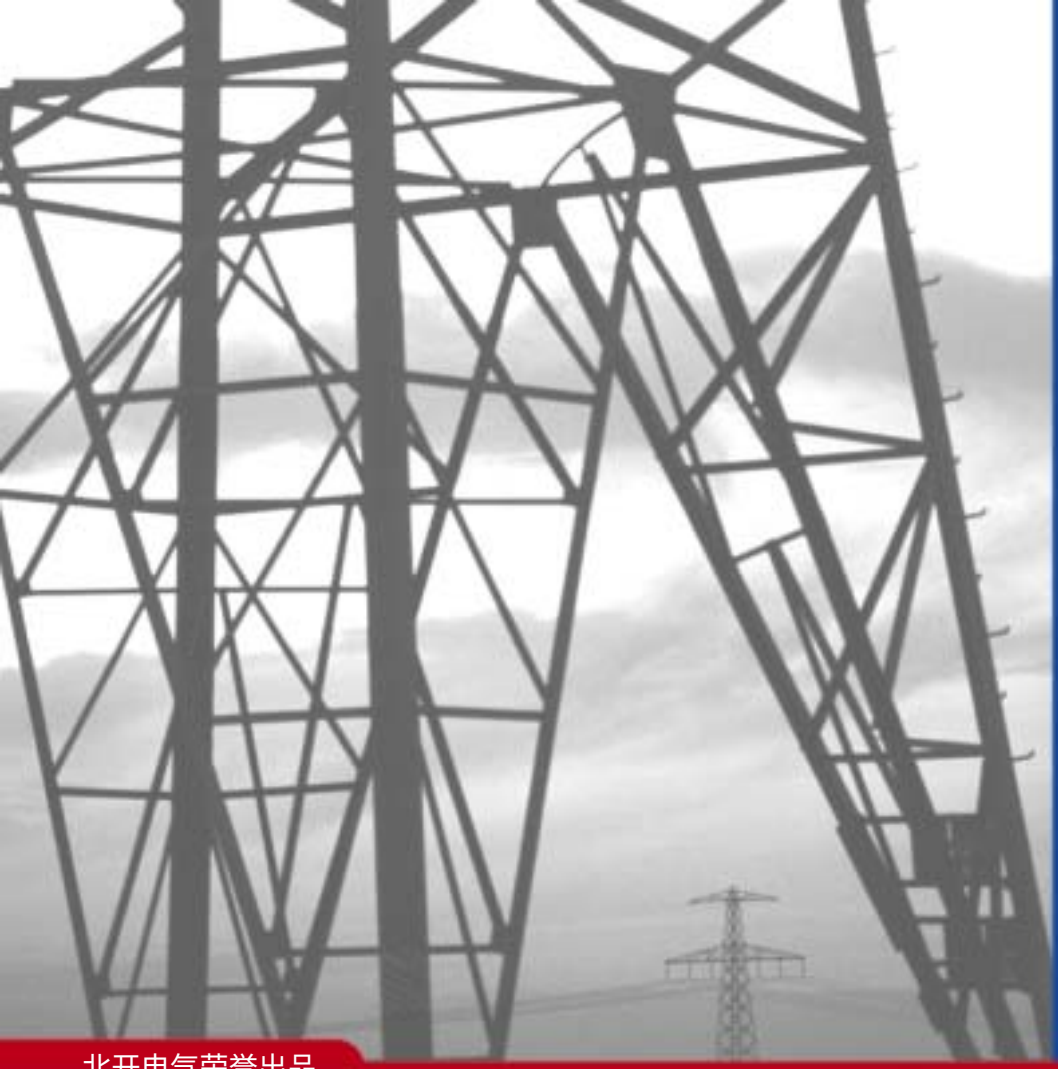


KYN28A-12(GZS1)

铠装移开式交流金属封闭开关设备

Armored Moveable AC Metal Sealed Switch Cabinet

北开电气荣誉出品

BBE 北开电气

KYN28A-12(GZS1)铠装移开式交流金属封闭开关设备安装使用说明
Installation and User Guides of Type KYN28A-12(GZS1) Armored Moveable AC Metal Sealed Switch Cabinet

一、概述

KYN28A-12 (GZS1)型真空开关柜符合 GB3906-91《3~35kV 交流金属封闭开关设备》及 DL404-91《户内交流开关柜订货技术条件》的有关要求。适用于 3.6~12kV 交流三相 50Hz 单母线电力系统中，做为接受和分配电能之用，本产品为户内使用。

二、使用环境

1. 周围空气温度：上限 40°C；下限 -10°C
2. 海拔：

   不大于 1000m。若大于 1000m，订货时需特殊说明。
3. 湿度及污秽

   相对日平均值不大于95%，月平均值不大于90%。在高湿期内温度急降时允许产生凝露。开关柜可以在 GB3906-91 附录 E 规定的 1 级条件使用。
4. 开关柜允许在 8 级地震烈度地区使用。
5. 周围空气不受腐蚀性气体、水蒸汽明显污染。
6. 无经常性剧烈振动。

三、产品系列和主要规格

1. 本产品系列可分为大电流柜 (额定电流>1600A)和小电流柜 (额定电流≤ 1600A)。
2. 开关柜主回路方案见附录 1。
3. 全型号的组成：

KYN 28A －∗－∗/∗/∗－∗

- ∗ 额定开断电流 (kA)
- ∗ 额定电流 (A)
- ∗ 环境特征　湿热带 TH　干热带 AH　普通型不注
- ∗ 主回路方案编号
- 28A 额定电压
- 设计序号
- KYN 户内型
- 移开式
- 交流金属铠装封闭开关设备

I. Profile

Type KYN28A-12(GZS1) Armored Moveable AC Metal Sealed Switch Cabinet satisfies the requirements of GB3906-91 and DL404-91, the 3~35kV AC Metal Sealed Switch Equipment and the Indoors AC Switch Cabinet Ordering Technical Conditions. The type of cabinet is usable for the electric system of 3.6~12kV AC 3-phase 50Hz single bus; And it is applicable for receiving and distributing electric energy. The cabinet product is used indoors.

II. Use Conditions

1. Ambient air temperature: upper limit 40 °C and lower limit -10 °C
2. Altitude: No higher than 1,000m. If it is higher than 1,000m, the altitude ought to be specially given in orders.
3. Humidity and dirtiness:

The relative daily humidity is no higher than 95%; and the monthly average value is no more than 95%. Dew is allowed when the temperature descends abruptly in the high-humidity period. The type of switch cabinet can work under the stipulated class-I conditions of GB3906-91 Appendix E.

4. The cabinet is usable in an area of Class-8 earthquake intensity.
5. The ambient air is not apparently contaminated by water steam and corrosive gas.
6. There is no frequent intensive oscillation.

III. Product Series and Main Specifications

1. The product series can be divided into the big-current cabinet (rated current > 1,600A) and the small-current cabinet (rated current < 1,600A).
2. For the main-loop solution of switch cabinet, see Appendix 1.
3. Composition of complete type:

KYN 28A －∗－∗/∗/∗－∗

- ∗ Rated current (kA)
- ∗ Rated current (A)
- ∗ Environmental feature, warn tropical Dry tropical; the common type is not noted
- ∗ No. of Main-loop Solution
- 28A Rated Voltage
- Design Serial No.
- KYN Indoor Type
- Moveable
- AC Metal Armored Sealed Switch Cabinet

四、名词解释

1. 可移开部件在开关柜内的状态

(1) 定位状态:定位状态是可移开部件在柜内的一种稳定状态，在这种状态时，可移开部件上安装的断路器可以进行合闸或分闸操作；推进机构的摇把不能转动，可移开部件不能移动。可移开部件的定位状态只能在工作位置和试验 (储存)位置实现。定位状态的实现和解除，都是通过推进机构和断路器机构之间的联锁实现的。

(2) 移动状态:移动状态是可移开部件在柜内的一种暂时状态，在这种状态下，可移开部件上安装的断路器不能进行操作，推进机构摇把可以转动，可移开部件可以在柜内的试验位置和工作位置之间移动。移动状态的实现和解除，是通过推进机构和断路器机构之间的联锁实现的。

2. 可移开部件在开关柜内的位置

(1) 工作位置：这是可移开部件在柜内的一种定位状态。在工作位置，开关柜的主回路接通，辅助回路也接通。

(2) 试验位置：这是可移开部件在柜内的一种定位状态。在实验位置，开关柜的辅助回路接通，但主回路断开，并且动、静触头被金属帘板分割。

(3) 断开位置：如果可移开部件在柜内试验位置再切断辅助回路，可移开部件就处于断开位置。

五、技术参数

1. 开关柜技术参数见表 1。

2. ZN63A -12真空断路器主要规格及技术参数见表2

IV. Terms and Conditions

1 States of moveable component in switch cabinet

(1) Positioning state: It refers to a stable state of moveable component in switch cabinet. On this state, breakers that the moveable component is equipped with can be closed and opened; the cranks of pushing mechanism cannot rotate and this component is immoveable. Of the component, the positioning state only can be achieved on the working and testing (storage) positions. The realization and free of positioning state are both achieved via the interlock between the pushing mechanism and the breaker unit.

(2) Shifting state: If refers to a temporary state of moveable component in switch cabinet. On this state, breakers that the moveable component is equipped with can be operated, the cranks of pushing mechanism can rotate and this component is moveable between working and testing positions within the cabinet. The realization and free of positioning state are both achieved via the interlock between the pushing mechanism and the breaker unit.

2. Positions of moveable component in switch cabinet

(1) Working position: It refers to a positioning state of moveable component in the cabinet. On the working position, the main loop of switch cabinet is turned on and then the auxiliary loop is switched on.

表 1/ Tab.1

项　目 / Item		单 位 / Unit	技 术 参 数 / Technical Parameter
额定电压 / Rated voltage		kV	3.6　7.2　12
额定绝缘水平 Rated insulation level	1min 工频耐受电压 The 1min-work-frequency endured voltage	kV	42
	雷电冲击耐受电压 The lightning-impact endured voltage	kV	75
额定频率 / Rated frequency		Hz	50
主母线额定电流 Rated current of main bus		A	1250　1600 2000　2500 3150
支母线额定电流 Rated current of branch bus		A	630　1250 1600　2000 2500　3150
额定热稳定电流 (4s) Rated thermal stable current (4s)		kA	31.5　40
额定动稳定电流 (峰值) Rated dynamic stable current (peak value)		kA	80　100
防护等级 Protection class		外壳为 IP40 / The shell is IP40 隔室为 IP20 / The isolation room is IP20	

表 2/ Tab.2

项　目 / Item	单 位 / Unit	参　数 / Parameter		
额定电压 / Rated voltage	kV	12		
额定电流 / Rated current	A	630 1250	630 1250 1600 2000 2500 3150	1250 1600 2000 2500 3150
额定短路开断电流 / Rated short opening current	kA	25	31.5	40
额定短路关合电流 / Rated short closing current	kA	63	80	100
额定热稳定电流 (4s) / Rated thermal stable current (4s)	kA	25	31.5	40
额定动稳定电流 (峰值) Rated dynamic stable current (peak value)	kA	63	80	100
额定单个 / 背对背电容器组 Rated single / back-to-back capacitor unit	A	630 / 400		
开断电流 / Opening current		(40kA 为 800/400) / (40kA is 800/400)		
额定短路开断电流开断次数 Opening numbers of rated short opening current	次 / times	50 (40kA 为 30) / 50 (40kA is 30)		
机械寿命 / Mechanical life	次 / times	20000		
额定操作顺序 / Rated operation order		O-0.3s-CO-180s-CO		

表 3/ Tab.3

序号 No.	参 数 名 称 Name of Parameter	单 位 Unit	数　值 Value
1	额定电压 / Rated voltage	kV	12
2	额定频率 / Rated frequency	Hz	50
3	雷电冲击耐受电压 (峰值) Lightning impact withstand voltage (peak)	kV	75
4	1min 工频耐受电压 1min power-frequency withstand voltage	kV	42
5	额定电流 / Rated current	A	1250
6	额定短路开断电流 Rated short-circuit opening current	kA	31.5
7	额定短路关合电流 Rated short-circuit closing current	kA	80
8	额定峰值耐受电流 Rated peak withstanding current	kA	80
9	额定短时耐受电流 Rated short-time withstanding current	kA	31.5
10	额定短路持续时间 Rated short-circuit continuity time	s	4
11	额定操作顺序 Rated operation order		分 -0.3s- 合分 -180s- 合分 Opening -0.3s- closing and opening -180s- closing and opening
12	额定短路电流开断次数 Rated short-circuit current opening times	次 Times	30
13	合分闸电磁铁额定电压 Rated voltage of closing and opening magnet	V	DC 110 、220
14	合分闸电磁铁线圈电流 Wiring current of closing and opening magnet	A	1.9 、1.1
15	储能电动机额定电压 Rated voltage of energy-storage motor	V	AC DC 110 、220

续表 3/ Tab.3 (continuous)

序号 No.	参数名称 Name of Parameter	单位 Unit	数值 Value
16	储能电动机额定功率 Rated power of energy-storage motor	w	200
17	储能时间 / Energy storage time	s	≤ 15
18	过流脱扣器 / Over-current releaser	A	5
19	机械寿命 / Mechanical life	次 / Times	30000
20	额定电容器组开断电流 Rated opening current of capacitor unit	A	630
21	额定电缆充电开断电流 Rated opening current of cable recharge	A	25

注：合分闸及开断时间为本断路器在最高、额定、最低操作电压下的操作时间。

Note: The closing, opening and brake time is the operation time of the breaker under the max. rated and min. operation voltage.

