



户内交流金属铠装中置移开式开关设备 Indoor AC Metal-clad Withdrawable Switchgear

KYN28A-12



天仑电气 - 为您提供一流的电力系统解决方案
Tianlun Electric, provide you with first-class power system solution

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宁波天仑电气有限公司
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公司简介 Introduction

宁波天仑电气有限公司(以下简称公司)成立于2001年1月。

公司坐落于浙江宁波,毗邻“东方大港”北仑港。拥有10000平方米的研发生产基地,年产值超亿元,目前有80多名年轻朝气的员工,其中60%为本科学历。公司是集研发、生产、销售、服务于一体的高新技术企业,致力于打造高品质的智能化、节能型、定制模式的输变电设备产品。

公司目前有符合国际及国内标准3大类18种产品,包括24kV中置式开关柜及环网柜,12kV中置式开关柜及环网柜,440V固定式分隔柜,抽屉式开关柜,预装式变电站,低压母线槽(合作生产),10kV变压器(合作生产)等等,同时部分为ABB、Schneider的授权产品。公司立足于浙江,为很多大型的制造企业、房产开发、学校、港口等用户提供了许多高质量的产品和服务,同时也出口到东非、北非及东南亚国家,获得了客户的一致满意。

公司严格执行ISO9001质量保证体系,标准化体系,安全生产标准体系,国家CCC认证体系。坚持持续提升产品质量,追求零缺陷产品,全心全意服务用户的质量方针,坚持以人为本,鼓励创新,精细化的管理理念,坚持以感恩在心为核心价值观,为我们的用户提供最好的产品和服务。

Ningbo TIANLUN Electric Co., Ltd was established in year 2001, January. It is located in Ningbo, near Beilun port, which is called "oriental grand port". TIANLUN has 10000-square-meter researching and developing workshop and annual output value exceeds 100 million. TIANLUN has a professional team composed of 80 innovative staff, most of them have bachelor's degrees. TIANLUN is a company that integrates researching, developing, selling and service. Our purpose is to create high quality electric equipment product which is intelligentized, energy-saving and customized.

TIANLUN mainly have 18 types of products which belong to 3 majors as follow: 24 kV Intermediate switchgear and Ring Main Unit Switchgear, 12kV Intermediate Switchgear and Ring Main Unit Switchgear, 440V Fixed Isolated Switchgear, Preparatory Transformer Substation, Low Voltage Bus Duct (coproduction) and 10kV transformer (coproduction). Some products are Licensed by ABB and Schneider. TIANLUN have been providing high quality products to large manufacture enterprise, real estate, school and port constructions. At the mean time, our product are exported to Africa and southeastern countries and win satisfaction from the overseas customers.

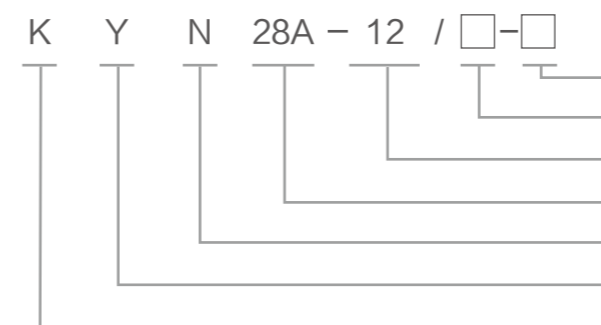
TIANLUN strictly stick to ISO9001 standard system, standardization system, safety standard system and CCC authentication system. Our quality policy is producing good and zero defect product, having customers well served. Our management policy is people orientation, creation encouragement and high-effective system. TIANLUN always hold a thankful heart and provide top-level product with best service.

1. 概述 Overview

KYN28A-12型户内交流金属铠装中置移开式开关设备(以下简称开关设备),系3.6kV~12kV三相交流50Hz单母线及单母线分段系统的成套配电装置。主要用于发电厂、中小型发电机送电、工矿企业事业配电以及电业系统的二次变电所的受电,送电及大型高压电动机起动等,实行控制保护、检测之用。本开关柜满足IEC62271、GB3906等标准要求,具有防止带负荷推拉断路器手车、防止误分合断路器、防止接地开关处在闭合位置时关合断路器、防止误入带电隔室、防止在带电时误合接地开关的联锁功能,既可配备ABB公司的VD4型真空断路器,也可配置VS1型真空断路器、隔离手车、电压互感器手车等,实为一种性能优越的配电装置。

The KYN28A-12 indoor AC metal-clad withdrawable switchgear (hereinafter referred to as switchgear) is a complete set of power distribution devices of 3.6kV ~ 12kV three-phase AC 50Hz single bus or single bus sectional system. The switchgear is mainly used in power plants, small and medium sized power generators, industrial and mining enterprises, and secondary substations of power system for power receiving, power transmission, and startup of large sized high voltage motor in order to implement control, protection, and monitor. The switchgear complies with IEC62271 and GB3906 standards and comes out with a variety of protection functions, including preventing pulling or pushing circuit breaker handcart in load mode, preventing turning on/off the circuit breaker by mistake, preventing turning on the circuit breaker when the grounding switch is in ON position, preventing entering the energized cubicle by mistake, and preventing turning on the interlock function of the grounding switch by mistake in energized state. The switchgear can be used in conjunction with the VD4 circuit breaker of the ABB company, VS1 circuit breaker, isolation handcart, and voltage transformer. It is really a high-performance power distribution device.

2. 型号含义 Model Description



| | |
|-------------|---|
| 额定短时耐受电流 kA | Rated short-time withstand current (kA) |
| 额定电流 A | Rated current (A) |
| 额定电压 kV | Rated voltage (kV) |
| 设计序号 | Design sequence number |
| 户内型 | Indoor |
| 中置、移开式 | Mid-mounted, withdrawable |
| 金属铠装 | Metal-clad |

3. 使用环境条件 Environmental Requirements

正常使用条件

- 海拔不超过1000m;
- 周围空气湿度: 上限+40°C, 下限-10°C(允许-25°C储运);
- 环境湿度: 日平均相对湿度不大于95%
月平均相对湿度不大于90%
- 地震: 地震烈度不超过8度;
- 适用于II类污秽环境。

Normal Operation Conditions

- Altitude ≤ 1000m
- Ambient temperature: -10°C ~ +40°C (temperature can be as low as -25°C during transportation and storage)
- Relative humidity: daily relative humidity ≤ 95% on average; monthly relative humidity ≤ 90% on average
- Seismic scale of earthquake ≤ 8
- The switchgear is applicable to category II contaminated environment.

特殊工作条件

在超过规定的正常环境条件下使用时,由用户和制造厂协商。

Special Operation Conditions

If the switchgear will be used in conditions that exceed the normal environmental conditions, users shall negotiate with the manufacturer.



ISO9001-2000



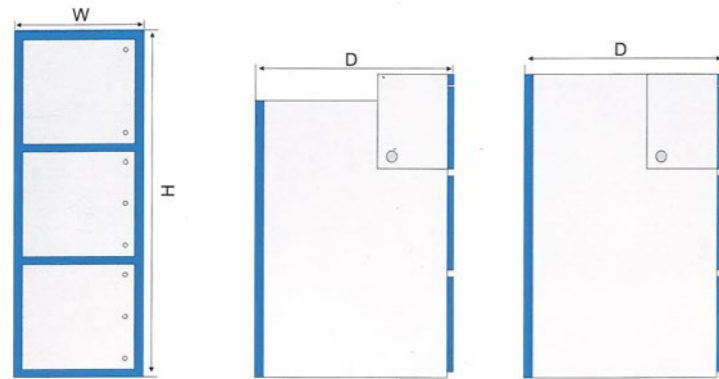
CCC 认证



WSC 北京世标认证中心



4. 外形尺寸和重量 见图 1、表 1 Appearance, Dimensions, and Weight (Refer to Figure 1 and Table 1)



| 高度 H (mm) Height (H) mm | 2300(2200) | |
|---------------------------|--|------|
| 宽度 W (mm) Width (W) mm | 分支小母线额定电流达至 1250A 热稳定电流 40kA Rated current for branch bus reaches 1250A, with thermal stable current being 40kA | 800 |
| | 分支小母线额定电流 1600A 及以上 Rated current for branch bus reaches 1600A or above | 1000 |
| 深度 D (mm) Depth (D) mm | 电缆进出线 Cable incoming/outgoing wire | 1500 |
| | 架空进出线 Aerial incoming/outgoing wire | 1660 |
| 重量 Weight (kg) | 700~1200 | |

