

ZN105-12/T6300-80型发电机保护用真空断路器安装使用说明

一、概述

ZN105-12/T6300-80型发电机出口保护用户内高压真空断路器是北京北开电气股份有限公司针对我国电力行业对大容量负荷用控制、保护断路器尚依赖进口的现状，于二〇〇三年开发出的新产品，是北京北开电气股份有限公司在消化、吸收自一九八三年引进的德国西门子公司3AF技术(即国产ZN12-12系列真空断路器)基础上，自行设计、研制的集大额定电流(6300A)和高开断容量(80kA)于一体的大容量真空断路器。

- 本断路器为额定电压12kV、三相交流50Hz户内交流高压开关设备，技术性能达到了国际先进水平，并填补了国产真空断路器在该参数等级的空白。
- 本断路器装配国营七七七厂灭弧室。可适用于发电机出口的保护开关。
- 本断路器机构与开关一体式设计，专用的弹簧储能式操动机构可实现交直流及手动操作。
- 本断路器设计先进、合理，性能优越，开断能力强，机构寿命长，操作功能齐全，无爆炸危险。适用于发电厂、大型变电所及高负荷用电工矿企业的控制和保护开关。
- 本断路器绝缘性能好，全面满足户内Ⅱ级污秽环境的使用要求。
- 本断路器作发电机断路器时，符合GB/T14824-93《发电机断路器通用技术条件》标准及DL427-91《户内型发电机断路器订货技术条件》。
- 产品使用环境及条件：

海拔高度：低于2000m

环境温度：最高+40°C，最低-25°C

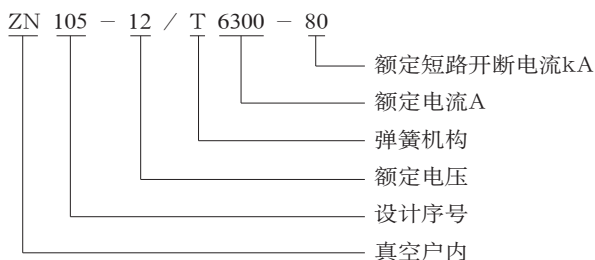
相对湿度：日平均不大于95%，月平均不大于90%

地震烈度：低于8级

无火灾、爆炸、无腐蚀性气体及无剧烈振动的场所。

二、技术参数

1、产品型号ZN105-12/T6300-80 的含义：



- 2、产品技术参数(见表2)
- 3、机械特性调整参数(见表1)

表1

参 数	单 位	数 据
触头开距	mm	11 ± 1
触头超行程	mm	6 ± 1
合闸速度	m/s	0.8~1.3
分闸速度	m/s	0.9~1.6
触头合闸弹跳时间	ms	≤ 5
相间中心距离	mm	400 ± 1.5
三相触头合分闸同期性	ms	≤ 5
每相回路电阻	μΩ	≤ 15

三、产品结构及工作原理

1、结构设计特点：

(1) ZN105-12/T6300-80型真空断路器在设计上较好地保持了3AF(即ZN12-10系列产品)设计上的优越性、系列性及零部件通用性。灭弧室采用CuCr触头材料、杯状加强的纵磁场结构，主屏蔽罩为外露式的真空灭弧室，设计裕度大。操动机构与断路器一体式设计，仅由两级蜗轮、蜗杆组成的减速箱，两套四连杆机构(其公共铰接点即断路器主轴)及一套变直机构便完成了全部储能、合分闸操作；整体设计布局合理、结构紧凑，传动杆系受力均匀，传动效率高，机构寿命长；先进的设计完全吻合纵向磁场灭弧室要求的断路器应具有较高的初分速度的特点，故开断能力强，电寿命长。

(2) 纯紫铜材质的上下出线及其双进(出)线方式，导电夹下出线三软联接三侧导电结构，圆满解决了断路器大额定电流6300A长期工作时发热问题—顺利通过了温升试验。

(3) 每相上下出线固定方式采用双绝缘子结构，较好地解决了大容量开断80kA 时短路电动力对产品强度要求。

(4) 传动环节中的拉杆及支杆均采用引拔棒为基体外护硅橡胶及伞裙，相间加装SMC材质绝缘隔板；这些措施提高了断路器整体绝缘水平，增加了绝缘裕度，使产品绝缘性能高于原3AF技术，并全面满足户内Ⅱ级污秽环境使用要求。

2、整体结构(见图1，图2)：

断路器主要由真空灭弧室、操动机构及支撑部分组成。在机构箱(1)上固定12只绝缘子(2)，三只灭弧室通过上、下出线(3)(9)固定在绝缘子上。下出线端装有两片软联

Installation and Use Guides of Type ZN105-12/T6300-80 Vacuum Breaker

I. Profile

In 2003, Beijing Beikai Electric Co., Ltd. developed the Type ZN105-12/T6300-80 indoor high-voltage vacuum breaker as the latest product for the following reason: The Chinese power industry had relied on the imported breakers oriented to the control and protection of highcapacity loads. This large-capacity vacuum breaker is integrated with big rated current (6,300A) (in reference to the international advanced same-product technological features) and high breaking capacity (80kA). It was designed developed on the basis of Germany Siemens 3AF technology (for domestic ZN12-12 series of vacuum breaker) that was imported in 1983.

- This breaker is an indoor AC high-voltage switch device of rated voltage 12kV and 3-phase AC 50Hz, whose technological performance tops domestically, hits the internationally advanced level and fills the blank in the parameter classes of domestic vacuum breakers.

- This breaker can be equipped with the arc chambers provided for generator protection by the state-owned No.777 factory.

- The mechanism of breaker is designed with the integration of switches. This special spring energy-storage operating mechanism can achieve the AC, DC and manual manipulations.

- The breaker is advanced and reasonable in design, with the characteristics of good performance, strong opening and closing abilities, long mechanical life, complete operation functions and free explosion, so this breaker is applicable to the controlling and protective switches of power plants, big-sized transformer substations and highload power-consuming industry enterprises.

- The breaker features good insulation performance, so it can completely satisfy the use requirements of II-class filthy environment.

- For generator protection use, the circuit breaker complies with standards of GB/T14824-93 «Common technical requirements for generator circuit breaker» and D1427-91 «Order technical requirements for indoor generator CB» .

- Environment and Conditions of Use Altitude: Lower than 2,000m.

Ambient air temperature: The upper and lower limits are +40°C and -25°C.

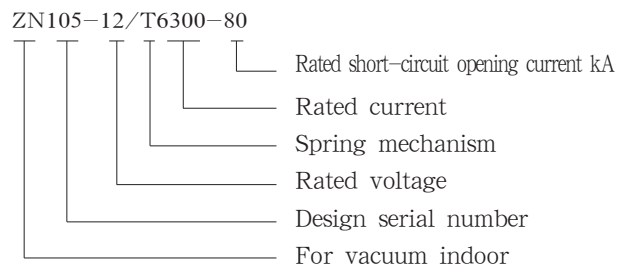
Relative humidity: The daily average is not more than 95% and the monthly is not more than 90%.

