分安装正确后，手动储能并合分闸操作几次。

(19) 分别用深度尺和游标卡尺测量断路器的行程和超行程，如图11。

断路器行程 = $L_{行合} - L_{行分}$ ；

断路器超程 = $L_{超分} - L_{超合}$ ；

其中： $L_{行合}$ 为断路器合闸状态的行程， $L_{行分}$ 为断路器分闸状态的行程； $L_{超分}$ 为断路器合闸状态的超行程， $L_{超合}$ 为断路器合闸状态的超行程。

(20) 调节断路器的行程和超行程时，首先松开活节螺栓上的紧定螺母，然后按(2)卸下拉杆的活节螺栓端，活节螺栓向内拧，行程增大、超程减小；向外则反之。然后装上拉杆重新测量。反复至数据合格后，将各部分紧死。

6. 更换电动机(见图12)

(1) 合闸簧不储能，断路器处于分闸状态，切断与断路器相联的一切电源。

(2) 拔去微动开关上的接线(看不懂接线图的用户在拔之前可将各接线位置记下，以便最后恢复)，拆下轴1上的挡卡，拆下轴1，然后取下微动开关。

(3) 拆去紧定螺栓1及连杆上的挡卡垫圈，将连杆与支架1整体取下。

(4) 拆下电动机与减速器相联的两个螺栓，取下电动机。

(5) 换上新电动机，注意要使电动机输出轴上的键与减速器正确配合。

(6) 按以上相反的顺序将各件装好，螺栓紧定。

(7) 手动储能，合分动作几次后电动储能合分操作几次，动作正常后电动机更换完毕。

7. 更换合闸簧(见图12)

(1) 合闸簧不储能，断路器处于分闸状态，切断与断路器相联的一切电源。

(2) 将螺钉1放松，使减速器的位置下降。

(3) 取下合闸簧上的挡卡垫圈，取下合闸簧。

(4) 将新合闸簧的配合孔擦干净后涂润滑脂，安上合闸簧。

(5) 装上垫圈、挡卡。

(6) 检查正确后，手动储能合分闸操作几次，动作正常后合闸簧更换完毕。

8. 微动开关与辅助开关的故障排除(见图12)。

微动开关与辅助开关的故障主要是触点的烧损，用户可按断路器的接线图与接线原理图，用现有微动开关与辅

micro-gap switch.

- (3) Screw off No.1 cap nut and the washer on the connecting pole, take off connecting pole and supporter together.
- (4) Screw off two sets of nut and bolt fasten motor and accelerator, and then take off the motor.
- (5) Replace the old motor, and you should pay attention to good coordination of key on output axis and accelerator.
- (6) Reassemble all the parts reversely, and fasten the bolts and nuts.
- (7) Spring charging manually, several circles of closing and opening and then followed by motor driving.

7. Replacement of closing spring (See Fig.12)

- (1) The closing spring is on natural state and the circuit breaker is powered off and on opening state.
- (2) Loose No.1 cap nut and descend the decelerator.
- (3) Remove the washer and baffle on the closing spring and then remove the spring.
- (4) Wipe off and lubricate the measured pole and install intact spring.
- (5) Install washer and baffle.

8. Trouble shooting of micro-gap switch and auxiliary switch

The frequent fault of micro-gap switch and auxiliary switch is burning and damage of contacts. The use can replace them with the other intact contacts according to the wiring diagram and principle diagram of circuit breaker. While trouble shooting, the circuit breaker shall be on raw, opened state and powered off. Screw off No.2 cap nut, and remove No.2 supporter, connect the wire to the right contact. If contacts are not available, new micro-gap switch and auxiliary switch can be used.

XIII Documents attached

- a. Product certificate
- b. Product manual
- c. Packing list

(Wiring diagram of circuit breaker in service shall be attached if wiring diagram designed by user comes into conflict with standard wiring diagram of circuit breaker.)