5. 技术参数 Technical Data

5.1 开关设备技术参数见表 2 Refer to Table 2 for Technical Indicators of the Switchgear

| 项目 Item | 单位 Unit | 数据 Value |
|--|---|---|
| 额定电压 (最高工作电压) Rated voltage (highest operating voltage) | kV | 12 |
| 额定绝缘水平 Rated insulating level | 1min 工频耐受电压 1min power frequency withstand voltage | kV 42 |
| | 雷电冲击耐受电压 Impulse withstand voltage | kV 75 |
| 额定频率 Rated frequency | Hz | 50 |
| 主母线额定电流 Rated current of main bus | A | 630, 1250, 1600, 2000, 2500, 3150, 4000 |
| 4s 热稳定电流 (有效值) Rated short-time Withstand Current (valid value) | kA | 16, 20, 25, 31, 5, 40 |
| 额定动稳定电流 (峰值) * Rated Peak withstand Current (peak value) * | kA | 40, 50, 63, 80, 100 |
| 防护等级 Degrees of protection | | 外壳为 IP4X Shell IP4X |

VD4 真空断路器技术数据见表 3、表 4；
VS1 真空断路器技术数据见表 5、表 6；

For the technical indicators of the VD4 circuit breaker, refer to Table 3 and Table 4;
For the technical indicators of the VS1 circuit breaker, refer to Table 5 and Table 6;

VD4 真空断路器技术数据

Technical Indicators of the VD4 Vacuum Circuit Breaker

| 项目 Item | 单位 Unit | 数据 Value | |
|--|---|--|-------|
| 额定电压 (最高工作电压) Rated voltage (highest operating voltage) | kV | 12 | |
| 额定绝缘水平 Rated insulating level | 1min 工频耐受电压 1min power frequency withstand voltage | 相对地 / 断口间 poles to earth / between open contacts | kV 42 |
| | 雷电冲击耐受电压 Impulse withstand voltage | 相对地 / 断口间 poles to earth / between open contacts | kV 75 |
| 额定频率 Rated frequency | Hz | 50 | |
| 额定电流 Rated current | A | 630, 1250, 1600, 2000, 2500, 3150, 4000 | |
| 额定对称短路开断电流 (有效值) Rated short-circuit breaking current (valid value) | kA | 16, 20, 25, 31, 5, 40 | |
| 4s 稳定电流 (有效值) 4s Rated short-time withstand current (valid value) | kA | 16, 20, 25, 31, 5, 40 | |
| 额定动稳定电流 (峰值) Rated peak withstand current (peak value) | kA | 40, 50, 63, 80, 100 | |
| 瞬态恢复电压上升率 Increase rate for transient recovery voltage | kV/ms | 0.345, 0.415 | |
| 瞬态恢复电压峰值 Peak value for transient recovery voltage | kV | 20.6, 30 | |
| 额定操作顺序 Rated operation sequence | | 分 -0.3s- 合分 -3min- 合分 o-0.3s-co-180s-co | |
| 自动重合闸操作顺序 Automatic return-on operation sequence | | 分 -0.3s- 合分 -3min- 合分 o-0.3s-co-180s-co | |
| 多次重合闸操作顺序 Multiple-time return-on operation sequence | | 分 -0.3s- 合分 -15s- 合分 -15s- 合分 c-0.3s-co-15s-co-15s-co | |
| 合闸时间 closing time | ms | 约 70 Approximate 70 | |
| 分闸时间 Opening time | ms | ≤ 45 | |
| 燃弧时间 Arcing time | ms | ≤ 15 | |
| 开断时间 Breaking time | ms | ≤ 60 | |

当断路器用于控制 3~10kV 电动机时，若起动电流小于 600A，必须加金属氧化物避雷器，其具体要求由用户与制造厂联系协商；当断路器用于开断电容器组时，电容器组的额定电流不应大于断路器额定电流的 80%。

When the circuit breaker is used to control 3 kV ~ 10 kV motors, if the startup current is smaller than 600A, add metal oxide arrester; detailed requirements shall be negotiated with the manufacturer. When the circuit breaker is used to control capacitance units, the rated current of the capacitance units shall not exceed 80% of the rated current of the circuit breaker.

动作时间推荐值:

| | |
|-------------|--|
| 合闸时间 | ≤ 70ms |
| 分闸时间 | ≤ 45 |
| 燃弧时间 (50Hz) | ≤ 15 |
| 开断时间 | ≤ 60 |
| 最小的合闸指令持续时间 | 40ms ¹⁾ (100ms) ²⁾ |
| 最小的分闸指令持续时间 | 40ms ¹⁾ (100ms) ²⁾ |

注: 1) 在辅助回路额定电压下;
2) 若继电器接点启动, 但未能开断脱扣线圈电流。

Recommended action time:

| | |
|-----------------------------------|--|
| closing time | ≤ 70ms |
| Opening time | ≤ 45 |
| Arcing time (50Hz) | ≤ 15 |
| Breaking time | ≤ 60 |
| Minimum turn-on command duration | 40ms ¹⁾ (100ms) ²⁾ |
| Minimum turn-off command duration | 40ms ¹⁾ (100ms) ²⁾ |

Notes: 1. Under the rated voltage of the auxiliary circuit;
2. The trip coil current cannot be disconnected if the relay is started up by connection point.

VD4 真空断路器弹簧操动机构技术数据

Technical Indicators for the Spring Operating Mechanism of the VD4 Vacuum Circuit Breaker

| 额定电压 (V) Rated voltage (V) | | 消耗功率 (VA/W ¹⁾ Power (VA/W ¹⁾ | 储能时间 (秒) (最大) S ²⁾ Energy storage time (s) (max.) S ²⁾ |
|----------------------------|-----|---|---|
| 交流 AC | 110 | 150 | 15 |
| | 220 | 150 | 15 |
| 直流 DC | 24 | 130 | 15 |
| | 30 | 130 | 15 |
| | 48 | 130 | 15 |
| | 60 | 130 | 15 |
| | 110 | 140 | 15 |
| | 220 | 140 | 15 |

注: 1) 近似值 2) 在额定电压下
Notes: 1) Approximate value 2) Under rated voltage

VS1-12 真空断路器机械调整参数

Technical Adjustment Indicators of VS1-12 Vacuum Circuit Breaker

| 序号 Sn | 名称 Name | 单位 Unit | 数据 Value | | | | | |
|----------|--|-------------------|----------|----------|-------------|-------|-------|-------|
| | | | 25kA | 31.5kA | 40kA,50kA | | | |
| 1 | 行程 travel | mm | 11±1 | | | | | |
| 2 | 超行程 overtravel | mm | 4±1 | | | | | |
| 3 | 相间中心距离 clearance between poles | mm | 210±0.6 | 275±1 | | | | |
| 4 | 合闸触头弹跳时间 closing contact bounce time | ms | ≤ 2 | | | | | |
| 5 | 三相分闸不同期性 Delay of three-phase Opening | ms | ≤ 2 | | | | | |
| 6 | 分闸时间 当操作压力 Opening time when operating voltage is | 最高 Highest | ms ≤ 50 | | | | | |
| | | 额定 Rated value | ms ≤ 50 | | | | | |
| | | 最低 Lowest | ms ≤ 60 | | | | | |
| 7 | 合闸时间 Closing time | ms | ≤ 100 | | | | | |
| 8 | 平均分闸速度 Average Opening speed | m/s | 0.96~1.2 | | | | | |
| 9 | 平均合闸速度 Average closing speed | m/s | 0.5~0.8 | | | | | |
| 10 | 触头压力 Contact pressure | N | 240±200 | 3100±200 | 4250±250 | | | |
| 11 | 各相回路电阻 Resistance of circuits of different phases | μΩ | 630A | 1250A | 1600A~2000A | 2500A | 3150A | 4000A |
| | | | ≤ 85 | ≤ 60 | ≤ 50 | ≤ 45 | ≤ 25 | ≤ 20 |