Earthquake intensity: lower than the class VIII.

The breaker is not used in the places of fire, explosion, corrosive gas and intensive shock.

II. Technical Specifications

1.The type of product is ZN105-12/T6300-80 that means;



2. Technical parameters (See Tab.2)

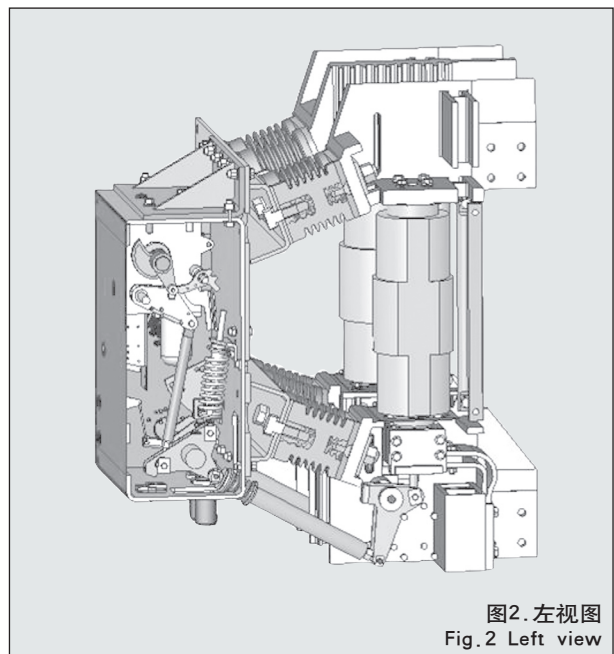
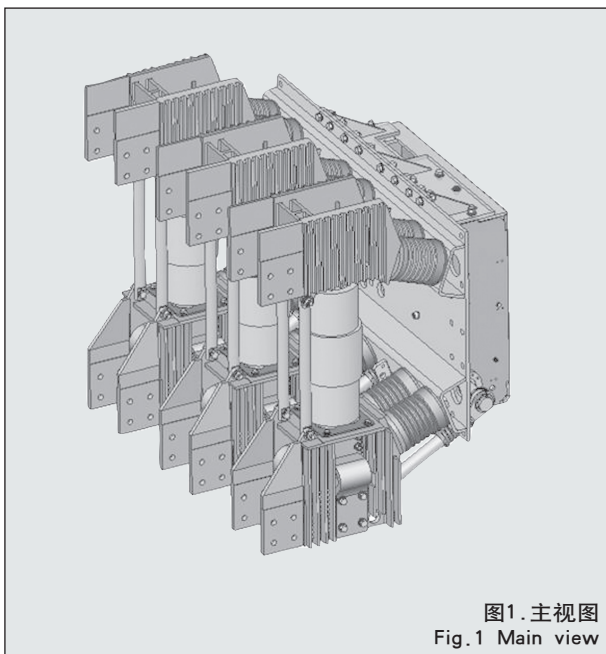
3. Adjustment parameters in mechanical performance (See Tab.1)

Tab.1

Parameter	Unit	Parameter
The distance of contactor	mm	11 ± 1
The over travel of contactor	mm	6 ± 1
The closing speed	m/s	0.8~1.3
The opening speed	m/s	0.9~1.6
The time of contactor's full-opening skip	ms	≤ 5
Distance to center	mm	400 ± 1.5
Simultaneity three contactors' opening and closing	ms	≤ 5
The resistance of each circuit	μΩ	≤ 15

表2

参数		单位	数据
额定电压		kV	12
额定电流		A	6300
额定短路开断电流		kA	80
额定峰值耐受电流		kA	224
额定短时耐受电流		kA	80
额定短路关合电流(峰值)		kA	224
额定短路持续时间		S	3
额定短路开断电流开断次数		次	5
额定操作顺序			合分-15min-合分
额定频率		Hz	50
雷电冲击耐受电压(峰值)	相间对地	kV	75
	真空断口	kV	85
1min工频耐受电压	相间对地	kV	42
	真空断口	kV	50
合闸时间		ms	40-65
分闸时间		ms	35-65
开断时间		ms	50-80
机械寿命		次	4000
储能电动机额定功率		W	550
储能电动机额定电压		V	≈220
储能时间		S	≤15
合分闸电磁铁额定电压		V	≈220
合分闸电磁铁额定电流		A	2
辅助开关额定电流		A	AC10 DC5
额定失步开断电流		kA	40
额定负荷开合次数		次	50
额定非对称开断电流直流分量百分数		%	平均74; 最高80
额定失步非对称开断电流直流分量百分数		%	50~60



Parameter		Unit	Parameter Common breaker
Rated voltage		kV	12
Rated current		A	6300
Rated short-circuit opening current		kA	80
Rated peak-value endured current		kA	224
Rated short-time endured current		kA	80
Rated short-circuit closing current (peak value)		kA	224
Rated short-circuit duration		S	3
The rated breaking times of short-circuit breaking current		times	5
Rated operation sequency			CO-15min-CO
Rated frequency		Hz	50
The thunder-impacting endured voltage (peak value)	phases to earth	kV	75
	Vacuum break	kV	85
The 1min work-frequency endured voltage Intermittent grounding	phases to earth	kV	42
	Vacuum break	kV	50
The closing time ms		ms	40-65
The opening time ms		ms	35-65
The breaking time ms		ms	50-80
Mechanical life times		times	4000
The rated power of energy-storage motor		W	550
The rated voltage of energy-storage motor		V	≈ 220
The energy-storage time		S	≤ 15
The rated voltage of opening and closing magnet		V	≈ 220
The rated current of opening and closing magnet		A	2
The rated current of auxiliary switch		A	AC10 DC5
Rated out-of-phase breaking current		kA	40
Times of rated load switching		times	50
Rated asymmetric breaking current DC component percentage		%	Average 74; maximum 80
Rated out-of-phase asymmetric breaking current DC component percentage		%	50~60

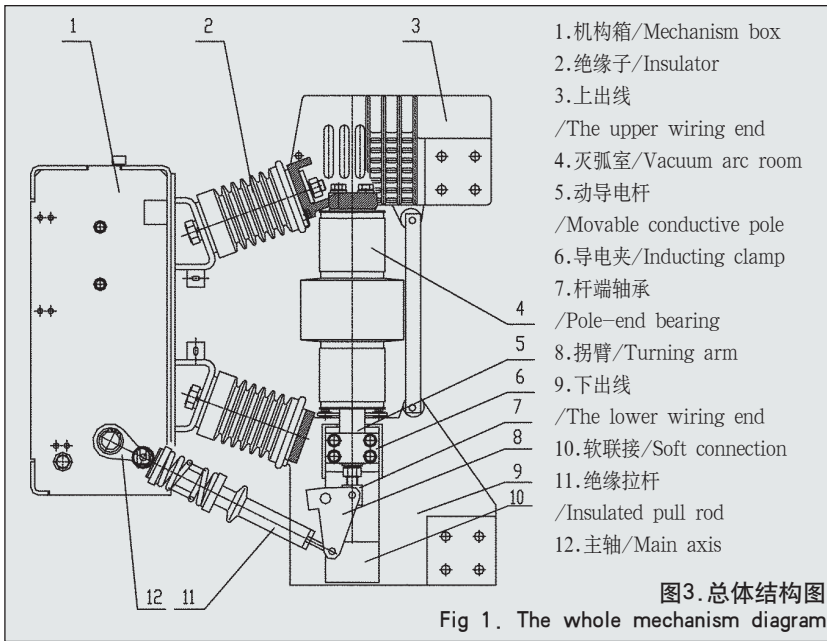
III. Structure and Senice Principal of Product