LZZBJ9-10 型电流互感器部分技术参数 表 4

Some technical parameters of Type LZZBJ9-10 current mutual indicator Tab.4

额定一次电流 I_e Rated one-off current I_e (A)	准确级及相应的额定输出 VA Accuracy-class and related rated output VA 0.2	0.5	1	10p10	1s 热稳定电流 Ith 1s thermal stable current 1th (kA)	动稳定电流 Dynamic stable current (kA)
15；20；30；40；50		10	20	15	400Ie	2.5Ith
60		10	15	15	21	52.5
75		10	20	15	31.5	8
100		10	20	15	45	112.5
150；160		10	20	15	63	130
200		15	30	15	63	130
300		10	20	15		
400		10	20	20		
500		15	30	30	80	160
600		15	30	20		
750；800	10	30	60	20		
1200；1500	20	30	60	30		
1500；1600	20	30	60	15		
2000	20	30	60	20	100	160
2500	20	30	60	20		
3000；3150	30	60	90	10P15, 30		

3. ZN65A-12 (EP)固封式真空断路器主要规格及技术参数见表 3

4. 电流互感器主要技术参数见表 4

5. 电压互感器主要技术参数见表 5、表 6

六、结构简述

本型开关柜是按照 GB3906-91 中规定的铠装移开式设计、制造的。外壳的防护等级为 IP40；各个隔室的防护等级为 IP20。开关柜主要由柜体和可移开部件(简称小车)两部分组成。

1. 柜体

本型开关柜的柜体是装配式结构，主要构件是用敷铝

(2) Testing position: It refers to a positioning state of moveable component in the cabinet. On the working position, the auxiliary loop of switch cabinet is turned on. However, the main loop is switched off and the active and static contactors are separated with a metal screen board.

(3) Breaking position: The moveable component will stay at the breaking positions if this component cuts off the auxiliary loop again in the testing positions of cabinet.

V. Technical Specifications

1. See Tab.1 for the technical indexes of switch cabinet.

JDZ18 型电压互感器技术参数 表 5

Technical parameters of Type JDZ18 voltage mutual indicator Tab.5

型 号 Type	额定频率 Rated Frequency (Hz)	额定电压比 Rated Voltage Rate (V)	准确级或准确级组合 Accuracy Class or Combination of Accuracy Classes	额定输出 Rate Output (VA)	极限输出 Limited Output (VA)	额定绝缘水平 Rated Insulation Level (kV)	备注 Remark
JDZ18-3	50，60	3000/100	0.2	30	400	3.6/25/40	同 VKV Same as VKV
			0.5	50			
			1	60			
			3	150			
JDZ18-6		6000/100	0.2	30	400	7.2/32/60	同 VKV Same as VKV
			0.5	50			
			1	60			
			3	150			
JDZ18-10		10000/100	0.2	30	400	12/42/75	同 VKV Same as VKV
			0.5	50			
			1	60			
			3	150			

JDZX18 型电压互感器技术参数 表 6

Technical parameters of Type JDZX18 voltage mutual indicator Tab.6

型 号 Type	额定频率 Rated Frequency (Hz)	额定电压比 Rated Voltage Rate (V)	准确级或准确级组合 Accuracy Class or Combination of Accuracy Classes	额定输出 Rate Output (VA)	极限输出 Limited Output (VA)	额定绝缘水平 Rated Insulation Level (kV)	备注 Remark
JDZX18-3	50，60	$\frac{3000}{\sqrt{3}}/\frac{100}{\sqrt{3}}/\frac{100}{3}$	0.5/6P	30/50	200	3.6/25/40	
JDZX18-6		$\frac{6000}{\sqrt{3}}/\frac{100}{\sqrt{3}}/\frac{100}{3}$				7.2/32/60	
JDZX18-10		$\frac{10000}{\sqrt{3}}/\frac{100}{\sqrt{3}}/\frac{100}{3}$				12/42/75	

锌薄钢板，经数控加工机床加工而成。由于采用了多重折弯工艺和拉铆螺母、高强度螺栓等，使开关柜在保证足够强度和刚性的同时，重量更轻，抵御有害气体腐蚀的能力更强，而且外观更加美观。

柜体结构按照柜内主要功能元件分隔为小车室、主母线室、电缆室 (电流互感器室)和继电器室 (见图 2)。除了继电器室以外，其余各个隔室均设置通向柜顶的事故排气通道。

小车室的底部设有小车轨道，供小车在柜内运动。隔室内安装有主回路静触头的触头盒与主母线室和电缆室相通。当小车在试验位置或退出柜外时，活动帘板将静触头盖住，形成有效隔离；当小车从试验位置向工作位置移动时，活动帘板自动打开，保证主回路的顺利连接。上、下

2. See Tab.2 for the main specifications and technical indexes of ZN63A-12 vacuum breaker.

3. See Tab.3 for the main specifications and technical indexes of ZN65A-12 (EP) solid sealed vacuum breaker.

4. See Tab.4 for the main technical parameters of current mutual indicator.

5. See Tab.5,6 for the main technical parameters of voltage mutual indicator.

VI. Brief Introduction to Structure

The type of switch cabinet is designed and manufactured in accordance to the stipulated armored moveable cabinets of GB3906-91. The protection class of cabinet' s shell is IP40; and that of each of isolation room is IP20.

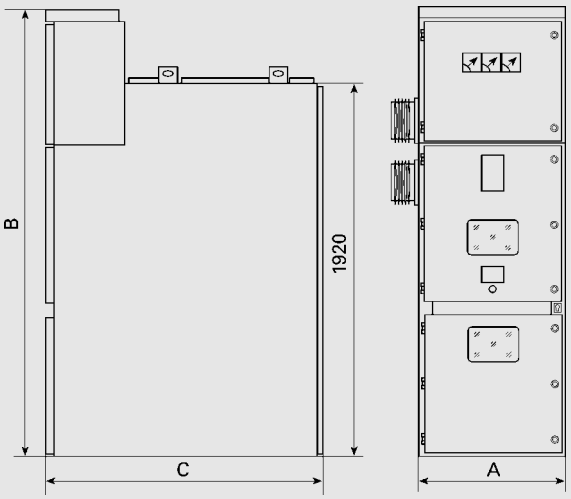
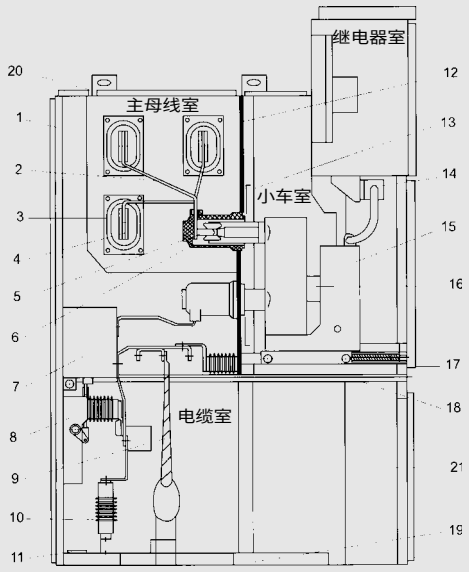


图 1. 开关柜外形示意图
Fig.1 Sketch Map of Switch Cabinet' s Appearance

高度 B / Height B (mm)		2300
宽度 A Height A (mm)	额定电流 1250A 及以下 Rated current 1,250A or lower	800
	额定电流 1250A 以上 Rated current 1,250A or higher	1000
深度 C Depth C (mm)	电缆进出线 / Cable wire-in and out (配 ZN63A、VD4、ZN65A-EP) (with ZN63A, VD4, ZN65A-EP)	1500
	架空进出线 / Overhead wire-in and out (配 ZN63A、VD4、ZN65A-EP) (with ZN63A, VD4, ZN65A-EP)	1760



1. 外壳 / Shell　2. 支母线 / Branch bus　3. 母线套管 / Bus sleeve pipe
4. 主母线 / Main bus　5. 静触头 / Static contactor
6. 静触头盒/ Static contactor box　7. 电流互感器/ Current mutual inductor
8. 接地开关 /Grounding switch　9. 一次电缆 / One-off cable
10. 避雷器 / Thunder arrester　11. 接地主干线 / Main grounding trunk
12. 隔板 / Isolation board　13. 活动帘板 / Active screen board
14. 二次插头 / Secondary contactor　15. 小车 / Car
16. 除湿加热器 / Dehumidifying heater
17. 水平隔板 (可拆卸) / Level isolation board (removable)
18. 接地开关操作机构 / Grounding switch operation mechanism
19. 柜底板/ Bottom board of cabinet　20. 泄压装置/ Pressure releaser
21. 二次电缆槽 / Secondary cable slot

图 2. 开关柜结构示意图
Fig.2 Sketch Map of Switch Cabinet' s Structure

活动帘板是独立运动的，并且可以分别锁定。因此，如果需要的话，检修人员可以锁定带电侧的帘板，检修另一侧的主回路静触头。

主母线室内安装三相矩形铜母线。各个开关柜的主母线室经套管连通，运行时各柜的主母线室之间是隔开的，可以避免一个间隔出现意外，祸及其他开关柜的扩展性事故发生。

电缆室内根据主回路方案的需要，可以安装电流互感器、接地开关、带电显示装置和固定主电缆用的构架、附件等。开关柜底板上开设有主电缆进入孔及可拆卸封板。本型开关柜每相可以并接 1～3 根单芯电缆。

继电器室是用于安装继电保护、控制等二次元件的。小室的左侧设有供控制电缆进出的线槽；在小室顶部设有小母线穿过孔，接线时顶盖板可以翻转，便于小母线安装。继电器室的门上可以安装需要观察的仪表装置、经常操作的开关和嵌入式的继电器等。

2. 小车

根据小车上配置的主回路元件的不同，可以有断路器

The switch cabinet mainly consists of the two parts, cabinet body and a moveable component (car for short).

1. Cabinet

Of the type of cabinet, the cabinet body sees an assembly structure, whose main parts are processed from aluminum-covered thin zinc steel boards with a digital-control lathe. Because that it applies the multi-layer bending technology with the rivet-pulled nuts and high-strength bolts, this type of cabinet can achieve the following performances while guaranteeing enough strength and rigidity: less weight, stronger ability of fighting against contamination of harmful gas and more elegant appearance.

Depending on the main functional components of cabinet, the cabinet is structurally divided into the car room, the main-bus room, the cable room (current mutual-sensation room) and the relay room (see Fig.2). Except the relay room, the other rooms all are equipped with fault exhaust

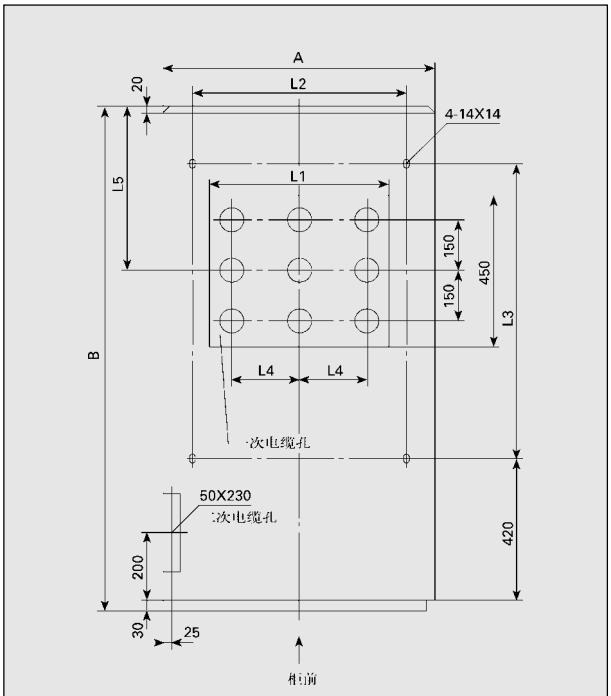


图 3. 开关柜安装尺寸示意图
Fig.3 Sketch Map of Installation Sizes of Switch Cabinet

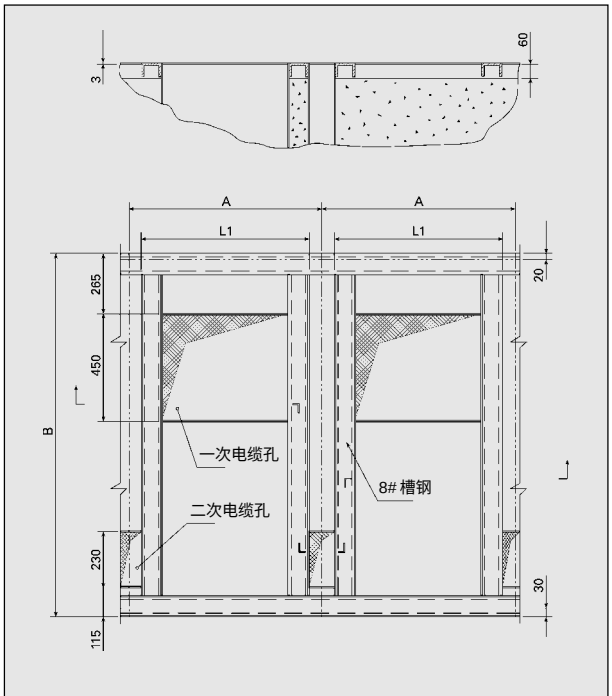


图 4. 基础施工参考图
Fig.4 Reference Map of Foundation Project

柜宽 A Cabinet width A	柜深 B Cabinet depth B	L1	L2	L3	L4	L5
800	1500 1760	530	630	880	200	490
1000	1500 1760	730	830	1040	300	490