VS1-12 真空断路器技术参数

Technical Indicators for VS1-12 Vacuum Circuit Breaker

| 序号 Sn | 名称 Name | 单位 Unit | 数据 Value | | | |
|-------|--|------------|--|------------------------|--------------------------------|--------------|
| 1 | 额定电压 Rated Voltage | kV | 12 | | | |
| 2 | 额定绝缘水平 Rated insulation level | kV | 1min 工频耐受电压 (有效值) 1min Power frequency withstand voltage (valid value after disconnection) | 42 | | |
| | | | 雷电冲击电压 (开断前峰值) Impulse voltage (peak value before disconnection) | 75 | | |
| | | | 雷电冲击电压 (开断后峰值) Impulse voltage (peak value after disconnection) | 75 | | |
| 3 | 额定频率 Rated frequency | Hz | 50 | | | |
| 4 | 额定电流 Rated current | A | 630 1250 | 1250 1600 2000 2500 | 1250 1600 2000 2500 3150 | 3150 4000 |
| 5 | 额定短路开断电流 Rated short-circuit breaking current | kA | 25 | 31.5 | 40 | 40 |
| 6 | 4s 热稳定电流 4s Rated Short-time Withstand current | kA | 25 | 31.5 | 40 | 40 |
| 7 | 额定短路开断电流 (峰值) Rated short-circuit Marking current (peak value) | kA | 63 | 80 | 100 | 100 |
| 8 | 额定动稳定电流 (峰值) Rated peak withstand current (peak value) | kA | 63 | 80 | 100 | 100 |
| 9 | 额定背对背电容器组关合涌流 Rated back-to-back capacitor bank inrush making current | kA | 12.5 (频率不大于 1000Hz) 12.5(frequency ≤ 1000Hz) | | | |
| 10 | 额定单个 / 背对背电容器组开断电流 Rated single/back-to-back capacitor bank breaking current | A | 630/400 | | | |
| 11 | 额定操作顺序 Rated operating sequence | | 分 -0.3s- 合分 -180s- 合分 分 -180s- 合分 -180s- 合分 O-0.3s-CO-180s-CO O-180s-CO-180s-CO | | | |
| 12 | 合闸时间 closing time | ms | ≤ 100 | | | |
| 13 | 分闸时间 Opening time | ms | ≤ 50 | | | |
| 14 | 燃弧时间 Arcing time | ms | ≤ 15 | | | |
| 15 | 额定短路开断电流开断次数 Breaking times for rated short-circuit current | 次 Times | 50 | 30 | 12 | |
| 16 | 机械寿命 Service life | 次 Times | 20000 | | | |
| 17 | 动、静触头允许磨损累计厚度 Accumulated permissible wear thickness of dynamic and static contacts | mm | 3 | | | |

5.2 主接线方案见表 7 Refer to Table 7 for the Main Wiring Solution

6. 结构

6. Structure

开关设备按 GB3906 中的铠装式金属封闭开关设备而设计。整体是由柜体和中置式可抽出部件（即手车）两大部分组成，见图 2、图 3。柜体分四个单独的隔室，外壳防护等级为 IP4X，各小室间和断路器室门打开时防护等级为 IP2X。具有架空进出线、电缆进出线及其他功能方案，经排列、组合后能成为各种方案形式的配电装置。本开关设备可以从正面精心安装调试和维护，因此它可以背靠背组成双重排列和靠墙安装，提高了开关设备的安全性、灵活性、减少了占地面积。

The switchgear is designed as a metal-clad hermetic switchgear in accordance with the requirements of GB3906. The switchgear is composed of the cabinet and centrally-installed drawable part (namely, the handcart), as show in Figure 2 and Figure 3. The cabinet consists of four independent cubicles with the housing reaching IP4X protection grade. The protection level of the cabinet is IP2X after the cubicles and circuit breaker are opened. The switchgear supports aerial incoming/outgoing deployment, cable incoming/outgoing deployment, and other functions and it can be built as a power distribution device of various patterns by means of arrangement and combination. The switchgear can be installed and maintained from the front side, thus it can be placed back to back in two rows or against wall, which improves switchgear safety and flexibility and reduces occupation area.

6.1 外壳及其他

开关设备的外壳是选用进口敷铝锌钢板，经 CNC 机床加工，并采取多重折边工艺。这样使整个柜体不仅具有精度高、很强的抗腐蚀与抗氧化作用，而且由于采用多重折边工艺，使柜体比其他同类设备柜体整体重量轻、机械强度高、外形美观。柜体采用组装式结构，用拉铆螺母和高强度的螺栓联接而成。这样使加工生产周期短、零部件通用性强、占地面积少，便于组织生产。

6.1 Housing and Others

The housing of the switchgear is made from imported galvanized thin sheet and it is formed after being processed by the CNC machine tool and folded. By the processing and folding, the switchgear not only comes out with high precision, strong anticorrosion, and anti-oxidation but also features less weight, higher mechanical strength, and more delicate appearance than other cabinets. The cabinet adopts a modular structure with the modules connected using rivet nuts and high-strength bolts, which shortens production period, improves generality of parts, reduces occupation area, and facilitates organization and production.

6.2 手车

手车柜架也采用薄板经 CNC 机床加工后组装而成。手车与柜体绝缘配合，机械联锁安全、可靠、灵活。根据用途不同手车分断路器手车、电压互感器手车、计量手车、隔离手车。各类手车按模数，积木式变化，同规格手车可以百分之百自由互换。手车在柜体内有断开位置 / 试验位置和工作位置，每一位置都分别有定位装置，以保证联锁可靠，必须按联锁防误操作程序进行操作。各种手车均采用涡轮、蜗杆摇动推进、退出，其操作轻便、灵活，适合于各种值班人员操作。手车当需要移开柜体时，用一辆专用运转车，就可以方便取出，进行各种检查、维护；而采用中置式，整个小车体积小，检查、维护都极方便。

断路器手车上装有真空断路器及其他辅助设备。当手车用运转车运入柜体断路器室时，便能可靠锁定在断开位置 / 试验位置；而且柜体位置显示灯便显示其在所在位置，而且只有完全锁定后，才能摇动推进机构，将手车推向工作位置。手车到工作位置后，推进手柄即摇不动，其对应位置显示其所处位置，手车的机械联锁能可靠保证手车只有在工作位置或试验位置，断路器才能进行合闸；而且手车只有在分闸状态，断路器才能移动。

6.2 Handcart

The skeleton of the handcart is made from thin sheet and processed by the CNC machine tool as well. The handcart is insulated from the cabinet with mechanical interlock being safe, reliable, and flexible. According to use purposes, handcarts fall into circuit breaker handcart, voltage transformer handcart, metering handcart, and isolation handcart. The handcarts can be changed like building blocks according to modulus. Handcarts with the same kind of specifications can be replaced freely. Each handcart comes out with Disconnect, Test and Work positions with each position equipped with a fixer to ensure interlock reliability. Make sure to operate the handcarts in accordance with the interlock operation procedure. Different kinds of handcarts are shaken, pulled in, and pushed out using worms and gears, which is easy and flexible to operate by any on-duty personnel. The handcarts can be removed from the cabinet with ease using special transmission trolley in order to carry out examination and maintenance. The central installation method makes it possible for the handcart to be light-weighted, which facilitates examination and maintenance as well. Circuit breaker handcart is equipped with vacuum circuit breaker and other auxiliary devices. After transmitting the handcart into the circuit breaker cubicle using the trolley, lock the handcart to the Disconnect or Test position. In this case, corresponding indicator on the cabinet will be lit on to show that the handcart is locked in position. Shake the pull-in mechanism to push the handcart to Work position. After the handcart is pushed to the Work position, the mechanism cannot be shaken and corresponding indicator on the cabinet will be lit on to show that the handcart is locked in position. The mechanical interlock can ensure that the circuit breaker can be turned on only when the handcart is in Work or Test position and it also ensures that the circuit breaker can be moved only when the handcart is in Disconnect position.

6.3 隔室

开关设备主要电气元件都有其独立的隔室，即：断路器手车室、母线室、电缆室、继电器仪表室。各隔室间防护等级都达到 IP2X；除继电器室外，其他三隔室都分别有其泄压通道。由于采用了中置式形式，电缆室位置大大增加，因此设备可接多路电缆。

6.3 Cubicle

Main electric parts of the switchgear are isolated in respective cubicle. There are circuit breaker handcart cubicle, bus cubicle, cable cubicle, and relay cubicle. The cubicles all reach IP2X protection grade. Except for the relay cubicle, the other three cubicles have been equipped with relief channels. Thanks to the central installation structure, the cable cubicle is enlarged significantly, so the switchgear can connect a plurality of cables.