1. Characteristics of structural design:

(1) On design, the Type ZN105-12/T6300-80 Vacuum Breaker better keeps the advantages of the 3AF (i.e., the ZN12-10 series of products), with the serial feature and the universal components. The arc-quenching chamber applies the CuCr material of contactor as well as the cupstyle structure of enforced longitudinal magnetic field. The main shielding cover of chamber exposes with a big designed capacity. The operating mechanism and the breaker are integrated. Only two stages of worm wheels and work pods combine the gearbox. The gearbox, two sets of four-connecting-pod mechanism (whose public connection point is the main axis of breaker) and a set of straightening mechanism

make the whole energy-storage, opening and closing operation. The beaker features the reliable whole design layout, compact structure, the even enforcement of transmission-pod system, the high transmission efficiency and the long mechanism life. Its advanced design completely satisfies the following requirements of breaker's longitudinal-magnetic-field arc chamber: a relatively high starting speed, a strong opening ability and a long electrical life.

(2) The upper and lower wiring ends of pure red copper, their dual inlet (outlet) wiring methods, the double-side inducting structure of inducting clamp's lower wiring dual soft connection together solve the following problem to pass a temperature-rising test smoothly: The breaker will become hot after working under the big 6,300A rated current for long time.



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电磁场，将电弧约束在磁场内，并均匀分布在触头表面，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。

本断路器采用的灭弧室开断能力较高，截流水平较低，并且有很长的电寿命。

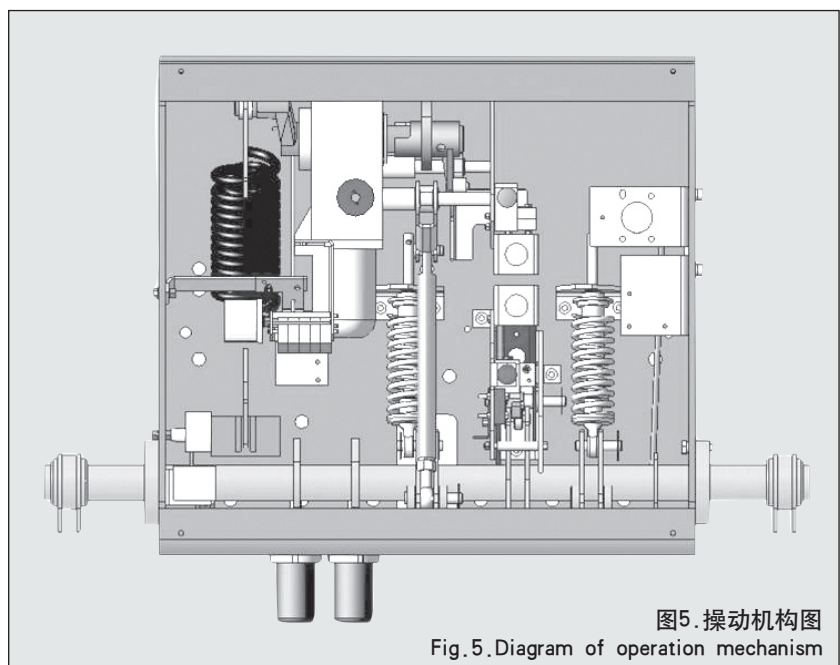
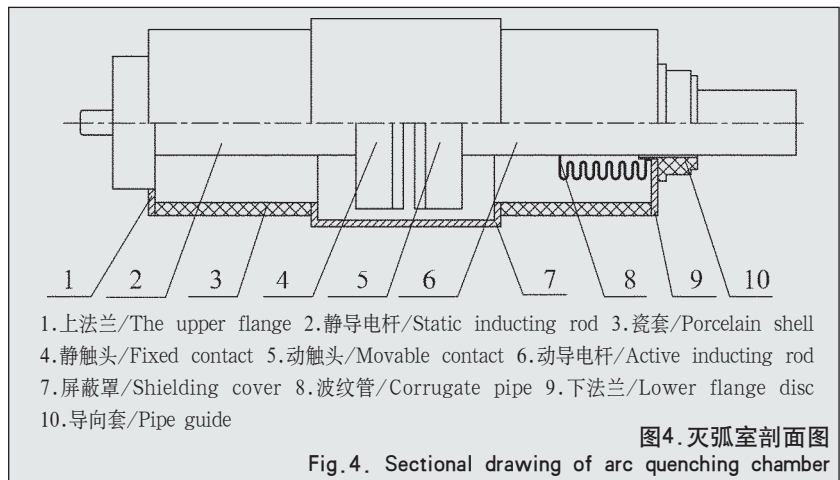
接(10)，其中，软联接的下端分别固定在下出线的两侧，软联接的上端与真空灭弧室动导电杆上的导电夹(6)的两侧固定。在动导电杆的底部装有万向杆端轴承(7)，该杆端轴承通过一轴销与下出线端上的拐臂(8)相连，开关主轴(12)通过三根绝缘拉杆(11)把力传递给动导电杆，使开关合、分闸(见图3)，断路器总重量为700kg。

3、真空灭弧室

断路器的灭弧室由一个金属圆筒屏蔽罩和两只瓷管封在一起作为外壳，上、下两只瓷管分别封在上、下法兰盘上，动、静触头分别焊在动、静导电杆上，静导电杆焊在上法兰盘上，动导电杆上焊一波纹管，波纹管的另一端焊在下法兰盘上，由此而形成一密封的腔体。该腔体经过抽真空，灭弧室气体压力小于 $1.33 \times 10^{-3} \text{Pa}$ 。当合、分闸操作时，动导电杆上、下运动，波纹管被压缩或拉伸，使真空灭弧室内的真空度得到保持。(见图4)

● 灭弧原理：

在真空中由于气体分子的平均自



(3) Each phase of fixed method of lower and upper wiring applies the double-insulator structure, so as to better meet the strength requirement of breaker when the structure sees a full closing capacity of 80kA.

(4) Both the pull rod and stand rod of transmission stage use a drawing stick whose shell and cover are made from silicone rubber for protection with the intermittently added SMC insulated plate for separation. This can raise the whole insulation level and extra capacity of breaker. Therefore, its insulating performance is higher than the original 3AF technology, so as to completely meets the requirement of its users on the indoor class-II dirt environment.