柜宽 A Cabinet width A	柜深 B Cabinet depth B	L1
800	1500 1760	690
1000	1500 1760	890

小车、电压互感器小车、隔离小车和计量小车等。各类小车按模数积木式变化；同规格小车保证互换。小车在柜内有试验 (断开)位置和工作位置两个定位位置。小车的推进(退出)采用蜗轮副省力机构，操作轻便、灵活。小车移出柜外时，需要配置专用的转运小车。

小车用转运小车运入柜体后，首先定位于试验 (断开)位置，小车与柜体锁定后，可以摇动推进机构，将小车推向工作位置。小车到达工作位置时，摇把摇动受阻，小车到位。小车的相关联锁机构保证只有断路器处于分闸状态，小车方可移动；只有小车在试验 (断开)位置或工作位置定位后，断路器方可合闸。

3. 联锁

(1) 本型开关柜设计了可靠的“ 五防 ”闭锁系统。

a. 断路器的防止误合、分操作，我们建议通过采用带红、绿翻牌的断路器控制开关实现。用户如果习惯使用其他防误措施，可以在订货时提出。

b. 开关柜闭锁保证断路器小车在试验或工作位置时，断路器才能进行合、分操作；断路器合闸后，小车将无法运动。防止了带负荷推拉小车。

c. 开关柜闭锁保证仅当接地开关处在分闸位置时，小车才可以从试验位置向工作位置移动；仅当小车处于试验位

pipes going straightly to the top of cabinet.

The car track is set on the bottom of car room and used for the car moving in the cabinet. The isolation room is equipped with the main-loop static contactor box connected to both the main-bus room and the cable room. When the car is at the testing position or withdraws from the cabinet, the active screen board will cover the static contactor in order to make the effective isolation. When the car moves from the testing position to the working position, the active screen board will open automatically to make sure the main loop is smoothly connected. The upper and lower active screen boards unreliably move and they can be locked singly. Hence, if necessary, the overhaul staff can lock the screen boards on the powered side with an aim to check the main-loop static contactors on the other side.

The main-bus room is equipped with the 3-phase rectangular bus. All of the switch cabinets' main bus rooms are connected with each via sleeves. While operated, all these switch cabinets' main bus rooms are separated with each other. This aims to avoid an

置时，接地开关才可以进行合闸操作。此外，接地开关必要时，可以配置带电显示装置。所以，可以防止带电合接地开关及接地开关处于合闸状态送电的误操作发生。

d. 开关柜闭锁保证接地开关没有合闸，柜前下门和柜后门都无法打开。从而防止了误入带电间隔。

(2) 二次插头副和小车位置的联锁

开关柜柜体与小车的二次线路是通过二次插头实现连接的。二次插头通过一根波纹伸缩管与小车连接；二次插座装设在柜体小车室的右上方。小车只有在试验位置时，可以插上或拔下二次插头。小车在工作位置时，联锁将二次插头锁定，使其不能拔下。如果二次电源没有接通，断路器的合闸机构可以被电磁锁锁定 (断路器选择配闭锁线圈)。此时，断路器小车在二次插头没有插好之前，只能进行分闸操作，而无法使其合闸。

(3) 带电显示装置

如果用户需要，开关柜内可以配置带电显示装置。其不但可以显示主回路的带电状态，而且可以与电磁锁配合，实现对开关手柄、柜门等的强制闭锁，达到防止带电关合接地开关、防止误入带电间隔的目的，从而提高了开关柜防误性能。

4. 接地装置

开关柜在电缆小室设置了可以与邻柜贯通的主接地干线。主接地干线与柜体结构有良好的导电接触，并通过柜体与小车保持良好的电连续性。

5. 开关柜的二次参考原理图

用户可根据自己的系统实际情况选择控制电源和配置断路器的控制电路，并设计相应开关柜二次原理图。图5、图 6 是 ZN63A-12 型断路器柜的控制及保护原理图，图 7 是相应的断路器内部接线图，图 8 是 ZN65A-12 (EP)固封式断路器柜的控制及保护原理图，图 9 是相应的断路器内部接线图，供用户设计时参考。

七、安装调整

1. 开关柜的基础尺寸和安装尺寸见图 3～图 4。
2. 开关柜的基础施工一般应当分两次浇铺混凝土，第一次固定电缆槽钢，第二次铺设地面，一般铺设厚度为 60mm，地面应低于基础槽钢的上平面 1~3mm。
3. 开关柜如果是单面排列，柜前走廊以大于 2.5m 为宜；开关柜如果是两列对面排列，柜间走廊以不小于 3m 为宜。
4. 开关柜在运输过程中，应当使用叉车或备有符合要求吊具的吊车等。严禁使用滚运方式，避免橇棍等损坏开关柜。小车不应当安装在柜体中运输，而应当在柜体安装完成后装入柜内。

unexpected extensional fault that can affect other switch cabinets.

Depending on the requirements of main-loop solutions, the cable room is able to be equipped with current mutual inductors, grounding switches and powered indication devices, as well as frames and accessories for fixing cables. The bottoms of switch cabinets are set with main-cable entrance holes and dismountable sealing boards. Each phase of the type of cabinet can be connected with 1~3 single-core cables in parallel.

The relay room is used for installing secondary components for the protection and control of relays. On the left of room, a line slot that is used for the entry and exit of controlling cables is ready; and the small-bus penetrating holes are set on the top of room. The top cover of room can turned over while the lines are connected, making it easy to install the small buses. The doors of relay rooms can be equipped with instrument devices for observation aims, as well as the frequently operated switches and embedded relays.

2. Car

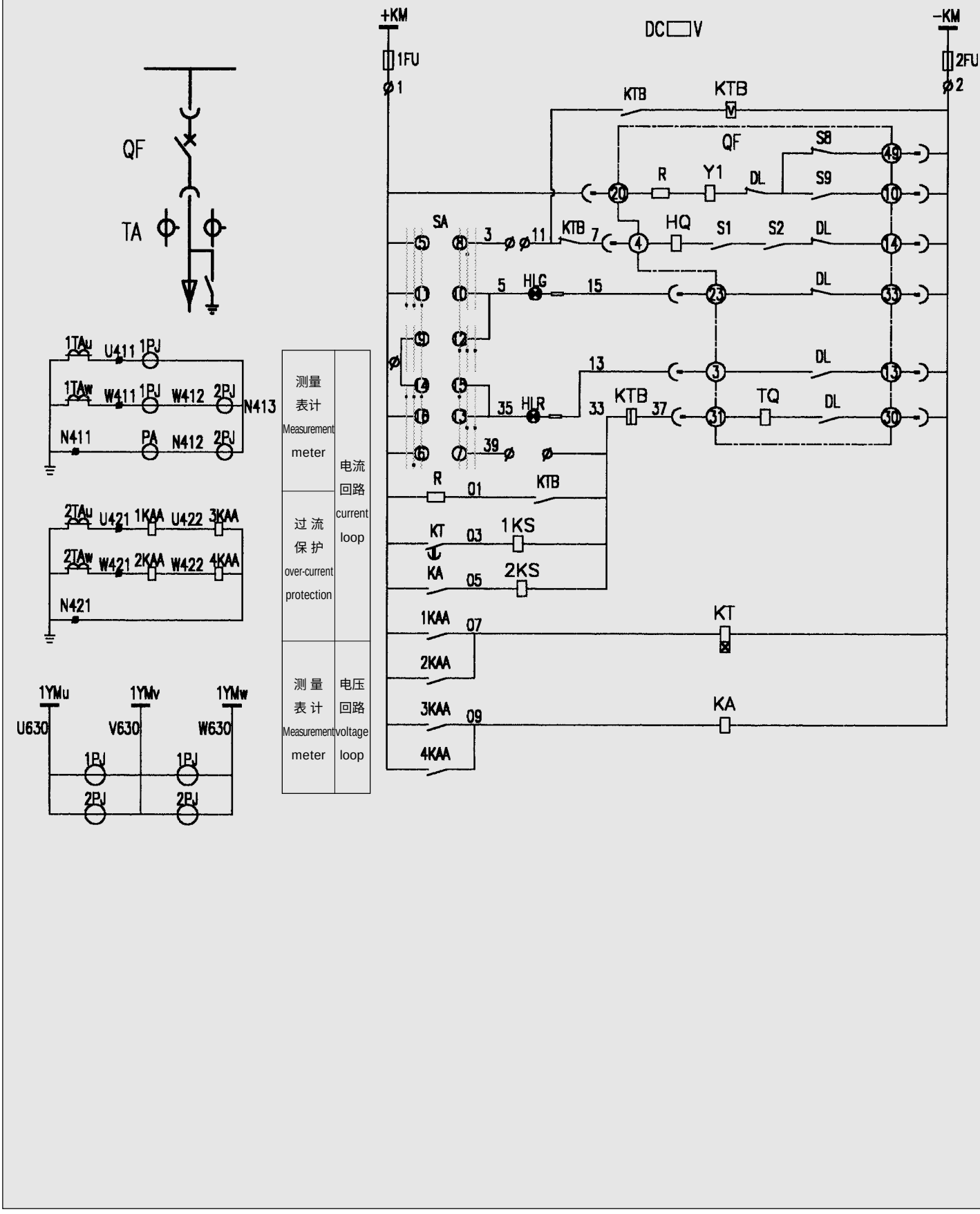
Depending on the different main-loop components with which the car is equipped, there are a relay car, a voltage mutual inductor, an isolation car and a computation car. It is guaranteed that the cars of same type can be interchanged depending on the modular-block-style changes of cars. In the cabinets, the cars see a testing (brake) position and a working position for anchor. The pushing (withdraw) unit of car applies a secondary turbine energy-saving mechanism, which is easy feasible to operate. When the cars are moved out of the cabinets, these cars should be equipped with special carriers.

After the cars are moved into the cabinets with the carriers, the cars will be first anchored at the testing (brake) position. After the cars arrive at the working position, the rotation of crank is blocked and the cars are ready. The related interlocks of cars make sure: Only if the breakers are opened, can the cars be moved; and only if the cars stay at the testing (brake) position and the working position; can the breakers are closed.

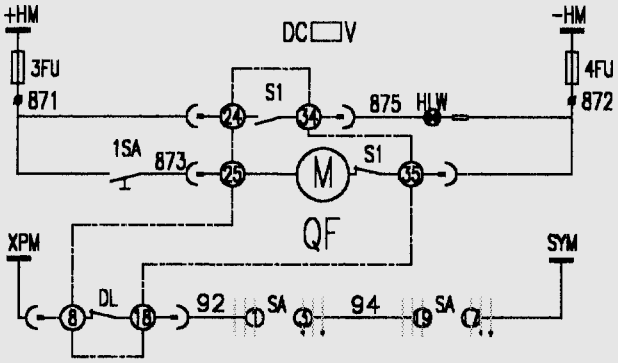
3. Interlock

(1) The type of switch cabinet applies a design of reliable "5-prevention" interlock system.

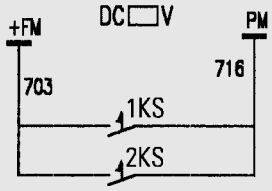
a. Protection of breaker' s wrong closing and opening.