6.3.1 断路器隔室 B

隔室两侧安装了轨道，供手车 15 在柜内由隔离位置 / 试验位置移动滑行至工作位置。静触头盒 6 的隔板 13（活门）安装在手车室的后壁后。当手车从断开位置 / 试验位置移动到工作位置过程中，上、下静触头盒上的活门与手车联动，同时自动打开；当反方向移动时活门则自动闭合，直至手车退至一定位置完全覆盖住静触头盒，形成有效隔离。同时由于上、下活门不联动，在检修时，可锁定带电侧的活门，从而保证检修维护人员不触及带电体。在断路器室门关闭时，手车同时能被操作。通过上门观察窗，可以观察隔室内手车所处位置、合、分闸显示、储能状况。

6.3.1 Circuit Breaker Cubicle B

The cubicle is installed with guide rails to allow the handcart (15) to slide from the Disconnect position or Test position to the Work position within the cabinet. The isolation board (13) of the static contact box (6) (namely the valve) is installed on the rear wall of the handcart cubicle. When the handcart moves from the Disconnect position or Test position to the Work position, the valves on the upper and lower static contact boxes couple with the handcart and automatically opens. If the handcarts move in the opposite direction, the valves automatically close until the handcart exits to a position to fully cover the static contact boxes and form an effective isolation to avoid the upper valve from coupling the lower valve. During examination and repair, lock the valve at the energized side to ensure that operator will not touch the energized parts. The handcart can be operated as well if the circuit breaker cubicle is closed. Through the observation window, the position of the handcart, ON/OFF indicator, and energy storage state can be viewed.

6.3.2 母线隔室 A

主母线 4 是单台拼接相互贯穿连接，见图 2，通过支母线 2 和静触头盒固定。主母线和联络母线为矩形截面的铜排；用于大电流负荷时采用双根母排拼成。支母线通过螺栓联接于静触头盒 6 和主母线，不需要其他支撑。对于特殊需要，母线可用热缩套和联接螺栓绝缘套和端帽覆盖。相邻柜母线用套管 3 固定。这样联接母线间所保留的空气缓冲，如果出现内部故障电弧时，能防止其贯穿熔化，套管 3 能有效把事故限制在隔室内而不向其他柜蔓延。

6.3.2 Bus Cubicle A

The main bus 4 is formed by assembling single buses (as shown in Figure 2) and fixed on the static contact via a branch bus 2. Both the main bus and contact bus adopt rectangular copper bar; assemble two bus bars for large current load. The branch bus is connected to the static contact box 6 and main bus using bolts, without other supports. In case of special requirement, the buses can be covered with shrinkable sleeve, bolt sleeve, and end cap. Buses of adjacent cabinets are fixed with sleeve 3. By this connection, the air buffer reserved between the buses can prevent penetration and melting in case of an internal arcing. The sleeve 3 helps effectively confine the fault within the cubicle without spreading to other cabinets.

6.3.3 电缆隔室 C

开关设备采用中置式，因而电缆室空间较大。电流互感器 7、接地开关 8 装在隔室后壁上，避雷器 10 安装于隔室后下部。将手车 15 和可抽出式水平隔板 17 移开后，施工人员就能从正面进入柜内安装和维护。电缆室内的电缆连接导体，每相可并 1—3 根单芯电缆，必要时每相可并接 6 根单芯电缆，联接电缆的柜底配置开缝的可卸式非金属封板或不导磁金属封板，确保了施工方便。

6.3.3 Cable Cubicle C

Since the switchgear adopts central installation method, the cable cubicle is enlarged. The current transformer 7 and grounding switch 8 are installed on the rear wall of the cubicle with the arrester 10 installed in the rear lower part of the cubicle. After removing the handcart 15 and drawable horizontal isolation board 17, constructor can enter the cabinet from the frontal side to install and maintain the cables. The cables inside the cubicle connect with conductors, with each phase paralleling 1~3 single-core cables even 6 single-core cables where necessary. The cabinet bottom is equipped with an openable detachable nonmetal board or nonmagnetic metal nonmetal to ensure construction convenience.

6.3.4 继电器仪表室

继电器仪表室内可安装继电保护元件、仪表、带电监察指示器，以及特殊要求的二次设备。控制线路敷设在足够空间的线槽内，并有金属盖板，可使二次线与高压室隔离。其左侧线槽是为控制小线的引进和引出预留的，开关柜自身内部的小线敷设在右侧。在继电器仪表室的顶板上还留有便于施工的小母线穿越孔。接线时，仪表室顶盖板可供翻转，便于小母线的安装。

6.3.4 Relay Cubicle

The relay cubicle can accommodate relay protection elements, meters, indicators and secondary devices that are specially required. Control wires are deployed in the channels with sufficient space and covered using metal lid to isolate the secondary wires from high-voltage cubicle. The channel at the left side is reserved for leading small lines in and out; the small lines for the switchgear are deployed at the right side. On the top of the relay cubicle, there are holes reserved for penetrating small buses. During wiring, the top board is reversible and facilitates installation.

6.4 防止误操作联锁装置

开关设备内装有安全可靠的联锁装置，完全满足五防的要求

- 仪表室门上装有提示性的按钮或者 KK 型开关，以防止误合、误分断路器
- 断路器手车在试验或工作位置时，断路器才能进行合分操作，而且在断路器合闸后，手车无法移动，防止了带负荷误推拉断路器。
- 仅当接地开关处在分闸位置时，断路器手车才能从试验 / 断开位置移至工作位置。仅当断路器手车处于试验 / 断开位置时，接地开关才能进行合闸操作（接地开关可带电压显示装置）。这样实现了防止带电误合接地开关，防止了接地开关处在闭合位置时关合断路器。
- 接地开关处于分闸位置时，下门及后门都无法打开，防止了误入带电间隔。
- 断路器手车在试验或工作位置，而没有控制电压时，仅能手动分闸，不能合闸。
- 断路器手车在工作位置时，二次插头被锁定不能拔除。
- 各柜体可装电气连锁。

6.4 The safe and reliable interlock device in the switchgear can meet requirements of protection functions including protecting against circuit breaker On/Off by mistake, protecting against disconnecter On/Off in load mode; protecting against, grounding cable (grounding switch) mounting in energized state; protecting against power transmission along grounding cable; and protecting against entering energized cubicle by mistake.

- The relay cubicle door is installed with button or KK conversion switch to avoid circuit breaker turn-on/off by mistake.
- The circuit breaker can be turned on/off only when the circuit breaker handcart is in Test or Work position; after the circuit breaker is in Disconnect position, the handcart cannot be moved; this helps avoid pulling the circuit breaker in load mode.
- The circuit breaker handcart can be moved from the Test / Disconnect position to the Work position only when the grounding switch is turned off. When the circuit breaker handcart is in Test or Disconnect position, the grounding switch (with voltage readable) can be turned on. This helps prevent turning on the grounding switch in energized state and turning on the circuit breaker when the grounding switch is turned off.
- When the grounding switch is turned off, the lower door and rear door cannot be opened to avoid entering the cubicle by mistake in energized state.
- If there is no voltage when the circuit breaker handcart is in Test or Work position, the circuit breaker can be manually turned off only.
- When the circuit breaker handcart is in Work position, the secondary plug is locked and cannot be removed.
- Each cabinet can be installed with electric interlock.

本开关设备可以在接地开关操作机构上加装电磁铁锁定装置以提高可靠性，其订货按用户的需求选择。

The reliability of the switchgear can be improved by installing an electromagnet lock device on the operation mechanism of the grounding switch. Actual requirements are raised by users when placing an order.

6.5 泄压装置

在断路器手车室，母线室和电缆室的上方均设有泄压装置，当断路器或母线发生内部故障电弧时，伴随电弧的出现，开关柜内部气压升高，装在门上的特殊密封圈把柜前面封闭起来，顶部装备的泄压金属板将被自动打开，释放压力和排泄气体，以确保操作人员和开关柜的安全。

6.5 Pressure Relief Device

Pressure relief devices are installed on the upper parts of the circuit breaker handcart cubicle and bus cubicle. When an arcing fault occurs on the circuit breaker or bus, the internal pressure of the switchgear rises. The special sealing ring on the door seals the cabinet and the pressure relief board on the top will be automatically opened to release pressure and air, ensuring safety of the operator and switchgear.