2. Whole structure (See Fig.1 and Fig.2):

The breaker mainly consists of vacuum arc-quenching chambers, the operating mechanism and the supporting parts. Twelve insulators (2) are fixed on the mechanism box (1). Three arc-quenching chambers are fixed on the insulators via the lower and upper wires (3) (9). The lower wire is equipped with two pieces of soft connection (10), whose lower ends are fixed on the two sides of lower wire and upper ends are fixed with the two sides of inducting clamp (6) of vacuum arc-quenching chambers' active inducting rods. The bottoms of active inducting rods are equipped with bearing for the ends of universal clamps (7). These ends are connected with turning arm (8) of the lower wiring ends via axial pins. The main axis of switch (12) transmits the force for the inducting pod via 3 insulated pull rods (11), so as to make the switch make the opening and closing operation (See Fig.3). The breaker totally weighs 700kg.

3. Vacuum arc-quenching chamber

The arc-quenching chamber of breaker consists of a metal cylinder shielding cover and 2 porcelain pipes together sealed for its shell. Both the lower and upper porcelain pipes are sealed on the lower and upper flange discs, respectively. Both the static and active contactors are welded on the static and active inducting rods, respectively. The active rod is welded with a corrugate pipe, whose other end is welded on the lower flange disc, so as to make

a sealed cavity, whose air can be drawn to make the air pressure of chamber become less than 1.33×10^{-3} pa. When the closing and opening operation is made, the active inducting rod will move upward and downward and then the corrugate pipe will be compressed or stretched to keep the vacuum degree of chamber. (See Fig.4)

● Arc-quenching principle:

Under the vacuum condition, gas is uneasy to drift away due to the very big average free journey of gas molecule. The strength of vacuum is much higher than that of air insulation. When the switch is opened, the contactor will generate electric arc and the surface of contactor volatilize steel vapor under high temperature. Because of the special design of its shape, the contactor will generate the longitudinal electromagnetic field in parallel to the arc while the short-circuit current passes. This will restrict the arc within the field and make it become averagely distributed on the surface of contactor. As the result, the arc voltage is low and then the arc-combustion time is short. This contactor will fire very little and go out when the current naturally zeros. Therefore, the strength of media between contactors will restore very quickly. The breaker applies the arc-quenching chamber whose opening ability is very high, current-breaking level is low and power life is quite long.

4. Operating mechanism

The operating mechanism mainly consists of the energystorage unit, locking unit, opening spring, main switch axial, buffer and control unit.

(1) Energy-storage and locking units

The energy-storage unit mainly comprises a decelerator box whose shell is cast aluminum. In this box, there are two sets of worm wheels and worm rods. The energy-storage axial is cross the decelerating box without mechanical connection with the wheels and rods. The energy-storage axial is covered with a sleeve, which is connected with a big worm wheel via keys. On this sleeve, an axial pin is equipped with a pawl. The right end of the axial is mounted with a cam on which there is a

4、操动机构：

操动机构主要由储能机构、锁定机构、双分闸弹簧、开关主轴、双缓冲器及控制装置组成。

(1) 储能及锁定机构：

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，此轴套用键联在大蜗轮上，轴套有一轴销，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，凸轮将把合闸弹簧的能量传给此轴承，三角形杠杆的另一个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双分闸弹簧，主轴上还装有三对拐臂，其中两对分别作用在合闸橡皮缓冲和双分闸油

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5所示)

(2) 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。

代号	额定电压	额定电流
5JK.647.034	直流220V	2A

二次回路电器元件及参数(见图6、图8)

符号	名称	型号规格	数量
YA2、3	分闸电磁铁	5JK.647.033-034	2
YA1	合闸电磁铁	5JK.647.033-034	1
S4-6	微动开关	LXW20-11	3
S1-2	微动开关	LXW20-11	2
S	辅助开关	F10-22II/W2	1
M	储能电机	12880B; 22880B	1
XT	接线端子	JH24	1

辅助开关有五对常开、常闭接和十一对常开、常闭接点两种。其中最大通过电流为AC10A；DC5A。

本断路器可带有一微型整流器，供无直流电源的用户使用，由用户订货提出。标准断路器接线方案见图6、图7。

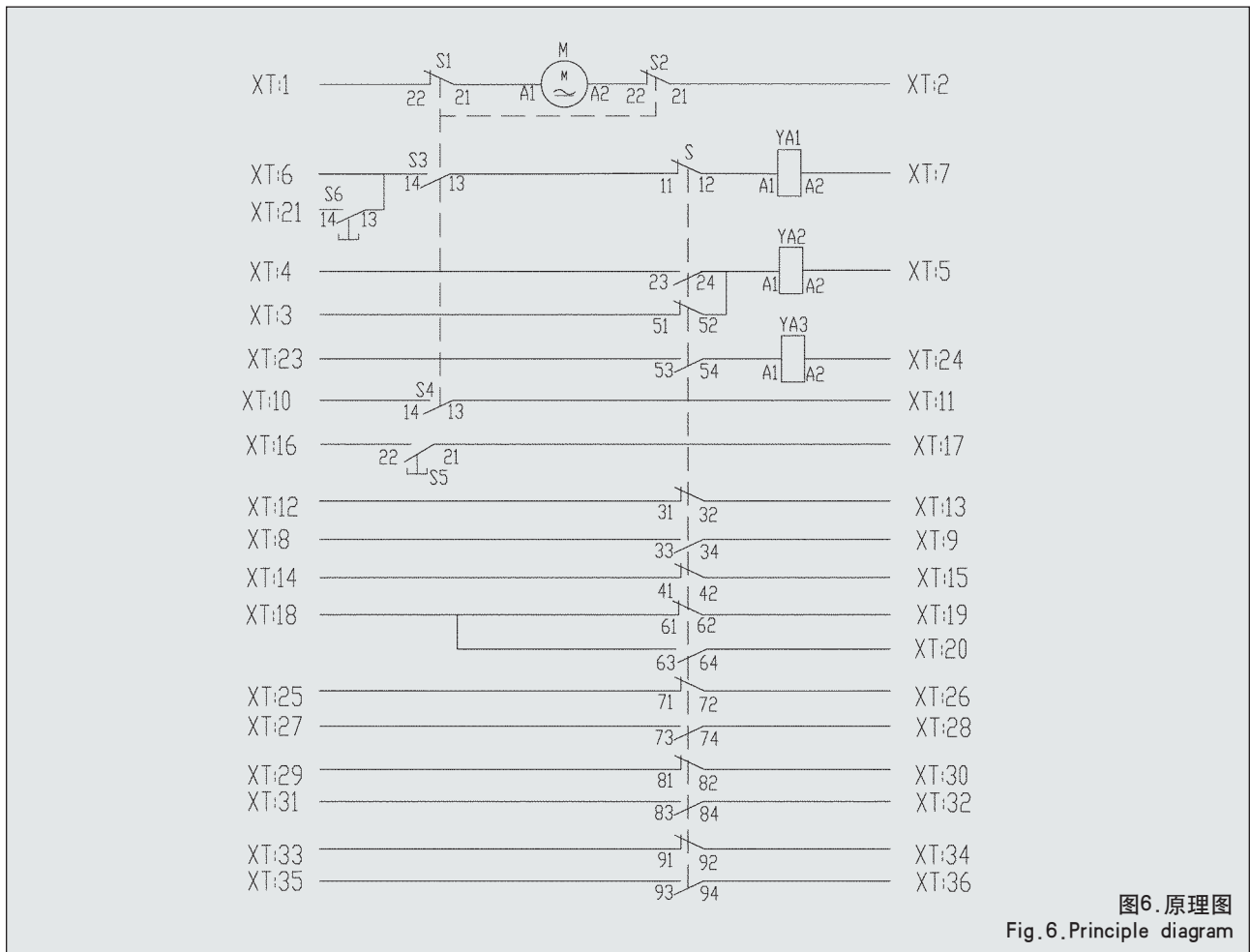


图6.原理图
Fig.6.Principle diagram

gap. The claw rotates the cam just with this gap. The left end of axial is equipped with a crank, on which an end of closing spring is hanged.