+KM
DC□V
-KM
1FU
2FU
QF
TA
KTB
SA
HQ
HLG
HLR
R
Y1
DL
S1
S2
S8
S9
TQ
KT
KA
1KS
2KS
1TAu
1TAw
N411
PA
N412
2PJ
N413
2TAu
2TAw
N421
1KAA
2KAA
3KAA
4KAA
1YMu
1YMv
1YMw
U630
V630
W630
测量表计 Measurement meter
电流回路 current loop
过流保护 over-current protection
测量表计 Measurement meter
电压回路 voltage loop

小母线 / small bus
熔断器 protective fuse
防跳回路 jumping-proof loop
合闸闭锁 closing lock
合闸 / closing
分闸指示 opening indication
合闸指示 closing indication
分闸 / opening
防跳保持 jumping-proof keeping
过流 / over current
速断 / fast break
过流保护 over-current protection
速断保护 fast-break protection



储能信号 energy-storage signal
储能回路 energy-storage loop
事故掉闸警告信号 fault off-brake alert signal



信号未复归 signal not reset

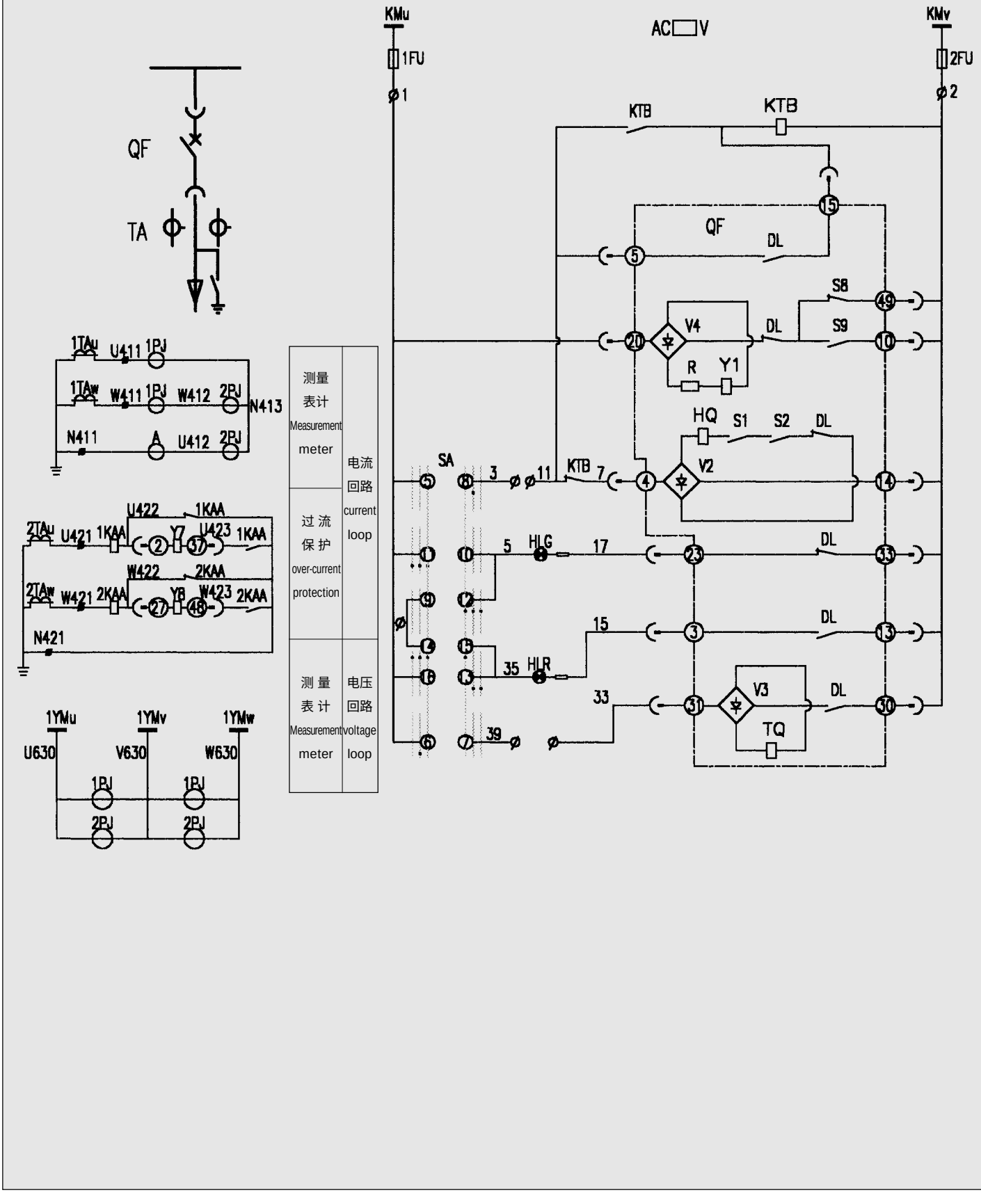
序号 No.	符 号 Symbol	名 称 Name	型号及规格 Type and Specification	数 量 Quantity
15	QF	真空断路器 Vacuum protective fuse	ZN63A**	1
14	KA	中间继电器 Auxiliary relay	DZY204 □V	1
13	1~4KAA	电流继电器 Current relay	DL-31 *A	各 2 2 each
12	KT	时间继电器 Time delay relay	DS-31C □V	1
11	1SA	储能开关 Energy-storage switch	MK621	1
10	3~4FU	熔断器 Protective fuse	RT14-20/*A	2
9	1~2FU	熔断器 Protective fuse	RT14-20/*A	2
8	1KS, 2KS	信号继电器 Signal relay	DX31 0.5A	2
7	KTB	防跳继电器 Energy-storage switch	DZB-214 □V 0.5A	1
6	R	电阻 Jumping-proof relay	ZG11-25W 1 欧姆	1
5	HLR, HLG, HLW	信号灯 Signal lamp	AD11-25 /21 □V 红，绿，白 AD11-25/21 □V red, green, white	各 1 1 each
4	SA	控制开关 Control switch	LW2-Z 1a 4 6a 40 20/F8	1
3	1PJ	无功电度表 Power-free ammeter	DX865-2K 100V 3 (6)A	1
2	2PJ	有功电度表 Powered ammeter	DS862-2K 100V 3 (6)A	1
1	PA	电流表 Ammeter	42L6-A */5A	1

** 注：取消断路器内部防跳

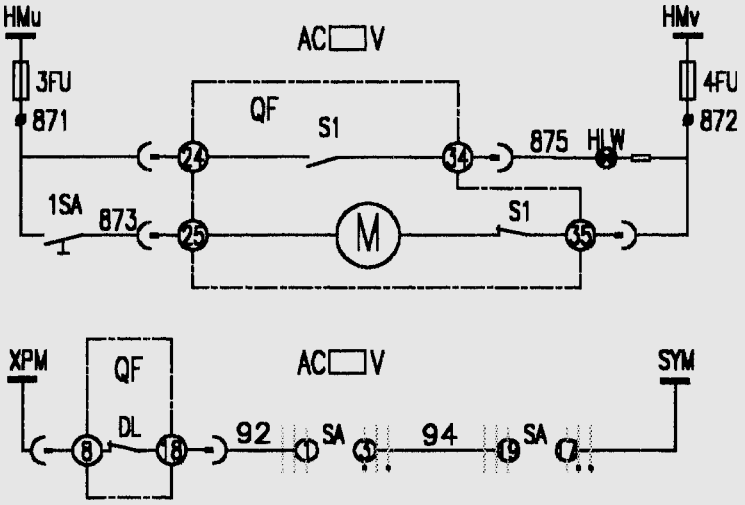
Note: Cancel internal anti-trip of circuit breaker

图 5. ZN63A-12 直流操作(弹簧机构)参考原理接线图

Fig.5 Reference Principal Wiring Map of ZN63A-12 DC Operation (Spring Mechanism)


KMu
AC□V
KMv
1FU
2FU
ø1
ø2
KTB
KTB
QF
TA
QF
DL
S8
S9
V4
DL
R
Y1
HQ
S1
S2
DL
SA
V2
KTB
HLG
HLR
V3
TQ
DL
1TAu
U411
1PJ
1TAw
W411
W412
2PJ
N413
N411
A
U412
2PJ
2TAu
U421
1KAA
U422
U423
2TAw
W421
2KAA
W422
W423
N421
1YMu
1YMv
1YMw
U630
V630
W630
测量表计 Measurement meter
电流回路 current loop
过流保护 over-current protection
测量表计 Measurement meter
电压回路 voltage loop

小母线 / small bus
熔断器 protective fuse
防跳回路 jumping-proof loop
合闸闭锁 closing lock
合 闸 closing
分闸指示 opening indication
合闸指示 closing indication
分 闸 opening



储能信号 energy-storage signal
电机回路 motor loop
事故掉闸警告信号 fault off-brake alert signal

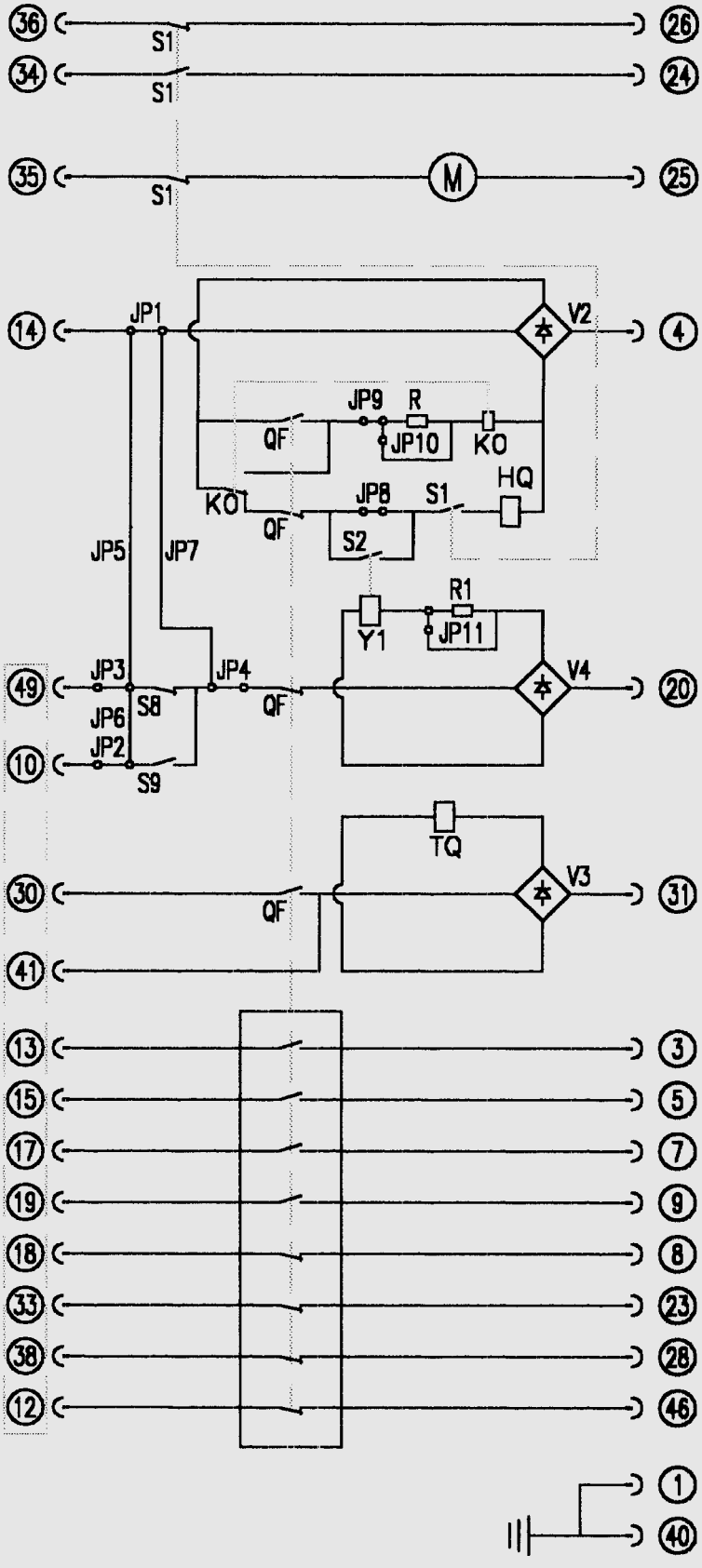
序号 No.	符 号 Symbol	名 称 Name	型号及规格 Type and Specification	数 量 Quantity
11	QF	真空断路器 Vacuum protective fuse	ZN63A**	1
10	1~2KAA	电流继电器 Current relay	GL15/*A	2
9	1SA	储能开关 Energy-storage switch	MK621	1
8	3~4FU	熔断器 Protective fuse	RT14/*A	2
7	1~2FU	熔断器 Protective fuse	RT14/*A	2
6	KTB	防跳继电器 Jumping-proof relay	DZ52-22 □V	1
5	HLR, HLG, HLW	信号灯 Signal lamp	AD11-25 /21 □V 红，绿，白 AD11-25/21 □V red, green, white	各1 1 each
4	SA	控制开关 Control switch	LW2-Z 1a 4 6a 40 20/ F8	1
3	1PJ	无功电度表 Power-free ammeter	DX865-2K 100V 3(6)A	1
2	2PJ	有功电度表 Powered ammeter	DS862-2K 100V 3(6)A	1
1	PA	电流表 Ammeter	42L6-A */5A	1