6.6 二次插头与手车的位置联锁

开关设备上的二次线与断路器手车的二次线的联络是通过手动二次插来实现的。二次插头的动触头通过一个尼龙波纹伸缩管与断路器手车相联，二次静触头座装设在开关柜手车室的右上方。断路器手车只有在试验 / 断开位置时，才能插上和接触二次插，断路器手车处于工作位置时由于机械联锁作用，二次插被锁定，不能被解除。由于断路器手车的合闸机构被电磁铁锁定，断路器手车在二次插未接通之前仅能进行分闸，所以无法使其合闸。

6.6 Interlocking Between the Secondary Plug and Handcart

The connection between the secondary wire of the switchgear and the secondary wire of the circuit breaker handcart is implemented by secondary plug. The dynamic contact of the secondary plug connects with the circuit breaker handcart via a nylon ripple shrinkage pipe and the static contact holder is installed in the upper right part of the handcart cubicle. The secondary plug can be inserted and removed only when the circuit breaker handcart is in Test / Disconnect position. When the circuit breaker handcart is in Work position, the secondary plug is locked and cannot be removed due to the mechanical interlock function. Since the turn-on mechanism of the circuit breaker handcart is locked by the electromagnet, the circuit breaker handcart can be turned off only before the secondary plug is inserted and connected.

6.7 带电显示装置

如果用户有所需求时，开关柜内设有检测一次回路运行的可选件即带电显示装置。该装置由高压传感器和可携带式显示器两单元组成，经用户外接电线连接为一体，该装置不但可以提示高压回路带电状况，而且还可以与电磁锁配合，实现强制闭锁开关手柄、网门，达到防止带电关合接地开关、防止误入带电间隔，从而提高配套产品的防误性能。

6.7 Energization Display Device

When users require, the switchgear can be equipped with an optional energization display device to detect primary circuit running. This device is composed of a high-voltage sensor and portable display. By connecting the device to the switchgear over a conducting wire, the device can not only show circuit energization state but also coordinate with the electromagnetic lock to forcibly lock the switch handle and door, thus preventing turning off the grounding switch in energized state and entering the energized cubicle and improving misoperation prevention performance.

6.8 防止凝露和腐蚀

为了防止在高温湿度或湿度变化较大的气候环境中产生凝露带来之危险。在断路器和电缆室内分别装设加热器，以便在上述环境之中使用和防止腐蚀发生。

6.8 Condensation and Corrosion Prevention

To avoid condensation when climatic environment changes dramatically due to high temperature or high relative humidity, install heater in the circuit breaker cubicle and cable cubicle to avoid anticorrosion of the switchgear when it is running in aforesaid climatic environment.

6.9 接地装置

在电缆室内单独设有 10x40mm 的接地铜排，此排能贯穿相邻各柜，并与柜体良好接触。此接地排供直接接地之元器件使用。同时由于整个柜体用敷铝锌板相并联，这样使整个柜体都处于良好接地状态之中，确保运行操作人员触及柜体安全。

6.9 Grounding Device

Install 10mm × 40mm grounding copper bar which can penetrate through adjacent cabinets and well contact with the cabinets. The copper bar is to be used by the elements directing grounded. In the meantime, the housing of the cabinet is assembled using galvanized boards, which enables the entire cabinet to be well grounded and ensures safety of the operator and cabinet.

7. 安装、调试及安装基础要求

7. Installation, Commissioning, and Foundation Requirements

7.1 基础形式

1. 开关设备的安装基础的施工应符合《电力建设施工及验收技术规范》的有关条款规定。
2. 开关设备的安装基础一般分二次浇灌混凝土。第一次为开关柜安装构件即角钢或方钢，槽钢构件安装基础。第二次浇灌混凝土是地面的补充层，一般厚度为 60mm，在浇注混凝土补充层时混凝土高度应低于构件平面 20mm。
3. 开关设备地基安装图详见图 2。
4. 在基础构架安装时要保证安装质量，框架安装的技术标准为 1 平方公差 1mm。

7.1 Foundation

1. Foundation construction for the switchgear shall comply with the relevant terms and prescriptions in the Technical Specifications for Power Construction, Examination and Acceptance.
2. Foundation construction is carried out by concrete pouring twice. In the first time, install such structures as angle steel, square steel and channel steel. In the second time, pour concrete as the supplement layer of the ground, with thickness being 60mm generally. During pouring, the concrete shall be 20mm lower than the structure plane.
3. Refer to Figure 2 for detailed switchgear foundation construction diagram.
4. Guarantee construction quality when constructing the basic structures. Technical standard for frame installation is tolerance 1mm for each square meter.

7.2 开关设备的安装

1. 开关设备的安装基础尺寸与安装尺寸详见图 2，图 3。
2. 柜体单列时，柜前走廊以 2.5 米为宜，双列布置时，柜间操作走廊以 3 米为宜。
3. 按工程需要与图纸标明，将开关柜运至它们特定的位置，如果一排较长的开关柜排列（为 10 台以上），拼柜工作应从中间部位开始。
4. 开关设备在运输过程中，应使用特定的运输工具如吊车或叉车，严禁使用滚筒撬棍；且严禁将断路器手车推入柜体一起搬运，断路器手车（以及其他手车）只有在柜体安装完毕以后再推入相应小室。
5. 松开母线室顶盖螺栓，卸去顶盖。
6. 在母线室前面松开螺栓，卸下装卸式隔板 12。
7. 松开断路器手车室下面的可抽出式水平隔板 17 的固定螺栓，并将水平隔板卸下。
8. 松开和移去电缆盖板 19。
9. 从开关设备左侧控制小线槽移去盖板。右前方控制线槽盖板亦同时卸下。
10. 卸下吊装板及紧固件。
11. 在此基础上，一个接一个地安装开关柜，包括水平和垂直两方面，开关柜安装平面度误差不得超过 2mm。
12. 当开关设备已完全组合（拼接）好时，可用 M12 的地脚螺栓将其与基础直接相连或用电焊与基础框架焊牢。

7.2 Switchgear Installation

1. Refer to Figure 2 and Figure 3 for the foundation size and installation size of the switchgear.
2. If cabinets are arranged in a single row, reserve a 2.5m wide passageway in front of the cabinets; if the cabinets will be arranged in two rows, reserve 3m passageway between the cabinets.
3. Transport the switchgears to specified position in accordance with engineering requirements and drawing notes. For a long row of switchgears (more than 10 sets generally), the assembly work shall start from the middle.
4. During transportation, use specified transport tools such as cranes and forklifts. Do not use roller to and do not push the circuit breaker handcart into cabinet for transportation. The circuit breaker handcart can be pushed into the cubicle only after the switchgear is installed.
5. Loosen the top bolts on the bus cubicle and remove the top lid.
6. Loosen the bolts in front of the bus cubicle and remove the isolating board 12.
7. Loosen the bolts of the drawable horizontal board 17 under the circuit breaker handcart cubicle and remove the horizontal board.
8. Loosen and remove the cable lid 19.
9. Remove the lid from the left side (small line channel) of the switchgear and the lid from the right frontal side (control line channel) of the switchgear.
10. Remove the lift board and fasteners.
11. Install the switchgears one by one both horizontally and vertically. The installation plane tolerance of the switchgears shall not exceed 2mm.
12. After the switchgears are all assembled together, use M12 foot bolts to connect the switchgears with frame or weld the switchgears to the frame.

7.3 母线的安装

开关设备中的母线均采用矩形母线，且分段形式，当选用不同电流时所选用的母线只是数量规格不一，因而在安装时必须遵照下列的步骤：

1. 用清洁干燥的软布擦揩母线，检查绝缘套管有否损伤，在连接部位涂上导电膏或者中性凡士林。
2. 一个柜接一个柜地安装母线，将母线段和对应的分支小母线接在一起，栓接时应插入合适的垫块，用螺栓拧紧。

7.3 Bus Installation

Switchgear buses are rectangular in shape and sectional. When current varies, only bus quantity and specifications are changed. During installation, make sure to follow the following steps:

1. Use a piece of clean and dry cloth to rub the buses, check the insulating sleeves for damage, and apply conductive paste or neutral Vaseline to the connection joints.
2. Install buses to the cabinets one after another. The bus section shall connect with corresponding branch bus. During connection, insert cushion blocks and fasten the bolts.