The axial pin of decelerator box is equipped with a triangle lever, on which a needle bearing is mounted. The cam transmits the energy of closing spring for the bearing. The rest hole of triangle lever is connected with an end of the connection rod via axial pins. The other end of the rod is installed on the arm of main axis to form a fourconnecting-pod mechanism. With this mechanism, the closing force is transmitted for the main axis of switch. The axial pin of decelerator box is equipped with a needle bearing, which is used to lock the closing block.

The arm of switch's main axis is equipped with the opening spring, and this axis is mounted with 3 pairs of arms. Two of these pairs play roles on the opening rubber buffer and the closing oil buffer; and the rest pair is equipped with a needle bearing for locking the opening block. The breaker's closing and opening blocks are same.(See Fig.5.)

(2) The breaker can be assembled with the control components of different specification and quantity up to the requirement of users.

a.The closing and opening magnets: They are of the screwpipe style with same sizes and data.

Code	Rated voltage	Rated current
5JK.647.034	DC220V	2A

See the electric components and parameters of second loops (Fig.6 and Fig.8).

Symbol	Name	Type and specification	Quantity
YA2, 3	Opening magnet	5JK.647.033-034	2
YA1	Closing magnet	5JK.647.033-034	1
S4-6	MS switch	LXW20-11	3
S1-2	MS switch	LXW20-11	2
S	Auxiliary switch	F10-22II/W2	1
M	Energy-storage motor	12880B; 22880B	1
XT	Terminal block	JH24	1

The auxiliary switches are oppositely opened and closed with 5 or 11 pairs for usual state, where the maximum passing current is AC10A and DC5A, respectively.

The breaker can be equipped with a mini-sized

rectifier, which is used for the users of DC power supplies and will be ordered by the users. For the wiring solution of standard breaker, see Fig.6 and Fig.7.

(3) Operation

a. Energy storage

Electric energy storage: After the motor is powered, the axial sleeve will be driven rotating by the big worm wheel in the decelerating box. The claw equipped on this sleeve will quickly enter the gap of cam. For this time, the claw drives the energy-storage axis rotating and the closing spring is pulled up storing the energy. When this switch is pulled up by the highest point and then locked by the closing block, the small connection rod on crank will drive the curve plate pressing down the MS switch, so as to turn off the power of motor. The "energy-storage indication" is shown on the penal hole. The whole energystorage time is less than 15s.

Manual storage: Insert the handle into the front square hole of decelerating box. Rotate this handle for 25 circles in clockwise. At this time, the claw enters the gap of cam to drive the energystorage axis rotating. Then, energetically rotate the handle for 8 circles. After the program of closing for energy storage is over, dismantle the handle.

b. Closing

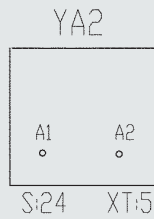
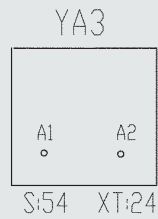
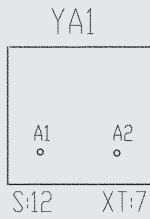
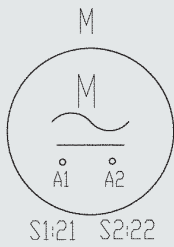
After the closing magnet is turned on or the closing button (black) is manually pressed, the closing block will be unlocked and then the energy-storage axis will rotate in counter-clockwise under the role of closing spring. For this time, the cam is depressed on the needle bearing of triangle rod, the connection rod of lever transmits force for the main axis of switch, the inducting rod moves upward, and the main axis turns about 60 degrees to be locked by the closing block. At the closing time, energy is stored on the opening spring and the contactor spring installed on the insulated pulling rod is depressed, in order to give the contactor a press. The "closing indication" is shown on the penal hole.

c. Opening

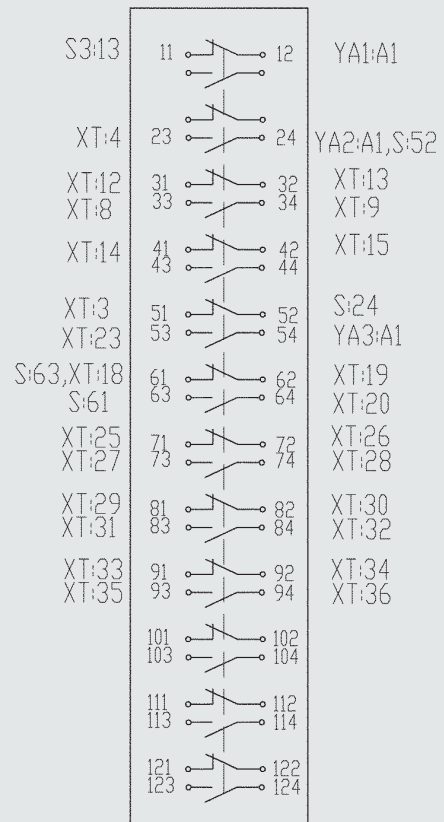
After the opening magnet is turned on or the

XT

25	S:71	1	S1:22
26	S:72	2	S2:21
27	S:73	3	S:51
28	S:74	4	S:23
29	S:81	5	YA2:A2
30	S:82	6	S3:14
31	S:83	7	YA1:A2
32	S:84	8	S:33
33	S:91	9	S:34
34	S:92	10	S4:14
35	S:93	11	S4:13
36	S:94	12	S:31
37		13	S:32
38		14	S:41
39		15	S:42
40		16	S5:22
41		17	S5:21
42		18	S:61
43		19	S:62
44		20	S:64
45		21	S6:14
46		22	
47		23	S:53
48		24	YA3:A2