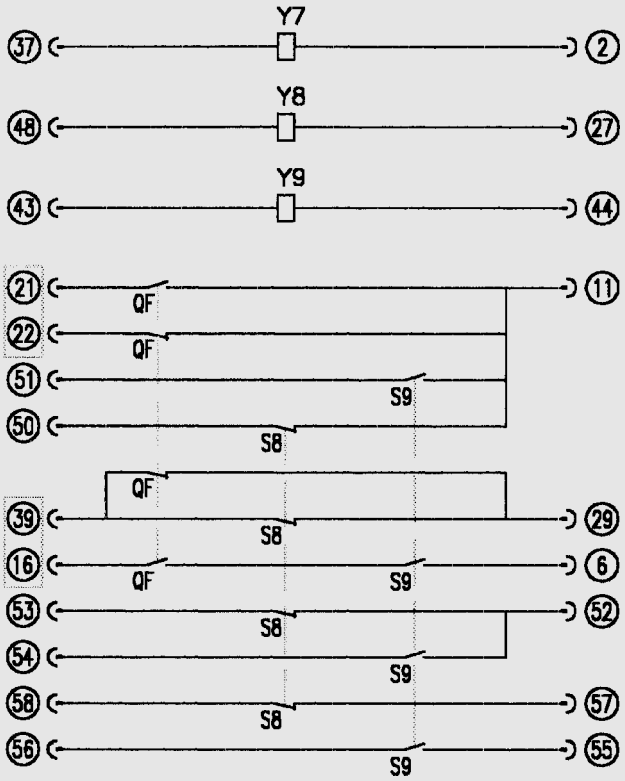
** 注：取消断路器内部防跳

Note: Cancel internal anti-trip of circuit breaker

图 6. ZN63A-12 交流操作(弹簧机构)参考原理接线图

Fig.6 Reference Principal Wiring Map of ZN63A-12 AC Operation (Spring Mechanism)


36
S1
26
34
S1
24
35
S1
M
25
14
JP1
V2
4
JP9
R
QF
JP10
KO
HQ
KO
JP8
S1
QF
S2
JP5
JP7
R1
Y1
JP11
49
JP3
JP4
V4
20
JP6
S8
QF
10
JP2
S9
TQ
30
V3
31
QF
41
13
3
15
5
17
7
19
9
18
8
33
23
38
28
12
46
1
40



操作电源选择

Selection of operation power supply

跳线 / 操作电源	JP10	JP11
AC/DC 220V	/	/
AC/DC 110V	√	√

jumping / Operation power supply	JP10	JP11
AC/DC 220V	/	/
AC/DC 110V	√	√

可选件接线装置 Wiring devices of optional components

跳线状态 / 跳线 / 配置		JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8	JP9
带防跳	带闭锁	√	√	√	√	/	/	/	/	√
	无闭锁	/	/	/	/	√	√	√	√	√
无防跳	带闭锁	√	√	√	√	/	/	/	/	/
	无闭锁	/	/	/	/	√	√	√	√	/

jumping state / jumping / Configuration		JP1	JP2	JP3	JP4	JP5	JP6	JP7	JP8	JP9
With jumping-proof	With lock	√	√	√	√	/	/	/	/	√
	Without lock	/	/	/	/	√	√	√	√	√
Without jumping-proof	With lock	√	√	√	√	/	/	/	/	/
	Without lock	/	/	/	/	√	√	√	√	/

注：“ / ”表示断开；“ √ ”表示连接。

HQ：合闸线圈

TQ：分闸线圈

S1：辅助开关 (合闸弹簧储能后切换)

S2：辅助开关

M：储能电机

QF：辅助开关 (分合操作时切换)

R0~R1：电阻

Y7~Y9：间接式过电流脱扣器线圈 (可选)

Y1：闭锁线圈 (可选)

K0：防跳继电器 (可选)

JP1~JP11：跳线

S8：辅助开关 (当 ZN63A 在试验位置时切换)

S9：辅助开关 (当 ZN63A 在工作位置时切换)

V2~V4：桥式整流器 (直流时取消)

Note: “ / ” means breaking, ”√ ” means connecting.

HO: Closing wiring

TO: Opening wiring

S1: Auxiliary switch (for switching after the closing spring stores energy)

S2: Auxiliary switch

M: Energy-storage motor

QF: Auxiliary switch (for switching when closing and opening operation is made)

R0~R1: resistance

Y7~Y9: Indirect over-current releaser wiring (optional)

Y1: Locking wiring (optional)

K0: Jumping-proof relay (optional)

JP1~JP11: Jumping line

S8: Auxiliary switch (for switching when ZN63A is at testing position)

S9: Auxiliary switch (for switching when ZN63A is at working position)

V2~V4: Bridge rectifier (cancelled for DC)

注：当为直流电源操作时，虚线框中的极性应相同，电机应按图示极性接线。

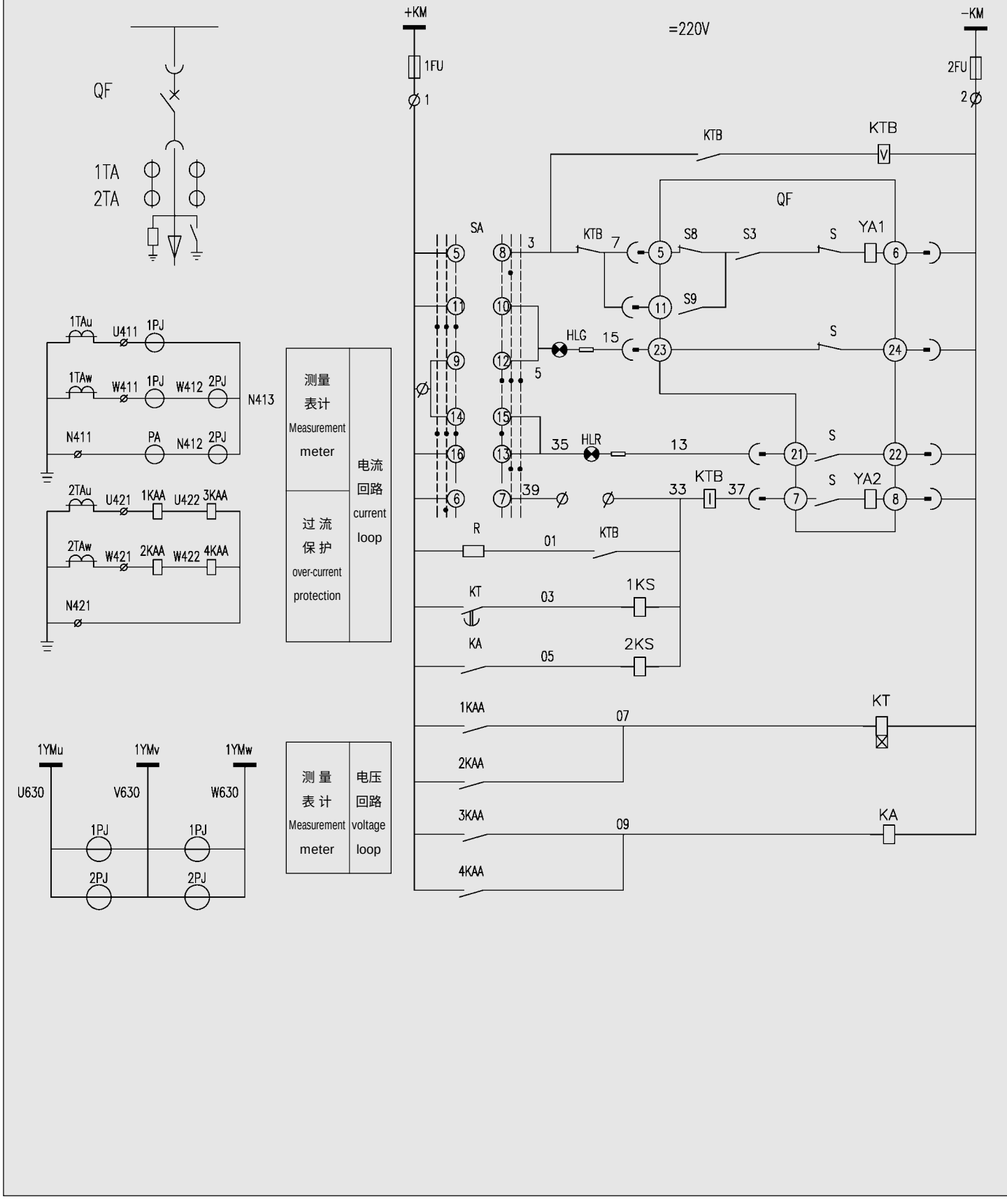
Note: With the DC power supply, the polarity in the dashed casing is the same and the motor should be connected as per the drawing`s polarity.

图中为断路器处于实验位置、分闸、未储能状态

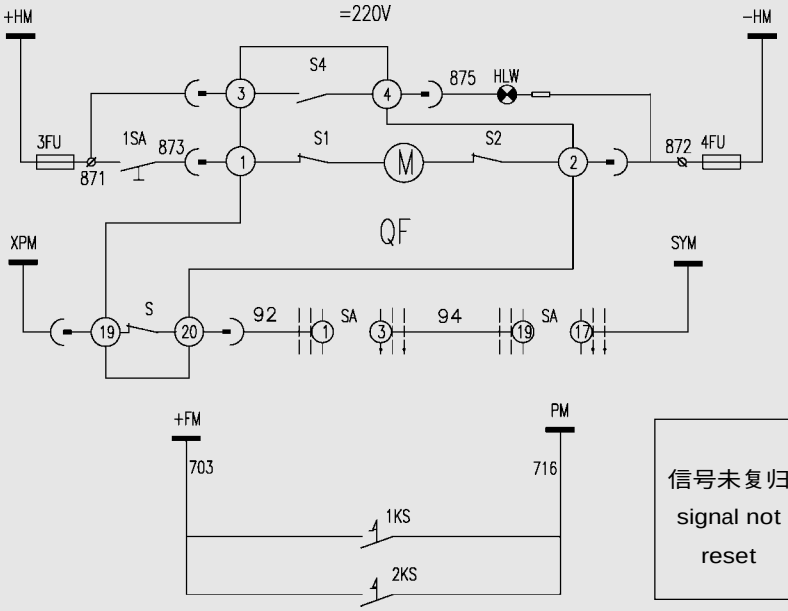
According to the drawing, the circuit breaker is in the test position, opening and un-storedenergy position

图 7. 断路器内部电气接线原理图

Fig.7 Electric Principal Wiring Map of Inside of Breaker


+KM
=220V
-KM
1FU
2FU
QF
1TA
2TA
KTB
SA
S8
S3
S
YA1
S9
HLG
HLR
YA2
1TAu
U411
1PJ
1TAw
W411
W412
2PJ
N413
N411
PA
N412
2TAu
U421
1KAA
U422
3KAA
2TAw
W421
2KAA
W422
4KAA
N421
测量表计 Measurement meter
过流保护 over-current protection
电流回路 current loop
R
01
KT
03
1KS
KA
05
2KS
07
09
1YMu
1YMv
1YMw
U630
V630
W630
测量表计 Measurement meter
电压回路 voltage loop

小母线 / small bus
熔断器 protective fuse
防跳回路 jumping-proof loop
试验合闸 Test switching-in
合闸回路 Switching-in circuit
掉闸回路 Trip circuit
过流 / over current
速断 / fast break
过流保护 over-current protection
速断保护 fast-break protection

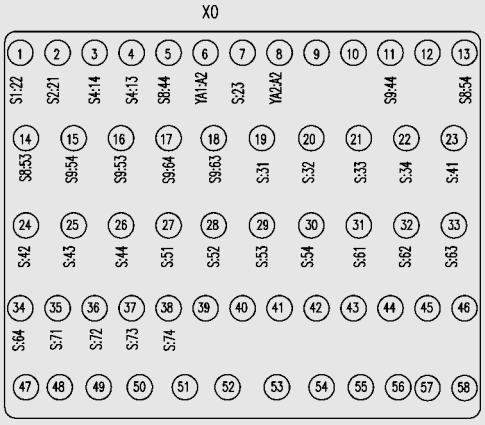


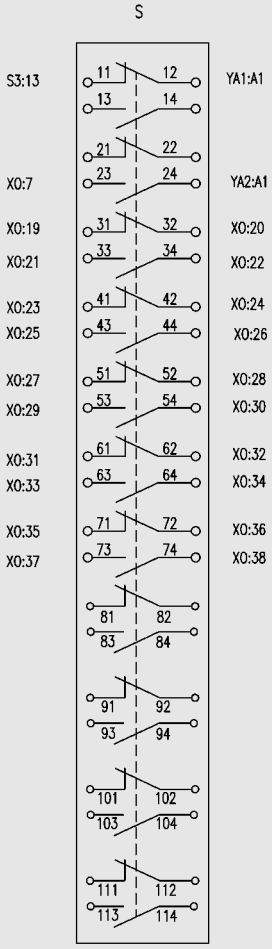
储能信号 energy-storage signal
储能回路 energy-storage loop
事故掉闸警告信号 fault off-brake alert signal