7.4 开关设备的接地装置

1. 用预设的连接板将各柜的接地母线 11 连接在一起。
2. 在开关柜内部联接所有需要接地的引线。
3. 将基础框架与接地排相连，如果柜子排列超过 10 台以上，必须有两个以上的接地排。
4. 将接地开关的接地线与开关柜接地主母线联接。

7.4 Grounding Device

1. Use preset joint boards to connect grounding buses 11 together.
2. Connect all lead wires that need grounding within the switchgear.
3. Connect the frame with the grounding bar. For a row of cabinets that exceed 10 sets, prepare two grounding bars at least.
4. Connect the grounding wire of the grounding switch with the main grounding bus of the switchgear.

7.5 开关设备安装后的检查

当开关设备安装就位后，清除柜内设备上的灰尘杂物，然后检查全部紧固螺栓有无松动，接线有无脱落。将断路器在柜中推进、推出，并进行分合闸动作，观察有无异常。将仪表的指针调整到零位，根据线路图检查二次接线是否正确，对继电器进行调整，检查联锁是否有效。

7.5 Examination After Installation

After the switchgears are installed, clear dusts and debris off the switchgear insides and check the fastening bolts and wires for looseness. Push and pull the circuit breakers in and out the cabinets to implement the turn-on and turn-off action and check for anomaly. Adjust the pointer to zero position and check the secondary wiring according to the wiring diagram. Adjust the relay and check whether the interlock is effective.

8. 使用和维护

8. Operation and Maintenance

8.1 开关柜在运行中，运行人员除应遵守有关规程外，还应注意以下问题

8.1 operators shall pay attention to the following in addition to abiding by relevant regulations during switchgear running.

8.1.1 操作程序

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

8.1.1 Operation Procedure

Though the switchgear is configured with an interlock to ensure operation procedure of different switchgear parts, operators shall follow the operation procedure and requirements herein to pull in and out the parts; arbitrarily operating or forcibly operating the device without analysis when operation is hindered is not allowed. Such operation is likely to cause damage to the device even result in severe accident.

8.1.1.1 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：断路器手车准备由柜外推入柜内前，应认真检查断路器是否完好，有无漏装部件，有无工具等杂物放在机构箱或开关内，确认无问题后将手车装在转运车上并锁定好。将转运车推到柜前，把手车升到合适位置，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，打开断路器手车的锁定钩，将手车平稳推入柜体同时锁定，当确认已将手车与柜体锁定好后，解除转运车与柜体的锁定。将转运车推开。
- 手车在柜内操作：手车在转运车装入柜体后，即处于柜内断开位置，若想将手车投入运行，首先使手车处于试验位置，应将辅助回路插头插好，若通电则仪表室面板上试验位置指示灯亮，此时可在主回路未接通的情况下对手车进行电气操作试验，若想继续进行操作，首先必须把所有柜门关好，用钥匙插入门锁孔，把门锁好。并确认断路器处分闸状态（见四条）。此时可将手车操作摇把插入中面板上操作孔内，顺时针转动摇把，直到摇把明显受阻并听到清脆的辅助开关切换声，同时仪表室面板上工作位置指示灯亮，然后取下摇把，此时，主回路接通，断路器处于工作位置，可通过控制回路对其进行合、分操作。
若准备将手车从工作位置退出，首先，应确认断路器已处于分闸状态（见 d 条），插入手车操作摇把，逆时针转动摇把受阻并听到清脆的辅助开关切换声，手车便回到试验位置，此时，主回路已经完全断开，金属活门关闭。
- 从柜中取出手车。若准备从柜内取出手车，首先应确定手车已处于试验位置，然后解除辅助回路插头，并将动插头扣锁在手车架上，此时将转运车推至柜前（与把手车装入柜内时相同），然后将手车解锁并对外拉出，当手车完全进入转运车并确认转运车锁定，解除转运车与柜体的锁定，把转运车向后拉出适当距离后，轻松放下停稳。如手车要用转运车运输较长距离时，在推动转动车过程中要格外小心，以避免运输过程中发生意外事故。
- 断路器在柜内的分、合闸状态确认：断路器的分合闸状态可由断路器的手车面板上分合闸指示牌及仪表室面板上分合闸指示灯两方判定。
若透过柜体中面板观察窗看到手车面板上绿色分闸指示牌则判断断路器处于分闸状态，此时如果辅助回路插头接通电，则仪表室面板上分闸指示灯亮。
若透过柜体中面板观察窗看到手车面板上红色合闸指示牌，则判断断路器处于合闸状态，此时如果辅助回路插头接通电，则仪表室面板上合闸指示灯亮。

8.1.1.1 Circuit breaker cabinet operation without grounding switch

- Push the circuit breaker handcart into the cabinet: before pushing the circuit breaker handcart into the cabinet, check the circuit breaker for damage, missed parts, and additional items (tools, etc) inside the actuating case or switchgear. Put the circuit breaker handcart onto the transfer trolley, lock it up, and push the trolley in front of the cabinet. Raise the handcart to a proper position, insert the fixing key in the front part of the trolley into the jack of the isolating panel of the cabinet to fasten the trolley to the cabinet, open the lock hook of the circuit breaker handcart, and steadily push the handcart into the cabinet and lock up. After the handcart is fastened to the cabinet, unlock the trolley from the cabinet and pull the trolley out.
- Operate the handcart in the cabinet: the handcart is in Disconnect position after it is pushed into the cabinet. To put the handcart into operation, set the handcart to Test position; ensure that the auxiliary circuit plug has been inserted; if the circuit has been energized, the indicator corresponding to the Test position on the operation panel of the relay cubicle will be lit on; in this case, the main circuit is not energized but you can test the handcart. To further operate the handcart, lock the cabinet door and ensure that the circuit breaker is in Disconnect position (refer to step d); insert the handle of the handcart into the upper hole of the middle door and rotate the handle clockwise until a blockage is felt, a clear click sound (indicating switch success) is heard, and the indicator corresponding to the Work position on the operation panel is lit on. Remove the handle. The main circuit is energized and the circuit breaker is in Work position and it can be turned on/off via the control circuit.
To exit the handcart from the Work position, ensure that the circuit breaker is in Disconnect position (refer to step d); insert the handle of the handcart and rotate the handle anticlockwise until a blockage is felt and a clear click sound (indicating switch success) is heard. In this case, the handcart is turned back to the Test position, the main circuit is disconnected, and the metal valve is closed.
- Pull the handcart out of the cabinet: to remove the handcart from the cabinet, ensure that the handcart is in the Test position first. Remove the auxiliary circuit plug and fasten the dynamic lock to the handcart rack. Push the transfer trolley in the front of the cabinet (in a way same as that is used when you push the handcart into the cabinet), unlock the handcart, and pull it out. After pulling the handcart to the transfer trolley and confirming that it is locked, unlock the transfer trolley from the cabinet and pull the transfer trolley backward a certain distance and draw it to a steady stop. If the handcart on the transfer trolley will transmit a long distance, pay special attention during transmission to avoid any accident.
- Confirm the On/Off state of the circuit breaker in the cabinet: determine the On/Off state of the circuit breaker based on the On/Off indicator on the handcart panel of the circuit breaker as well as the On/Off indicator on the operation panel of the relay cubicle.
Via the observation window on the middle door of the cabinet, if the Off indicator on the handcart panel is green, the circuit breaker is in Off state. In this case, if the auxiliary circuit is energized, the Off indicator is lit off.
Via the observation window on the middle door of the cabinet, if the On indicator on the handcart panel is red, the circuit breaker is in On state. In this case, if the auxiliary circuit is energized, the closing indicator is lit on.

8.1.1.2 有接地开关的断路器柜的操作

将断路器手车推入柜内和从柜内取出手车的程序，与无接地开关的断路器柜的操作程序完全相同，仅当手车在柜内操作过程中和操作接地开关过程中要注意的地方叙述如下：

- 手车在柜内操作
当准备将手车推入工作位置时，除了要遵守 8.1.1.1b 中提请注意的诸项要求外，还应确认接地开关处于分闸状态，否则下一步操作无法完成。
- 合、分接地开关操作
若要合接地开关，首先应确定手车已退到试验 / 断开位置，并取下推进摇把，然后按下接地开关操作孔处联锁弯板，插入接地开关操作手柄，顺时针转动 90 度，接地开关处于合闸状态。逆时针转动 90 度，便将接地开关分闸。

8.1.1.2 Circuit breaker cabinet operation with grounding switch

The procedure to pull or push the circuit breaker handcart with grounding switch into or out of the cabinet is identical with the procedure to pull or push the circuit breaker handcart without grounding switch. The precautions that need attention when the handcart is operated within the cabinet and the grounding switch is operated include:

- When the handcart is within the cabinet
To push the handcart to the Work position, in addition to observing the requirements stipulated in point b of section 8.1.1.1, check whether the grounding switch is turned off; otherwise, the next step cannot be performed.
- Turn on/off the grounding switch.
To turn on the grounding switch, confirm that the handcart has been switched back to the Test or Disconnect position first. Remove the handle, press the interlocking bent plate at the hole of the grounding switch, insert the operation handle of the grounding switch, and rotate the handle 90° clockwise; to turn off the grounding switch, rotate the handle 90° anticlockwise.