S



S1 S2 S3 S4 S7

S5

S6

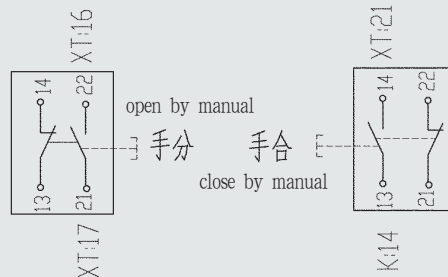
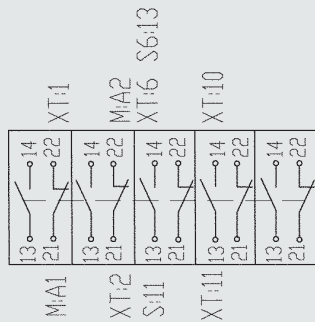
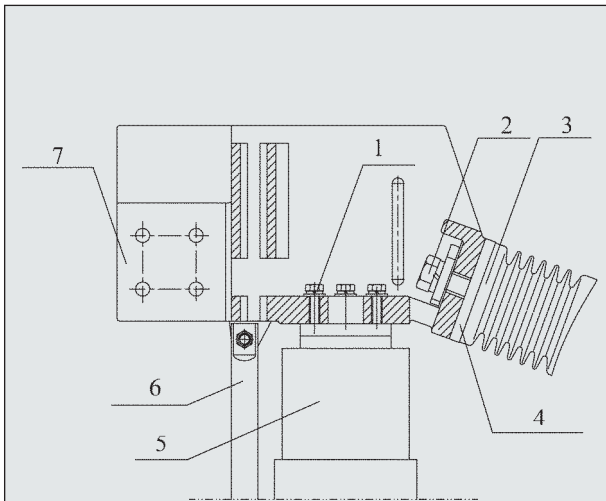


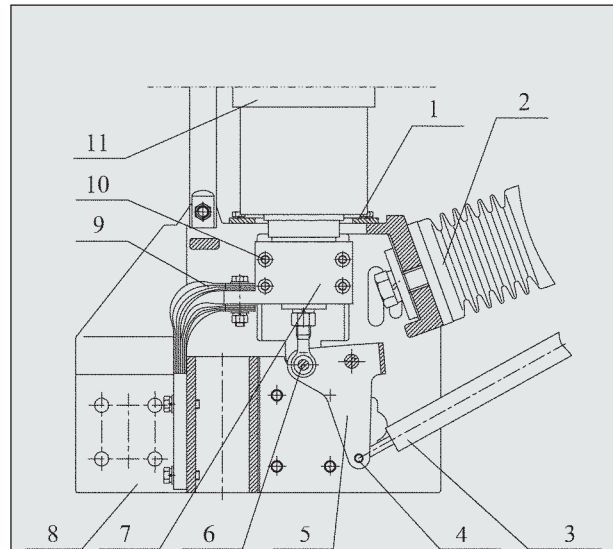
图7. 接线图

Fig.7. Connection diagram



1. 螺栓/Bolt 2. 螺母/Nut 3. 绝缘子/Insulator
4. 绝缘子压板/The press plate of insulator
5. 灭弧室/Arc-quenching room
6. 绝缘支杆/Insulation stand
7. 上出线/The upper wiring end

图8. 卸下上出线端示意图
Fig.8. The sketch map of upper wiring end being disassembled



1. 定位板/Positioning plate 2. 绝缘子/Insulator
3. 绝缘拉杆/Insulated pull rod 4. 带槽销/Slotted pin
5. 拐臂/Arm 6. 带槽销/Slotted pin 7. 导电夹/Inducting clamp
8. 下出线/The lower wiring end 9. 软连接/Soft connection
10. 螺栓/Bolt 11. 灭弧室/Arc-quenching room

图9. 卸下真空灭弧室示意图
Fig.9. The sketch map of vacuum arc-quenching room being disassembled

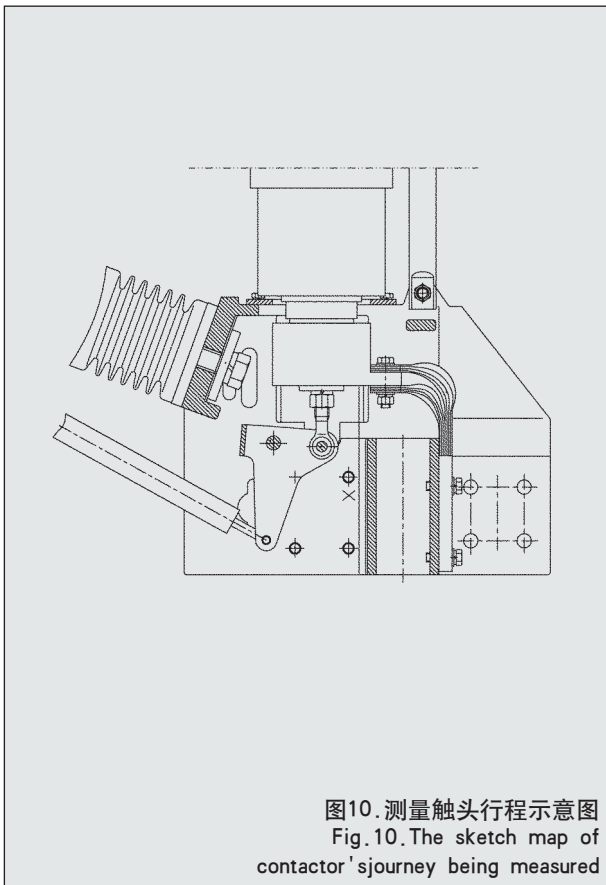


图10. 测量触头行程示意图
Fig.10. The sketch map of contactor's journey being measured

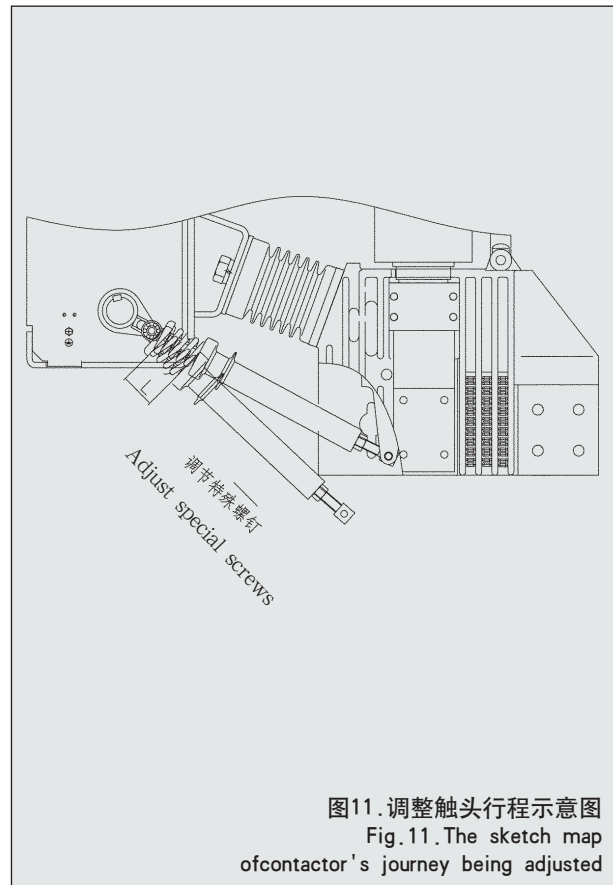


图11. 调整触头行程示意图
Fig.11. The sketch map of contactor's journey being adjusted

(3) 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，轴套上安装着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25圈，这时棘爪进入了凸轮缺口带动储能轴转动。再继续用力摇转手把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(黑色)。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，凸轮压在三角杆上的滚针轴承上，杠杆上的连杆将力传给开关主轴，导电杆向上运动，主轴转角约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(红色)。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，断路器处于分闸状态，“分闸指示”显示在面板孔中。