信号未复归
signal not reset

序号 No.	符 号 Symbol	名 称 Name	型号及规格 Type and Specification	数 量 Quantity
15	QF	固封式真空断路器 Solid sea	ZN65A-12 (EP)	1
14 14	1SA 1-2KAA	储能开关 Energy-storage switch	MK621	1
13 13	3~4FU 15A	熔断器 Protective fuse	RT14-20/10A	2
12 12	1~2FU 3-4FU	熔断器 Protective fuse	RT14-20/*A	2
11 11	KA 1-2FU	中间继电器 Auxiliary relay	DZY204 220V ZNY204 220V	1
10	R	电阻 Current relay	ZG11-25W 1Ω	1
9	KTB	防跳继电器 Energy-storage switch	DZB-213 220V 0.5A	1
8	KT	时间继电器 Protective fuse	DS-31C 220V	1
7	1~4KAA	电流继电器 Current relay	DL-31 *A	各 2 2 each
6	1KS 2KS	信号继电器 Jumping-proof relay	DX31 0.5A	2
5	HLR, HLG, HLW	信号灯 Signal lamp	AD11-25 /21 □V 红，绿，白 AD11-25/21 □V red, green, white	各 1 1 each
4	SA	控制开关 Control switch	LW2-Z 1a 4 6a 40 20/ F8	1
3	1PJ	无功电度表 Power-free ammeter	DX865-2K 100V 3 (6)A	1
2	2PJ	有功电度表 Powered ammeter	DS862-2K 100V 3 (6)A	1
1	PA	电流表 Ammeter	42L6-A */5A	1

图 8. ZN65A-12(EP)直流操作(弹簧机构)参考原理接线图
Fig.8 Reference Principal Wiring Map of ZN65A-12 (EP) DC Operation (Spring Mechanism)


X0
1 2 3 4 5 6 7 8 9 10 11 12 13
S1:22 S2:21 S4:14 S4:13 S8:44 YA1:A2 S:23 YA2:A2 S9:44 S8:54
14 15 16 17 18 19 20 21 22 23
S8:53 S9:54 S9:53 S9:64 S9:63 S:31 S:32 S:33 S:34 S:41
24 25 26 27 28 29 30 31 32 33
S:42 S:43 S:44 S:51 S:52 S:53 S:54 S:61 S:62 S:63
34 35 36 37 38 39 40 41 42 43 44 45 46
S:64 S:71 S:72 S:73 S:74
47 48 49 50 51 52 53 54 55 56 57 58


S
S3:13
11 12 YA1:A1
13 14
21 22
X0:7
23 24 YA2:A1
X0:19
31 32 X0:20
X0:21
33 34 X0:22
X0:23
41 42 X0:24
X0:25
43 44 X0:26
X0:27
51 52 X0:28
X0:29
53 54 X0:30
X0:31
61 62 X0:32
X0:33
63 64 X0:34
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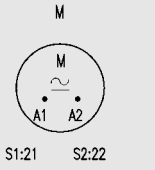
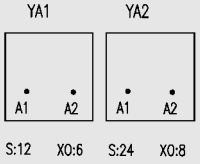
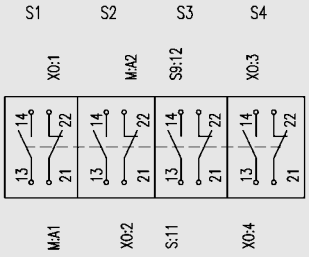
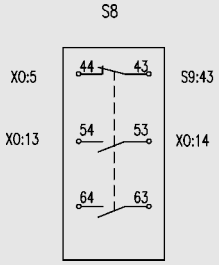
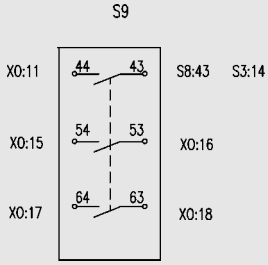
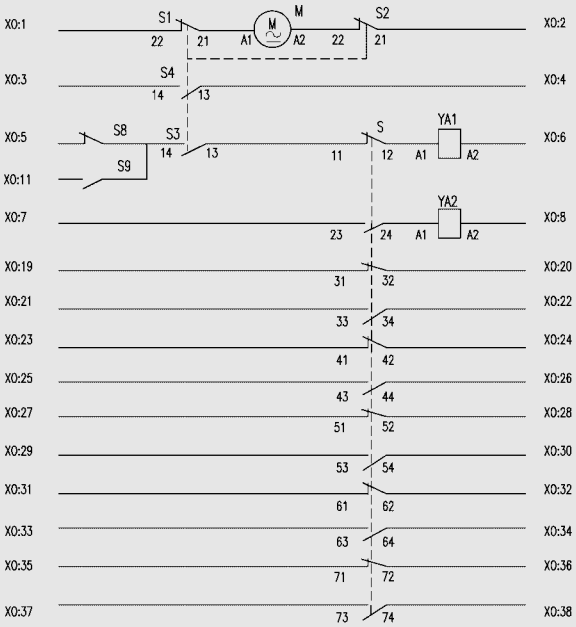

M
M
A1 A2
S1:21 S2:22

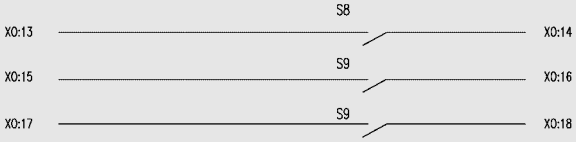

YA1 YA2
A1 A2 A1 A2
S:12 X0:6 S:24 X0:8


S1 S2 S3 S4
X0:1 M:A2 S9:12 X0:3
14 22 13 21
M:A1 X0:2 S:11 X0:4


S8
X0:5 44 43 S9:43
X0:13 54 53 X0:14
64 63


S9
X0:11 44 43 S8:43 S3:14
X0:15 54 53 X0:16
X0:17 64 63 X0:18





S9	辅助开关 (当断路器在工作位置时切换) Auxiliary switch (for switching when ZN63A is at working position)		1	
S8	辅助开关 (当断路器在试验位置时切换) Auxiliary switch (for switching when ZN63A is at testing position)		1	
YA2	分闸电磁铁 Opening magnet	5BK.520.098	1	
YA1	合闸电磁铁 Closing magnet	5	BK.520.017	1 借用 ZN65A-12/1250-25 1 Reference with ZN65A-12/1250-25
S1-S6	微动开关 Mini switch	LXW22-11	6	
S	辅助开关 Auxiliary switch	F10-22II/W2/11K11B	1	
M	储能电机 Energy-storage motor	HDZ-220808	1	
XO	插头座 Socket	CD-58	1	
符 号 Symbol	名 称 Name	型号规格 Type and Specification	数 量 Quantity	备 注 Remark

图 9. ZN65A-EP 固封式真空断路器接线原理图

Fig.9The connection diagram of the ZN65A-EP pole with epoxy resting vacuum breaker

5. 开关柜的安装步骤建议如下：(参考图2)

(1) 松开主母线室的顶盖螺钉，卸去顶盖。

(2) 在主母线室前面卸下隔板项12。

(3) 松开小车室下面的隔板项17。

(4) 卸下电缆盖板项19。

(5) 卸去开关柜内左右两侧二次电缆槽盖板。

(6) 卸下吊装板。

(7) 此时，可以一台一台的顺序组合开关柜。如果一排开关柜的数量超过10台，建议由中间向两侧组合。在垂直和水平两个方向的不平度，要求不大于2mm。

(8) 当开关柜组合好后，可用M12螺栓将开关柜与基础连接；也可以使用焊接的方式，将开关柜与基础连接在一起。

6. 主母线的安装

(1) 将主母线的包装箱打开，按母线上的标记将母线排好。检查主母线套管是否完好。

(2) 擦净母线接触面，涂上导电膏或者中性凡士林后，将母线穿入主母线套管。主母线的安装最好与开关柜的拼装工作交替进行，避免整排开关柜拼装完成后穿装主母线困难。

7. 接地回路的安装

(1) 开关柜安装好后，用随柜附带的连接件将各柜的主接地干线连接好。

(2) 将开关柜的主接地干线与建筑的接地网连接，如果开关柜的数量超过10台，必须有两个以上的连接点。

八、使用与维护

1. 使用前的检查

开关柜在使用前，应当清理设备内外；检查各部分的紧固件有无松动；检查各种电器设备的接线有无脱落；将小车在开关柜内试推、拉；对断路器进行合分操作，观察有无异常；检查联锁机构是否完整、灵活、可靠；检查二次线路接线是否正确；进行规程要求的各项试验。

2. 开关柜在运行中，运行人员除了应遵守有关规程的要求以外，还应注意以下问题：

(1) 操作程序

虽然开关柜设计有保证开关柜各部分操作程序正确的联锁，但是操作人员对开关柜各部分的投入和退出仍应严格按操作规程和本技术文件的要求进行，不应随意操作，更不应在操作受阻时，不加分析强行操作。否则，容易造成设备损坏，甚至引起事故。

a. 无接地开关的断路器柜的操作

- 将断路器可移开部件装入柜体

断路器小车准备由柜外推入柜内前，应认真检查

We suggest you achieve the protection by means of the breaker control switch with the red and green turning plates. If being accustomed to use other fault-prevention methods, the users can mention the methods in the orders.

b. The lock of switch cabinet makes sure that only if the breaker car stays at the testing or working position, can the breaker be closed and opened. After the breaker is closed, the car will be unable to move in order to prevent the car being pulled and pushed with loads.

c. The lock of switch cabinet makes sure: Only if the grounding switch stays at the opening position, can the car be moved from the testing to the working position; and only if the car stays at the testing position, can the grounding switch be closed. In addition, this switch can be equipped with a power indication unit if necessary. Therefore, maloperation that the switch is closed with power or stays at the closing power-supply state can be banned.

d. The lock of switch cabinet makes sure: If the grounding switch has not been closed, the front lower door and the rear door of cabinet cannot be opened, so as to prevent the wrong power isolation.

(2) Interlocks of secondary plug and car' s position

The switch cabinet and the car' s secondary circuit are connected together via the secondary plug. The plug is connected with the car via a corrugated expansion tube. The secondary socket is set on the right upper of cabinet' s car room. The plug can only be inserted and unplugged when the car is only at the testing position. For this position, the interlock will lock the secondary plug to make it unable to be unplugged. If the secondary power supply is not turned on, the closing mechanism of breaker can be locked with the magnetic lock (The breaker selects the locking coil). At that time, the breaker car can only make the opening operation before the secondary plug has not been inserted.

(3) Power indication unit

If the user needs it, the power indication unit can be used for the switch cabinet. This unit not only indicates the power state of main loop, but also can coordinate with the magnetic lock. This aims to achieve the enforced locks of switch handle and cabinet door, so as to prevent the grounding switch being closed with power for the wrong

断路器是否完好，有没有漏装部件，有无工具等杂物放在机构箱或开关内，确认无问题后将小车装在转运车上并锁定好。将转运车推到柜前，把小车调整到合适位置；注意应将转运车前部定位锁板插入柜体中隔板插口并将转运车与柜体锁定之后，再打开断路器小车的锁定钩，将小车平稳推入柜体并锁定。当确认已将小车与柜体锁定好后，解除转运车与柜体的锁定，将转运车推开。

- 小车在柜内操作

小车从转运车装入柜体后，即处于柜内断开位置，若想将小车投入运行，首先应使小车处于试验位置，并将辅助回路插头插好。如接通二次电源，则继电器室面板上的小车试验位置指示灯亮。此时，可在主回路未接通的情况下对小车进行电气操作试验。若想继续进行操作，必须确认断路器处于分闸状态后，可将小车推进摇把插入操作孔，顺时针转动摇把，直到感到摇把明显受阻并且听到辅助开关的切换声，看到继电器室门上的小车工作位置指示灯亮时取下摇把，小车在工作位置定位。此时，主回路接通，断路器已处于准备状态，可通过控制回路对其进行合、分操作。

若准备将小车从工作位置退出，首先应确认断路器已处于分闸状态。然后插入摇把，逆时针转动摇把直到感到摇把明显受阻并且听到辅助开关的切换声，看到继电器室门上的小车试验位置指示灯亮时取下摇把，小车回到试验位置。此时，主回路已经完全断开，金属活动帘板关闭。

- 从柜中取出小车

若准备从柜内取出小车，首先应确定小车已处于试验位置，然后打开柜门，把转运车与柜体锁住 (与把小车装入柜内时相同)，摘开辅助回路插头并扣锁在小车骨架上，将小车解锁后向外拉出。当小车完全进入转运车，并确认被转运车锁定后，再打开转运车与柜体锁定，把转运车向后拉出。如小车要用转运车运输较长距离时，应当格外小心，以避免运输过程中发生意外事故。

- 断路器在柜内合、分状态的确认

断路器的合分状态可以通过断路器的小车面板上的合分闸指示牌及继电器室门上的合分闸指示灯的指示进行判断。

b. 有接地开关的断路器柜的操作

有接地开关的断路器柜将断路器小车装入柜内和从柜内取出小车的程序与无接地开关的断路器柜的操作程序完全相同，仅在小车在柜内移动过程和操作接地开关过程中

power isolation and raise the maloperation-banned performance of cabinet.