8.1.1.3 一般隔离柜的操作

隔离手车不具备接通和断开负荷电流的能力，因此在负荷的情况下不允许推拉手车。在进行隔离手车柜内操作时，必须保证首先将与之相配合的断路器分闸（见 8.1.1.1 中 d），同时断路器分闸后其辅助触点转换解除与配合的隔离手车上的电气联锁，只有这时才能操作隔离车，具体操作程序同操作断路手车相同。

8.1.1.3 General isolating cabinet operation

The isolating handcart is not able to connect or disconnect the load current, so it is forbidden to pull or push the isolating handcart in load mode. Before operating the isolating handcart within the cabinet, make sure that corresponding circuit breaker has been turned off (refer to step d in section 8.1.1.1) and the electric interlock between the auxiliary contact of the circuit breaker and the isolating handcart has been cleared. Specific operation procedure is similar to the procedure to operate the circuit breaker handcart.

8.1.2 使用联锁的注意事项

1. 本产品的联锁功能是机械联锁为主，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，只有规程制度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。
2. 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（如果操作受阻增大）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。
3. 有些联锁因特殊需要允许紧急解锁（如柜体下面板和接地开关的联锁），紧急解锁的使用必须慎重，不宜经常使用，使用时也要采取必要的防护措施，一经处理完毕，应立即回复联锁原状。

8.1.2 Precautions for Using Interlock

1. The interlock function of this product is based upon a mechanically-running interlock primarily and supported by an electric interlock and it meets the five protection requirements of the switchgear (the five protection requirement are protecting against circuit breaker On/Off by mistake, protecting against disconnecter On/Off in load mode; protecting against grounding cable (grounding switch) mounting in energized state; protecting against power transmission along grounding cable; and protecting against entering energized cubicle by mistake). Operators shall not neglect the requirements of the operation procedure. Combination of the procedure with technical means helps maximize the guarantee effect of the interlock device and avoid misoperation.
2. During normal operation, the interlock turn-on/off function is implemented without additional steps. If operation is hindered (for example, resistance increases), check for misoperation first; forcible operation will cause damage to the device even result in accident.
3. In special cases, emergency interlock is allowed (for example, interlocking the bottom plate of the cabinet and grounding switch). Be cautious about using the emergency interlock and avoid frequent use. To use emergency interlock, take necessary protective measures. After using the function, restore the interlock back to original state.

8.2 开关柜的检修除按有关规程要求进行外，建议用户特别注意以下几点：

1. 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. 检查手车推进机构及其联锁的情况，使其满足本说明书的有关要求。
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。
4. 检查辅助回路触头有无异常情况，并进行必要的修整。
5. 检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，保证其导电连续性。
6. 检查各部分紧固件，如有松动，应及时紧固。

8.2 In addition to abiding by relevant procedure during switchgear inspection and maintenance, users should pay attention to the following precautions:

1. Check the circuit breaker in accordance with the requirements in the installation guide of the vacuum circuit breaker and carry out necessary adjustment.
2. Check the pushing actuator of the handcart and its interlock and ensure that it meets relevant requirements in this guide.
3. Check the contact of the main circuit and scrub the old grease on the dynamic and static contacts to check for damage, spring force change and coating oxidization caused by high temperature. If the problems exist, handle the problems in a timely manner.
4. Check the contact of the auxiliary circuit for anomaly and make necessary adjustment.
5. Check various parts of the grounding circuit, including grounding contact, main grounding cable, and door crossing grounding cable to ensure continuity of electric conduction.
6. Check fasteners of various parts for looseness and secure the fasteners in a timely manner.

9. 运输与存放

9. Transportation and Storage

9. 开关柜在运输与存放过程中应注意以下几点：

- a. 不许倾翻，倒置和遭受剧烈震动，防止靠近火源。
- b. 应防止淋雨，以免产品受潮。
- c. 不得随意拆卸电器产品及零件。

9. Pay attention to the following during transportation and storage of the switchgear:

- a. Do not overturn and violently shake the switchgear and keep the device away from fire.
- b. Protect the device from rain to avoid dampening it.
- c. Do not arbitrarily disassemble the device and its parts.

10. 产品成套提供下列文件

- a. 产品合格证；
- b. 产品装箱单；
- c. 产品出厂试验报告；
- d. 产品使用说明书；
- e. 设备清单；
- f. 二次接线图；
- g. 出图产品按供图目录及设备表供应；
- h. 中置手车操作摇把，接地开关操作手柄及中置手车转运车（合同台量 10 台以下，每 5 台配一套；超过 10 台，每增加 10 台，加 1 套）。

10. Accompanied Files and Attachments

- a. Product certificate;
- b. Packing list;
- c. Factory test report;
- d. Product operation guide;
- e. Device list;
- f. Secondary wiring diagram;
- g. Products with drawings are supplied in accordance with the catalogue of drawings and device list;
- h. Operation handle of the centrally-installed handcart, operation handle of the grounding switch, and transfer trolley of the handcart (if the prescribed number of switchgears in the contract is less than ten, provide a suit of transfer trolley to match the switchgears; if the number exceeds ten, provide a transfer trolley for each additional ten switchgears)

11. 订货须知

订货时应提供下列资料:

- 主接线方案编号及单线系统图, 排列图及平面布置图;
- 二次原理图, 端子排列图, 若无端子排列图时按制造厂家端子排编排;
- 开关柜的电器元件的型号、规格、数量;
- 电气设备汇总表;
- 需要母线桥(两列柜间母线桥和墙柜间母线桥)时需提供跨距和高度尺寸;
- 开关柜使用的特别环境条件时在订货时提出;
- 需要其他或超出附件时应提出种类和数量。

11. Notice for Order Placement

Provide the following materials when placing an order:

- Main wiring scheme number and single-wire system diagram, arrangement diagram, and floor plan;
- Secondary schematics and terminal arrangement diagram; if there is no terminal arrangement diagram, prepare in accordance with the terminal bar of the manufacturer;
- Model, specifications, and quantity of electric elements of the switchgear;
- Summary list of electric devices;
- Span distance and height shall be provided if bus bridges (bus bridges between two cabinets and bus bridge between wall and cabinet) are needed;
- It shall be noted down if the switchgear will be used in special environment;
- Type and quantity shall be specified if additional requirements are raised or the type and quantity exceeds the supplies stipulated in the attachment.

| 方案号 Solution No. | 001 | 002 | 003 | 004 | 005 | 006 |
|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W × D × H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |

| 额定电流 (A) Rated current (A) | | 630-4000 | | | | | |
|---|---|--|--|--|--|--|--|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 2 | 2 | 2 | 3 | 3 | 3 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | | | | | | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | | | | | | |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | 1 | 1 | | 1 | 1 |
| 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | 3 | | | 3 |
| 回路名称 Circuit name | | 受电、馈电 Power receiving, feeder power receiving | 受电、馈电 Power receiving, feeder power receiving | 受电、馈电 Power receiving, feeder power receiving | 受电、馈电 Power receiving, feeder power receiving | 受电、馈电 Power receiving, feeder power receiving | 受电、馈电 Power receiving, feeder power receiving |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 方案号 Solution No. | 007 | 008 | 009 | 010 | 011 | 012 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |

| 方案号 Solution No. | 013 | 014 | 015 | 016 | 017 | 018 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|---------------------------|--------------------------|--------------------------|---------------------------|---------------------------|---|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 2 | 2 | 2 | 3 | 3 | 3 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | | | | | | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | | | | | | |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | 1 | | 1 | | 1 |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | |
| 回路名称 Circuit name | 联络 (右) Contact (right) | 联络 (右) Contact (right) | 联络 (左) Contact (left) | 联络 (左) Contact (left) | 联络 (右) Contact (right) | 联络 (右) Contact (right) | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