d. 断路器在合闸后，电动机立即给合闸弹簧储能，也可用手动再储能。

四、运输、验收及储运：

- 断路器在出厂时为合闸状态，合闸弹簧不得储能。
- 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。
- 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。
- 用户收到断路器时应及时进行以下工作：
 - 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、检查附件及设备是否齐全。
 - 5、检查断路器是否受潮，如果已受潮则需将绝缘支杆与绝缘拉杆拆下放入70~80°C的烘箱中烘烤48h。
 - 6、断路器长期不使用时，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、在机构箱上装有起吊装置，作为起吊时挂钩用，不得勾住绝缘子或断路器的其它部位吊起。

五、安装：

- 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。
- 将机构箱侧面的接地孔锉出金属光泽并以工业凡士林油涂于接地线。
- 用手动使开关分、合闸。检查“储能”、“合闸”、“分闸”指示是否正确。
- 用开关底板上的安装孔安装。外形图见图12。
- 拆除起吊装置，装上绝缘隔板。

六、运行前的准备：

- 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。
- 断路器各转动部分涂以润滑油。
- 绝缘件表面擦拭干净。
- 断路器通电进行试操作，无异常现象时，即可投入运行。

七、使用、维护与检修：

- 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m。

- 断路器的额定电流和短路开断电流不同时，其电寿命不同。
- 断路器应根据现场运行情况进行清洁、润滑保养，并检测断路器各项技术参数。
- 真空灭弧室在使用或达到技术参数中规定的短路电流开断次数后，即需更换灭弧室。
- 更换灭弧室时：首先将开关分闸，然后按以下顺序进行。
 - 1、先拆下绝缘支杆，然后拧下上出线端与灭弧室联接的四条螺栓，同时拧下绝缘子压板与上出线联接的螺母。然后，卸下上出线。(见图8)
 - 2、拆下绝缘拉杆与拐臂联接的轴销，拧下软联接与下出线端、导电夹连接的螺栓。再将固定板拆下。然后，将灭弧室下的方向杆端轴承与拐臂连接的带槽销卸下，将定位板的四条螺栓松开，最后，双握住灭弧室往上提即可卸下。(见图9)
 - 3、将新灭弧室导电杆用钢刷刷出金属光泽后涂上工业凡士

opening button is manually pressed, the opening block will be unlocked and then the main axis will rotate in counterclockwise under the roles of opening spring and contactor spring. The breaker stays at the opening state. The "opening indication" is shown on the penal hole.

d. After the breaker is closed, the motor will immediately store energy for the opening spring or the operator will be able to manually store the energy.

IV. Transportation, Acceptance and Storage

- While being delivered from the factory, the breakers stay at the closing state where no energy is stored on the closing spring.

- While being mounted on the manual car, the breakers cannot be packed with the switch cabinet. If needing to be singly provided, the breakers ought to be packed in conformity with the packing standard.

- While being delivered, the breakers stay at the closing state where no inclination, intensive shocking or dripping is allowed.

- The users ought to do the following work at once after receiving the breakers:

1. Check whether the package is damaged or rained.
2. Take out the packing list from the case and see whether the attached document is complete in comparison to the list.

3. Check whether the technical specifications on the nameplates of breakers can satisfy the ordering requirements or not.

4. Check whether the attachment and the equipment both are complete.

5. Check whether the breakers are humidified. If these breakers are rained, both the insulated props and the insulated pulling rods ought to be dismantled and placed in the ovens of 70~80 C for the 48h drying.

6. If the breakers have not been used for long time, their inducting surface ought to be coated with industrial petroleum jelly and the insulated parts should be wrapped with clean oily paper.

7. The breakers ought to be stored in dry fanned

rooms where they the breakers are vertically placed without overlay.

8. On the two sides of mechanism box, there are lewis holes being used for lifting hooks. While the breakers are lifted, neither their insulated trunks nor the other parts can be hooked.

V. Installation

- The users ought to polish the electrically inducting parts for metal luster with steel brushes and then wipe these parts for cleaning and coat them the industrial petroleum jelly.

- On the sides of mechanism boxes, the grounding holes ought to be rasped for metal luster and coated with the industrial petroleum jelly.

- The users ought to make the switches closed and opened manually, in order to see whether the indications of energy storage, closing and opening are normal or not.

- The users ought to mount the breakers with the installation holes on the switch bottom. For the appearance drawing, see Fig.12.

- Dismantle lifting devise and fix insulation plate.

VI. Preparation for Operation

- Before the operation, the users do not need to have any adjustment on the breakers, but ought to tighten loose screws on any of the parts.

- The users ought to coat lubricant oil on all of the rotating parts.

- The users ought to wipe the insulated surface for cleaning.

- The breakers should be tested with power supply. Only if they have no abnormal phenomenon, can the breakers be put into operation.

VII. Use, maintenance and overhaul

- The breaker ought to be installed in a place of altitude more than 1,000m and less than 4,000m, the testing voltage is as follows; According to the standard of this user guide, the rated enduring voltage times the coefficient ka.

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

Where, H—the altitude (m) of the installation place.

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- 4、双手握紧新灭弧室装入固定板及导电夹的孔中。
- 5、装上上出线端，注意三相垂直及水平位置不超过1mm，拧紧螺钉及螺母。
- 6、装上轴销。
- 7、拧紧固定板及导电夹螺钉。
- 8、装上两侧软联接。

● 灭弧室更换后应测量触头行程和超行程：

量出分、合闸位置时的X， $X_{合} - X_{分} = X_{触头行程}$ ，X应为 $11 \pm 1\text{mm}$ 。量出分、合闸位置时的L， $L_{分} - L_{合} = L_{触头超行程}$ ，L应为 $6 \pm 1\text{mm}$ 。X.测量部位见图12；L.测量部位见图11。

触头行程不符合要求时可卸下绝缘拉杆处轴销，调整绝缘拉杆的长度，行程偏小时，将特殊螺钉往里拧入，使拉杆变短；行程偏大时则将特殊螺钉往外拧出，使拉杆变长(见图10)。