4. Grounding unit

The cable room of switch cabinet is set with a main grounding trunk that is able to have a thorough connection with neighbor cabinets. This trunk has a good electric-conductive contact with the cabinet structure and keeps a good electric continuity with the car via the cabinet.

5. The secondary reference principal drawing of cabinet

The user can select the controlling circuits of control power supply and breaker and design the secondary principal drawing of related switch cabinet, depending on his or her own system. Fig.5 and Fig.6 are the control and protection principal drawings of Type ZN63A-12 Breaker Cabinet; and Fig.7 is the internal wiring drawing of appropriate breaker. Fig.8 is the control and protection principal drawings of Type ZN65A-12 (EP) solid sealed breaker cabinet; and Fig.9 is the internal wiring drawing of appropriate breaker. This is reference for the user making designs.

VII. Installation and Adjustment

1. For the basic and installation sizes of switch cabinets, see Fig. 3~4.

2. The foundation project of switch cabinets generally ought to be divided into two times of filling and paving concrete. For the first time, the cable channel steel is fixed; and in the second time, the ground is paved generally with the thickness of 60mm. The ground ought to be 1~3mm lower than the upper plain of foundation channel steel.

3. If the switch cabinets are arranged along a single side, the corridor before cabinets ought to be larger than 2. 5m; and if these cabinets face each other with two rows, the corridor between cabinets ought to be no less than 3m.

4. For the conveyance of cabinets, a fork cart or a crane that is equipped with special hoists up to the standards ought to be used. The roll conveyance method is strictly forbidden in order to prevent the switch cabinets being damaged by the rods. The car should not be installed in the cabinets for conveyance, but be placed in the cabinets after they have been installed.

5. It is suggested that the switch cabinets are installed with the following steps: (See the Reference Fig.2)

要注意如下问题：

● 小车在柜内操作

当准备将小车推入工作位置时，除了要遵守8.2.1.a 中提请注意的诸项要求外，还应确认接地开关处于分开状态，否则下一步操作将无法完成。

● 合接地开关操作

若要合接地开关，首先应确定小车已退到试验位置并取下推进机构摇把，然后按下接地开关操作孔处的联锁弯板，插入接地开关操作摇把，顺时针转动90°，接地开关合闸。若要分接地开关需逆时针转动操作摇把 90°，接地开关分闸。

c. 一般隔离柜的操作

隔离小车本不具备接通和断开负荷电流的能力，因此在带负荷的情况下推拉小车是极其危险的，因此在进行隔离小车柜内操作时，必须保证首先断开与之相配合的断路器，断路器分闸后，其辅助开关切断隔离小车的电气闭锁，隔离小车可以进行推拉操作。隔离小车推拉的具体操作方法与断路器小车相同。

(2) 使用联锁的注意事项

a. 本产品的联锁功能是以机械联锁为主，辅之以电气联锁实现其功能的，功能上能实现开关柜 " 五防 " 闭锁的要求。但是操作人员不应因此而忽视操作规程的要求，不按规程规定的要求操作。只有组织手段与技术手段相结合才能有效发挥联锁装置的保障作用，防止误操作事故的发生。

b. 本产品的联锁功能的投入与解除，大部分是在正常操作过程中同时实现的，不需要增加额外的操作步骤。如发现操作受阻(如操作阻力突然增大)应首先检查是否有误操作的可能，而不应强行操作以至损坏设备，甚至导致误操作事故的发生。

c. 有些联锁因特殊需要允许紧急解锁 (如柜体前下门和接地开关的联锁)。紧急解锁的使用必须慎重，不宜随意使用，使用时也要采取必要的防护措施，一经处理完毕，应立即恢复联锁原状。

3. 开关柜的检修应除按有关规程要求进行外，建议用户特别注意以下几点：

(1) 定期按真空断路器的安装使用说明书的要求，检查断路器的情况，并进行必要的调整。

(2) 检查小车推进机构及其联锁的情况，使其满足本说明书有关要求。

(3) 检查主回路触头的情况，擦除动、静触头上陈旧油脂，察看触头有无损伤；弹簧力有无明显变化；有无因温度过高引起镀层异常氧化现象，如有以上情况，应及时处理。检查辅助回路触头有无异常情况，并进行必要的修整。

(4) 检查接地回路各部分的情况，如接地触头、主接地线及过门接地线等，保证其电连续性。

(5) 检查各部分紧固件，如有松动，应及时紧固。

九、运输与储存

1. 开关柜的长途运输，建议不采用公路运输的方式，特别不要长距离在三级以下公路运输。
2. 开关柜在包装底板上固定时可采用滚运。无包装开关柜应采用吊运或铲运。
3. 开关柜 (即使是带外包装的)不宜长期在户外储放。较长时期不用的开关柜，应储放在干燥，通风的户内仓库中。开关柜的外包装有效期一般不超过一年。

十、产品的成套性

产品在交货时应具备以下文件和附件：

1. 产品的合格证明书。
2. 产品的安装使用说明书。
3. 装箱单。
4. 产品的工程设计资料 (包括系统图，二次接线图，设备明细表等)。
5. 小车推进摇把、接地开关操作摇把 (建议每 5 台开关柜配一套) 及转运车 (建议合同台量 10 台以下，每 5 台配一套；超过 10 台，每增加 10 台，加一套)。
6. 开关柜内主要元件的安装使用说明书等技术文件和附件。

十一、主回路方案图如下：(见附表 1)

1) Loosen the cover screw of bus room and disassemble the cover.

2) Disassemble the isolation board top 12 before the bus room.

3) Loosen the isolation board top 17 below the car room.

4) Disassemble the secondary cable channel covers on the left and right sides in switch cabinets.

5) Disassemble the hoist boards.

6) At that time, the switch cabinets can be combined one by one orderly. If there are over 10 switch cabinets on one row, it is suggested they are combined from the middle cabinets to those arranged on the two sides. The unevenness degrees in the vertical and horizontal directions are no more than 2mm.

7) When the switch cabinets have been combined, the M12 bolts or welding measures are usable for the connection of switch cabinets and foundation.

6. Installation of main bus

1) Open the packing box of main bus, arrange the bus in

accordance with the signs of bus, and check whether the sleeve of bus is perfect.

2) Wipe the contacting surface of bus cleanly, coat conductive paste or neutral vasline and then put the bus through the main-bus sleeve. The installation of main bus should be made interactively with the assembly of switch cabinets, with an aim to prevent the difficulties of assembling main bus after the whole row of cabinets are installed.

7. Installation of grounded loop

1) After the switch cabinets are installed, the staff shall use the attached connection parts to connect the main grounding trunks.

2) Connect the main grounding trunks of switch cabinets with the grounded networks of building. If there are over 10 switch cabinets, two or more connection points are needed.

VIII. Use and Maintenance

1. Check before use

After the switch cabinets are used, the staff ought to do some cleaning for their insides and outsides, check whether there are loose fasteners and dropped wirings on all the parts and electric appliance, try to push and pull the car in the switch cabinets, open and close the breakers to see whether there are abnormality, check whether the interlocking mechanism is complete, flexible and reliable, check whether the secondary-circuit wirings are correct and make a variety of tests depending on the requirements of rules and regulations.

2. When the switch cabinets are operating, the staff ought to pay attention to the following while they abide by the rules and regulations.

(1) Operation order

Although the switch cabinets are equipped with interlock that is able to guarantee the correct operation orders of all of their parts on design, the operation staff still ought to operate and withdraw all these parts strictly in accordance with the rules and regulations as well as the requirements of the technical documents. The staff not only makes no casual operation, but also enforces no operation without analysis. Otherwise, it is easy to make the equipment damaged or even cause a fault.

a. Operation of breaker cabinet of free grounding switch

● Install the moveable parts of breaker into cabinet

Before the car of breaker is ready for being pushed from the outside of cabinet to the inside, the staff ought to carefully check whether the breaker is perfect, there are any missed components and sundries such as tools are placed in the organism box or switch or not. Only after ensuring there is no problem, can the staff install the car on the carrier and lock this car. Therefore, the staff can push the carrier before the cabinet and adjust the car for the proper position. The staff ought to be careful to insert the front positioning lock of carrier into the hole of the middle isolation board of cabinet, lock the carrier with the cabinet and then open the locking hook of breaker' s car, in order to smoothly push the car into cabinet and lock it. After ensuring that the car has been locked with the cabinet, can the staff relief the lock between the carrier and cabinet and then push the carrier away.

● Operate car in cabinet

After the car is installed from the carrier to the cabinet, the car will stay at the breaking position of cabinet. To put the car into operation, the staff ought to first make the car stay at the testing position and then insert the plug of auxiliary loop. If the secondary power supply is switched on, the indication lamp of car testing position on the panel of relay will go on. At that time, the staff can make the electric operation test for the car without the main loop turned on. To continue making the operation, the staff must make sure the breaker stay at the opening state before doing the following action: Insert the pushing crank of car into the operation hole and rotate the crank in clockwise. The staff can take down the crank only if he or she feels it has been blocked obviously, hears the turning sound of auxiliary switch and see the indication lamp of car testing position on the panel of relay lights. The car has been ready at the working position. At this time, the main loop is turned on and the breaker has been ready, so the staff can make the opening and closing operations for the control loop.

To withdraw the car from the working position, the staff ought to first make sure the breaker has stayed at the opening state. Then the staff inserts the crank and rotates it in clockwise. The staff can take down the crank only if he or she feels it has been blocked obviously, hears the turning sound of auxiliary switch and see the indication

lamp of car testing position on the panel of relay lights. The car has returned to the testing position. At this time, the main loop is turned off and the metal active screen board is closed.

● Take out car from cabinet

To take out car from cabinet, the staff ought to first make sure the car has stayed at the testing state. Then the staff opens the door of cabinet, locks the carrier with the cabinet (same as installing the car into the cabinet), presses on the plug of auxiliary loop and covers and locks it on the frame of car, so as to unlock the car and pull it out. When the whole car goes in the carrier and the staff makes sure the carrier is locked, the staff can relief the lock between the carrier and the cabinet again and pull the carrier back out of the cabinet. If the car needs to be conveyed for long distance with the carrier, the staff should be careful to avoid unexpected faults during the conveyance.

● Confirm the breaker' s closing and opening state in cabinet

To confirm the breaker' s closing and opening state in cabinet, the staff can make judgement with the closing and opening sign boards on the car panel of breaker and the closing and opening indication lamps on the door of relay.

b. Operation of breaker cabinet with grounding switch

Refer to the following operations of breaker cabinet with grounding switch: Installing the breaker car into the cabinet and taking out the car from the cabinet. The staff only needs to pay attention to the following problems when the car is moved or the grounding switch is operated in the cabinet:

● Operate car in cabinet

When the car is ready for being pushed onto the working position, the staff not only abides by the precautions of B.2.1a, but also makes sure the grounding switch stays at the opening state. Otherwise, the next operation cannot be finished.

● Operate grounding switch

To turn on the grounding switch, the staff ought to first confirm that the car has withdrawn for the testing position. Then the staff takes down the crank of pushing mechanism, presses the interlocking crooked board at the operation hole of grounding switch, inserts the operation crank of grounding switch and rotates it by 90° in clockwise. To turn off the grounding switch, the staff ought to rotate the operation crank by 90° in counterclockwise. At this time, this switch is turned off.

c. Operation of common isolation cabinet

The isolation car does not feature the abilities of turning on and off load current, so it is very dangerous to pull and push the car with loads. Therefore, the staff must make sure the following operations when he or she operates the isolation car in the cabinet: At first, switch off the breaker which coordinates with the car; after this breaker is opened, its auxiliary switch turns off the electric lockout of isolation car. At that time, this car can be pulled and pushed. For the concrete operations of isolation car, refer to the car of breaker.

(2) Precautions for interlock to be used

a. Of the cabinet product, the interlock functions are focused on mechanical interlock and associated with electric interlock. These functions can satisfy the requirements of switch cabinet' s "5-prevention" lockout. However, the staff should not ignore the requirements of operation regulations and then make operations that are not up to the standards. The protection purposes of interlock device can be effectively exerted only if the staff takes the measures of organization and technology, in order to prevent the faults from maloperation.

b. Most of the uses and releases of product' s interlocks functions are realized with the normal operations, without extra added operating steps. If a block operation is seen (the operating resistance is added abruptly), the staff ought to first check whether it is possible to make maloperation. At that time, the staff cannot enforce the operations so as to destroy equipment or even cause a fault of maloperation.

c. For special purposes, some of interlocks (such as the interlocks of cabinet' s front lower door and grounding switch) allow emergency unlocking. The use of emergency unlocking should be careful without casualty. This use also needs necessary protective measures. After the use, the original interlocks ought to be resumed immediately.