XIV Spare parts and auxiliary parts

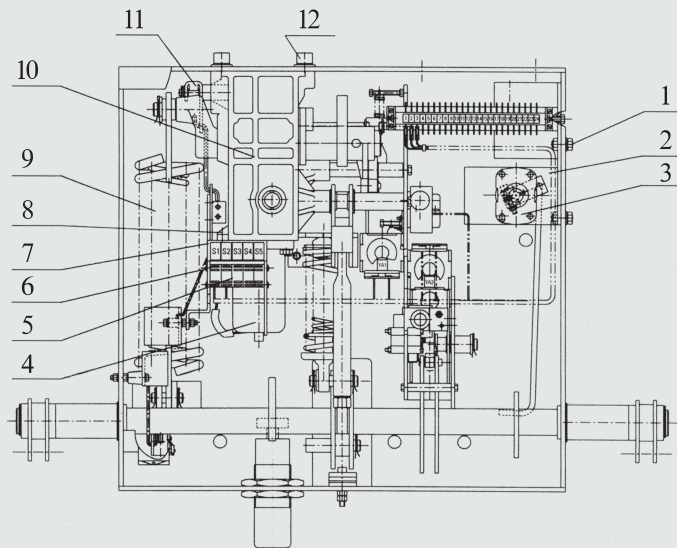
1. Ex-works spare parts

Handle	Sheath	Crimped joint
1	24	24

2. List of mechanical life for partly components

Item	Operations (times)
Vacuum interrupter	30000(20000)*
Opening and closing coils	30000
Closing spring	60000
Motor	60000
Auxiliary switch	60000
Micro-gap switch	60000

* Mechanical life of circuit breaker manufactured domestically is 20000 operations, and for that imported is 30000 operations.



1. 紧定螺钉 2. 支架 3. 辅助开关 4. 电动机 5. 微动开关 6. 轴 7. 支架
 8. 紧定螺栓 9. 合闸簧 10. 减速器 11. 连杆 12. 紧定螺钉
 1.No.2 cap nut 2.No.2 supporter 3.Auxiliary switch 4.Motor 5.Micro-gap switch 6.No.1 shaft
 7.No.1 supporter 8.No.1 Cap bol 9.Closing spring 10.Decelerator 11.Connecting pole 12.No.1 cap nut

图12/ Figure 12

助开关的其它完好触点替换。辅助开关的故障排除时，断路器不储能，处于分闸状态，没有和其它电源相联。拆下紧定螺钉2后，取出支架2，将线接在合适的触点上。如果没有可用触点，可换新微动开关或辅助开关。

十三、随机文件

1. 产品合格证书；
2. 安装使用说明书；
3. 装箱单。

(用户要求接线图与断路器标准接线图不一致时，要附断路器实际接线图)

十四、备品及附件

1. 出厂备件

摇把	护套	压接簧片
1	24	24

2. 部分零件寿命一览表

名称	寿命(次)
真空灭弧室	30000(20000)*
合分闸线圈	30000
合闸簧	60000
电动机	60000
辅助开关	60000
微动开关	60000

* 国产灭弧室寿命20000次，进口灭弧室寿命30000次。

十五、订货须知

1. 订货时应注明断路器型号、名称、主要技术参数及订货数量；电动机电压种类及参数、脱扣器种类及参数、数量、辅助开关接点对数；合、分闸电磁铁电压，用户如果需要其它备品须在订货时提出。
2. 用户在订货前需查看断路器的标准接线及原理图，如有其它要求，需在订货时向我公司提出，经两方协商一致后，方能订货。并且在订货协议上注明：随安装使用说明书附接线图。

提示：

本书说明书所涉及的内容，包括文字、图形、参数等，如做任何修改，恕不另行通知！

包装物不回收，请做好包装物及废弃物的处理，保护环境。

注意安全，保护人身健康。

XV Instructions for placing orders

1. Type, description, main parameters, quantity, as well as variety and parameters of motor voltage, specification of release, pairs of auxiliary contacts; voltage of closing and opening electro-magnet; special requirements and spare parts should be notified while ordering.
2. Purchasers shall check standard wiring and principle of circuit breaker before ordering, other requirement shall be mentioned while ordering. Only after agreement of both parties, can they sign a contract. Wiring diagram attached with user's installation manual shall be clarified on order agreement.

Caution:

All the contents covered in this specification, including words, diagram, parameters etc, can be modified without prior notice.

Properly dispose of the wrapped and wastes. Strengthen environment protection.

Attach importance to human health and safety.