- 灭弧室在卸下绝缘拉杆后动导电杆要用很大力才能拉出，即证明真空度良好。

八、随机文件：

- 1、产品合格证明书；
- 2、安装使用说明书；
- 3、装箱单。

九、备品及附件：

名称	手摇把	护套	压接簧片
数量(个)	1	24	24

十、定货须知：

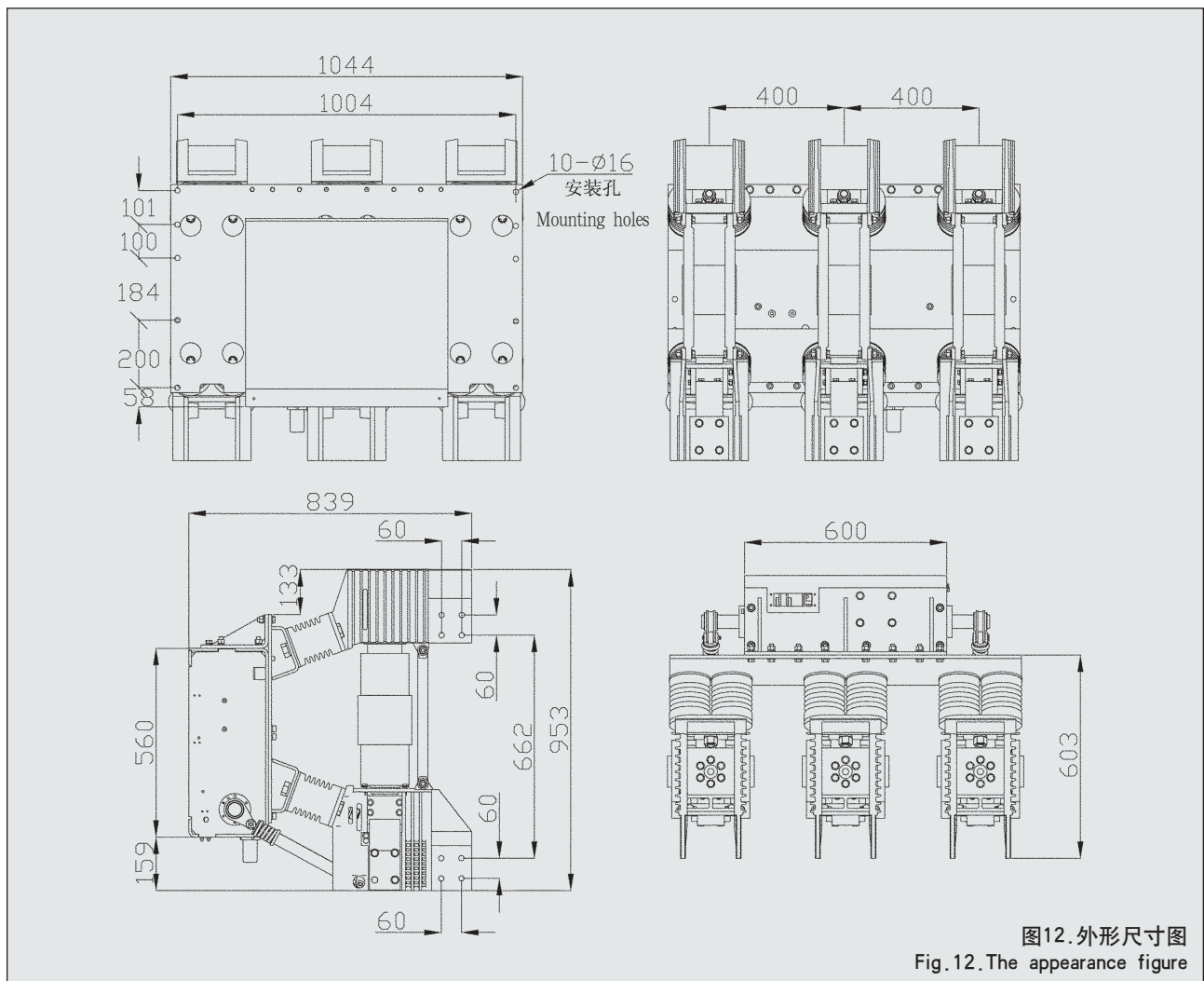
订货时应注明断路器型号、名称、主要技术参数及订货数量；电动机电压种类及参数、脱扣器种类及参数、数量、辅助开关接点对数；合、分闸电磁铁电压，用户如果需要备品须在订货时提出。

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。



- The power life of the breaker is varied if its rated current is different from the short-circuit-closing current.
- Depending on its operation on site, the breaker ought to be cleaned, maintained with lubricant oil and tested on a variety of its technical specifications.
- Vacuum arc-quenching room ought to be replaced immediately if it has used or seen the short-circuit current up to the technical specification and then it has been opened for several times.
- When the arc-quenching chamber is changed: First of all the switch is opened and then the following procedures are made:
 1. Disassemble the insulated prop, then twist off the four bolts which connect the upper and lower wiring ends with the arc chamber. Meanwhile, unscrew the nuts which connect the lower insulator-press plate with the upper wiring end. Next, disassemble the upper outer wiring (See Fig.8).
 2. Disassemble the axial pin which connects the insulated pulling rod with the arm. Twist off the bolts which connect the soft connection with the lower wiring end and inducting clamp. Then, take down the fixing plate and unbolt the slotted pin that connects the bearing for the ends of universal clamp with the arm below the arc chamber. Next, unscrew the four bolts of positioning plate. At last, hold the chamber with two hands to raise it. (See Fig.9)
 3. Polish the electrically inducting parts of arc chamber for metal luster with steel brushes and then wipe these parts for cleaning and coat them the industrial petroleum jelly.
 4. Firmly hold the chamber with two hands to place it in the bundle of fixing plate and inducting clamp.
 5. Assemble the upper wiring end. Pay attention to the three-phase vertical and horizontal position is no more than 1mm. Then, screw down the bolts and nuts.
 6. Assemble the axial pin.
 7. Screw down the bolts of fixing plate and inducting clamp.
 8. Assemble the soft connection of two sides.
- After the arc-quenching chamber is changed, the journey and super journey of contact are both

measured. For the opening and closing positions, $X_c - X_o = X_j$ (the journey of contactor). X should be $11 \pm 1\text{mm}$. For the positions $L_c - L_o = L_j$ (the super journey of contactor). L should be $6 \pm 1\text{mm}$. For the measured parts of X , see Fig.12; and for those of L , see Fig.11.

If the journeys of contactor do not meet the requirements, the axial pin of insulated pulling rod can be disassembled. Then, the operator ought to adjust the length of rod. If the journey is on the small side, the operator can screw down the special bolts to make the rod become shorter; and if the journey is bigger, the operator can twist off the bolts to lengthen the rod. (see Fig.10)

- The vacuum degree proves good if the operator spends much energy pulling the inducting rod after the insulated pulling rod of arc chamber is disassembled.

VIII. Attached Document

1. The certificate of product's quality
2. The user guide on installation
3. The packing list

IX. Accessories and Spare Parts

Name	Manual crank	Protective sleeve	Pressing and connection spring
Number	1	24	24

X. Ordering Notice

While ordering the breakers, the users ought to remark the types, names, main technical parameters and ordered quantity of breakers, as well as the types and parameters of motors' voltage, the types, parameters and number of releasers, the number of pairs of auxiliary-switch connection points and the voltage of closing and opening magnet. If needed, the accessories and spare parts ought to be mentioned in the ordering.

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

Attach importance to human health & safety. Strengthen environment protection. Properly dispose of the wrapped and wastes.