3. The overhaul of switch cabinets ought to be made according to the related regulations. It is suggested the users pay attention to the following precautions:

1) For the fixed time, check whether the vacuum breaker

conforms to the installation and user' s guide.

2) Check the states of car' s pushing mechanism and interlocks in accordance with the guide.

3) Check the states of main loop' s contactors. Wipe old grease out of the active and static contactors. See whether the contactors are damaged, the spring forces are obviously changed or the over-high temperature has made any abnormal oxidation on the plate or not. If the above is seen, the staff ought to make timely treatment. Also, the staff checks whether there is abnormality on the auxiliary loop' s contactors and then makes necessary modification.

4) For all the parts of grounding loop, the staff ought to check the grounding contactors, the main grounding wires and the inter-grounding wires, in order to make sure the electric continuity.

5) The staff ought to check all the fasteners. If any the loose parts are seen, the staff should fasten them in time.

IX. Conveyance and Storage

1. It is not suggested to convey the switch cabinet for long distance along road, especially the class-III below road.

2. A roll-conveyance method is allowed if the switch cabinet is fixed on the bottom board of package. A hoisting or forking method should be applied for the package-free cabinet.

3. The switch cabinet (even if it sees an outside package) cannot be stored outdoors for long time. If the cabinet will not be used for long term, it should be placed in an indoor warehouse where is dry and ventilated. The expiry of cabinet' s outside package is no more than one year generally.

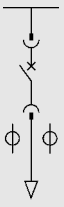
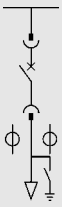
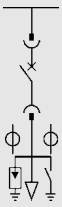
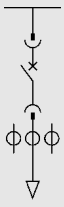
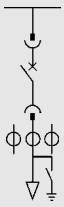
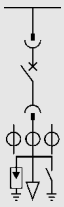
X. Suite of Product

While being delivered, the cabinet should be equipped with the following document and appendixes.

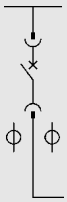
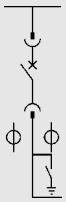
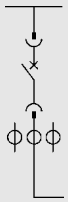
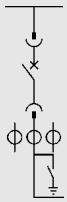
1. The quality certificate of product
2. The installation and user' s guide of product
3. The packing sheet
4. The engineering design data (system drawing, secondary wiring map and equipment list included)
5. The pushing crank of car, the operating crank of grounding switch (it is suggested that 5 switch cabinets are equipped with one set of cranks) and carrier (it is suggested that if there are no more than 10 switch cabinets in the order, 5 of them are equipped with one carrier; and if there are more than 10 switch cabinets, every 5 extra ones are equipped with one carrier.)
6. Technical document and appendixes such as the installation and user' s guides of cabinet' s main components

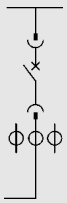
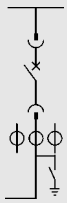
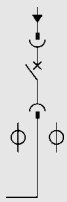
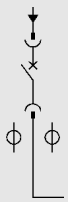
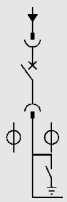
XI. The main-loop solutions are as follows: (See Appendix 1)

附表 1 主回路方案 / Appendix 1. Main-loop solutions feedback power

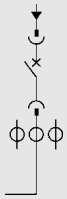
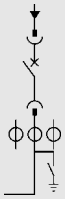
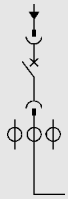
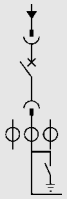
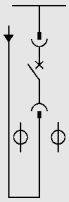
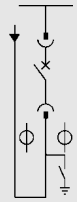
方案号 / Number of Solution		01	02	03	04	05	06
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		2000					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1	1	1	1	1
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	2	2	2	3	3	3
	JN15 型接地开关 Type JN15 grounding switch		1	1		1	1
	HY5W 型避雷器 Type HY5W lightning-rod			3			3
备 注 Remark		受电、馈电 Power, feedback power	受电、馈电 Power, feedback power	受电、馈电 Power, feedback power	受电、馈电 Power, feedback power	受电、馈电 Power, feedback power	受电、馈电 Power, feedback power

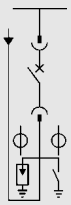
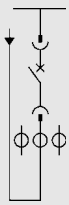
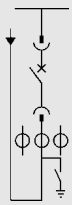
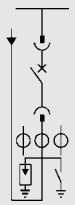
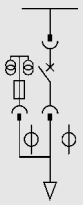
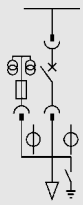
续附表 1 / See attachment form 1

方案号 / Number of Solution		07	08	09	10	11	12
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1	1	1	1	1
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	2	2	2	2	3	3
	JN15 型接地开关 Type JN15 grounding switch		1		1		1
备 注 Remark		联 络 Contact	联 络 Contact	联 络 Contact	联 络 Contact	联 络 Contact	联 络 Contact

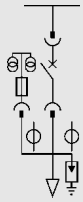
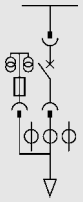
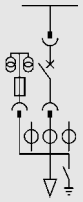
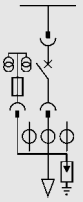
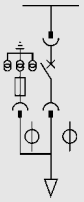
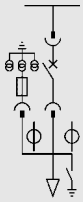
方案号 / Number of Solution		13	14	15	16	17	18
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1	1	1	1	1
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	3	3	2	2	2	2
	JN15 型接地开关 Type JN15 grounding switch						
备 注 Remark		联络 Contact	联络 Contact	架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进线 Aerial wire-in

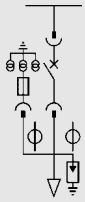
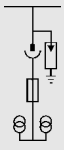
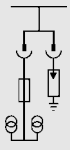
续附表 1 / See attachment form 1

方案号 / Number of Solution		19	20	21	22	23	24
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1	1	1	1	1
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	3	3	3	3	2	2
	JN15 型接地开关 Type JN15 grounding switch						
备 注 Remark		架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进出线 Aerial wire-in	架空进出线 Aerial wire-in

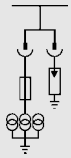
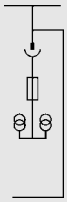
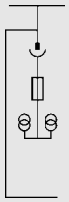
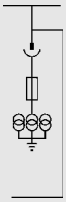
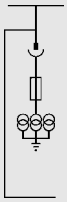
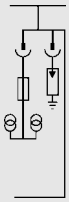
方案号 / Number of Solution		25	26	27	28	29	30
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150				2000	
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1	1	1	1	1
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	2	3	3	3	2	2
	JN15 型接地开关 Type JN15 grounding switch	1		1	1		1
	HY5W 型避雷器 Type HY5W lightning-rod	3			3		
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor					2	2
	XRNP 型熔断器 Type XRNP protective fuse					3	3
备 注 Remark		架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进线 Aerial wire-in	架空进线 Aerial wire-in	进线 +PT Wire-in + PT	进线 +PT Wire-in + PT

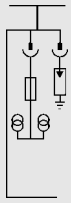
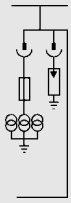
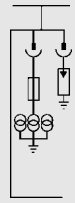
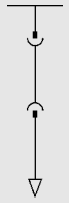
续附表 1 / See attachment form 1

方案号 / Number of Solution		31	32	33	34	35	36
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		2000					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1	1	1	1	1
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	2	3	3	3	2	2
	JN15 型接地开关 Type JN15 grounding switch			1			1
	HY5W 型避雷器 Type HY5W lightning-rod	3			3		
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor	2	2	2	2		
	JDZX18 型电压互感器 Type JDZX18 voltage mutual inductor					3	3
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3	3	3	3
备 注 Remark		进线 +PT Wire-in + PT	进线 +PT Wire-in + PT	进线 +PT Wire-in + PT	进线 +PT Wire-in + PT	进线 +PT Wire-in + PT	进线 +PT Wire-in + PT

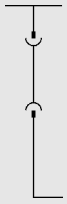
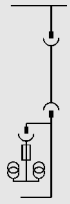
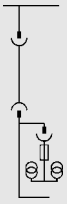
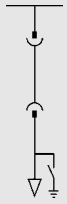
方案号 / Number of Solution		37	38	39	40	41	42
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		2000					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1					
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	2					
	JN15 型接地开关 Type JN15 grounding switch						
	HY5W 型避雷器 Type HY5W lightning-rod	3			3	3	3
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor		2		2		2
	JDZX18 型电压互感器 Type JDZX18 voltage mutual inductor	3		3		3	
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3	3	3	3
备 注 Remark		进线 +PT Wire-in + PT	PT	PT	PT+FV	PT+FV	PT+FV

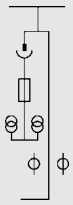
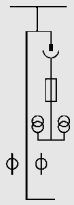
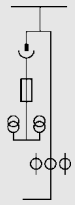
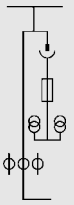
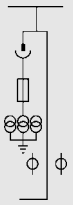
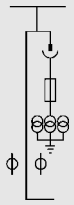
续附表 1 / See attachment form 1

方案号 / Number of Solution		43	44	45	46	47	48
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	HY5W 型避雷器 Type HY5W lightning-rod	3					3
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor		2	2			2
	JDZX18 型电压互感器 Type JDZX18 voltage mutual inductor	3		3	3		
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3	3	3	3
备注 Remark		PT+FV	联络 +PT Contact + PT	联络 +PT Contact + PT	联络 +PT Contact + PT	联络 +PT Contact + PT	联络 PT+FV Contact PT + FV

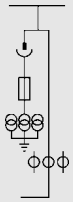
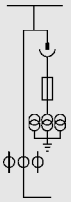
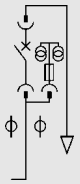
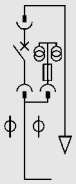
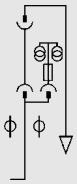
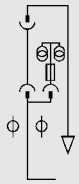
方案号 / Number of Solution		49	50	51	52	53	54
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					2000
主回路主要设备元件 Main components of main-loop equipment	HY5W 型避雷器 Type HY5W lightning-rod	3	3	3			
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor	2					
	JDZX18 型电压互感器 Type JDZX18 voltage mutual inductor		3	3			
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3			
备 注 Remark		联络 PT+FV Contact PT + FV	联络 PT+FV Contact PT + FV	联络 PT+FV Contact PT + FV	联络 Contact	联络 Contact	隔离 Isolation

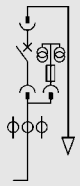
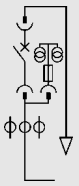
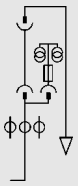
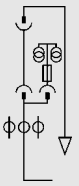
续附表 1 / See attachment form 1

方案号 / Number of Solution		55	56	57	58	59	60
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					2000
主回路主要设备元件 Main components of main-loop equipment	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor			2			2
	XRNP 型熔断器 Type XRNP protective fuse			3			3
	JN15 型接地开关 Type JN15 grounding switch						1
备 注 Remark		隔离 + 联络 Isolation + contact	隔离 + 联络 Isolation + contact	隔离 + 联络 PT Isolation + contact PT	隔离 + 联络 PT Isolation + contact PT	隔离 + 联络 PT Isolation + contact PT	隔离 Isolation

方案号 / Number of Solution		61	62	63	64	65	66
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	2	2	2	2	2	2
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor	2	2	2	2		
	JDZX18 型电压互感器 Type JDZX18 voltage mutual inductor					3	3
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3	3	3	3
备 注 Remark		联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	联络 + 计量 Contact + computation

续附表 1 / See attachment form 1

方案号 / Number of Solution		67	68	69	70	71	72
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum protective fuse			1	1		
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	3	3	2	2	2	2
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor			2	2	2	2
	JDZX18 型电压互感器 Type JDZX18 voltage mutual inductor	3	3				
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3	3	3	3
备注 Remark		联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	进线 + 计量 Wire-in+ computation	进线 + 计量 Wire-in + computation	进线 + 计量 Wire-in + computation	进线 + 计量 Wire-in + computation

方案号 / Number of Solution		73	74	75	76		
主回路方案 Main-loop solution							
最大额定电流 (A) Max. rated current (A)		3150					
主回路主要设备元件 Main components of main-loop equipment	ZN63A-12 型真空断路器 Type ZN63A-12 vacuum breaker	1	1				
	LZZBJ9 型电流互感器 Type LZZBJ9 current mutual inductor	3	3	3	3		
	JDZ18 型电压互感器 Type JDZ18 voltage mutual inductor	2	2	2	2		
	XRNP 型熔断器 Type XRNP protective fuse	3	3	3	3		
备 注 Remark		联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	联络 + 计量 Contact + computation	联络 + 计量 Contact + computation		

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