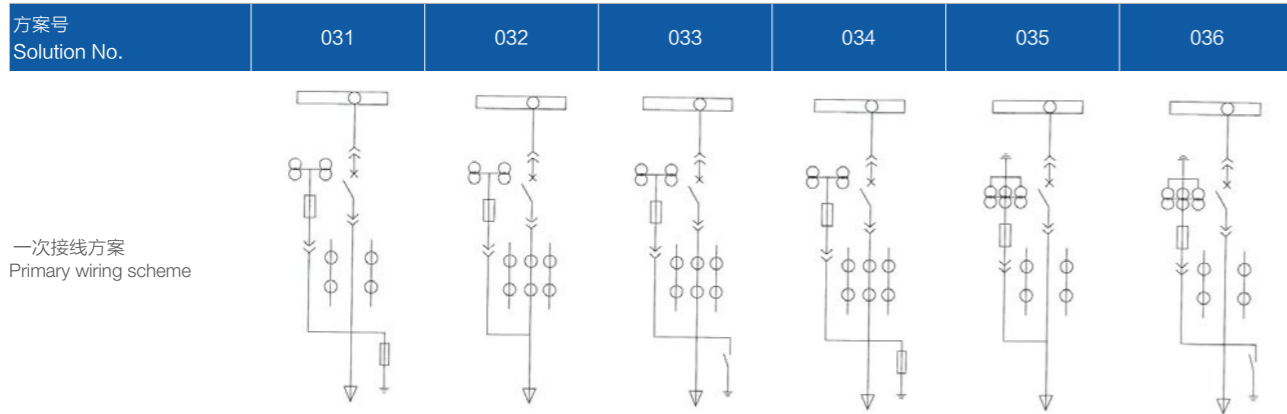
| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|--------------------------|---|---|--|--|---|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 3 | 3 | 2 | 2 | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | | | | | | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | | | | | | |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | 1 | | 1 | | 1 |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | |
| 回路名称 Circuit name | 联络 (左) Contact (left) | 联络 (左) Contact (left) | 架空进线 (左联络) Aerial incoming wire (left contact) | 架空进线 (左联络) Aerial incoming wire (left contact) | 架空进线 (右联络) Aerial incoming wire (right contact) | 架空进线 (右联络) Aerial incoming wire (right contact) | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 方案号 Solution No. | 019 | 020 | 021 | 022 | 023 | 024 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |

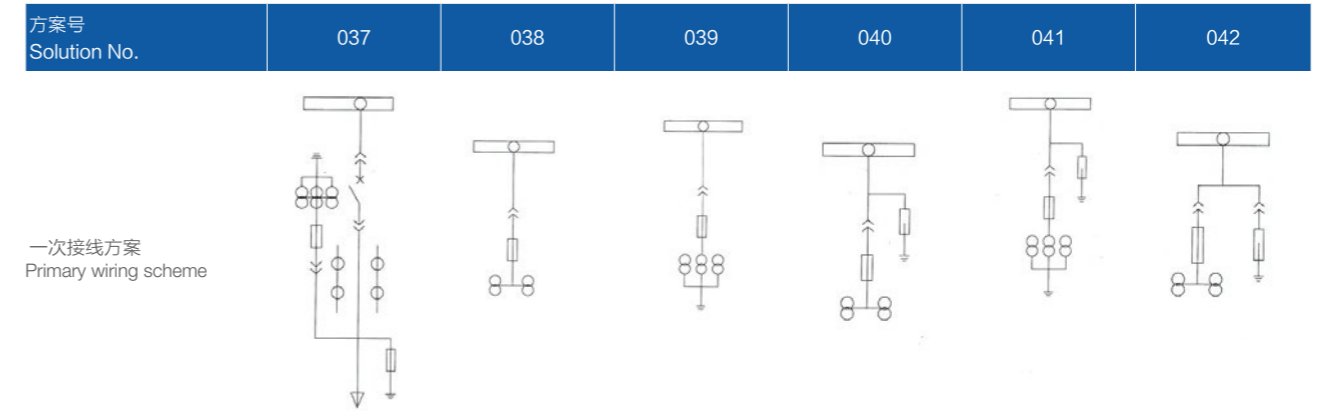
| 方案号 Solution No. | 025 | 026 | 027 | 028 | 029 | 030 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |

| 额定电流 (A) Rated current (A) | | 630-4000 | | | | | |
|---|---|---|--|--|---|---|---|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 3 | 3 | 3 | 3 | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | | | | | | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | | | | | | |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | 1 | | 1 | | 1 |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | |
| 回路名称 Circuit name | 架空进线 (左联络) Aerial incoming wire (left contact) | 架空进线 (左联络) Aerial incoming wire (left contact) | 架空进线 (右联络) Aerial incoming wire (right contact) | 架空进线 (右联络) Aerial incoming wire (right contact) | 架空进线 Aerial incoming / outgoing wire | 架空进线 Aerial incoming / outgoing wire | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 额定电流 (A) Rated current (A) | | 630-4000 | | | | | |
|---|---|-------------------------------------|-------------------------------------|--|---------------------------------|------------------------|-------------|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 2 | 3 | 3 | 3 | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | | | | | JDZ10-10A 2 | JDZ10-10A 2 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | | | | | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | 1 | | 1 | 1 | | 1 |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | 3 | | | 3 | | |
| 回路名称 Circuit name | 架空进出线 Aerial incoming / outgoing | 架空进出线 Aerial incoming / outgoing | 架空进出线 Aerial incoming / outgoing | 架空进出线 +PT Aerial incoming / outgoing+PT | 电缆进线 +PT Cable incoming + PT | 电缆进线 Cable incoming | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |



| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|



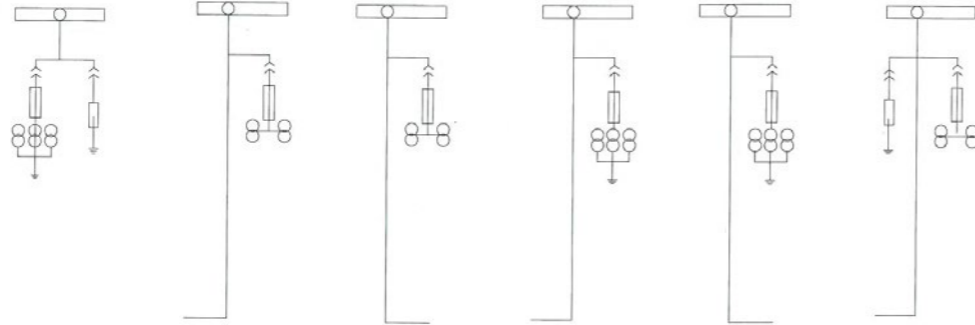
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800x1500x2300 | 800x1500x2300 | 800x1500x2300 | 800x1500x2300 | 800x1500x2300 |
|---|------------------------------|---------------|---------------|---------------|---------------|---------------|
|---|------------------------------|---------------|---------------|---------------|---------------|---------------|

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|---|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 3 | 3 | 3 | 3 | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZX10-10A 3 | JDZX10-10A 3 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | 1 | | | 1 |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | 3 | | | 3 | | |
| 回路名称 Circuit name | | 电缆进线 +PT incoming + PT | 电缆进线 +PT incoming + PT | 电缆进线 +PT incoming + PT | 电缆进线 +PT incoming + PT | 电缆进线 +PT incoming + PT | 电缆进线 +PT incoming + PT |
| 备注 Remark | | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | |

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|---|-----------------------------|-----------------------------|---|---|---|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | 1 | | | | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 2 | | | | | |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZX10-10A 3 | JDZ10-10A 2 | JDZX10-10A 3 | JDZ10-10A 2 | JDZX10-10A 3 | JDZ10-10A 2 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | 3 | | | 3 | 3 | 3 |
| 回路名称 Circuit name | | 电缆进线 +PT incoming + PT | 电压测量 Voltage measurement | 电压测量 Voltage measurement | 电缆进线 + 避雷针 incoming cable +arrester | 电缆进线 + 避雷针 incoming cable +arrester | 电缆进线 + 避雷针 incoming cable +arrester |
| 备注 Remark | | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | |

| 方案号 Solution No. | 043 | 044 | 045 | 046 | 047 | 048 |
|---------------------|-----|-----|-----|-----|-----|-----|
|---------------------|-----|-----|-----|-----|-----|-----|

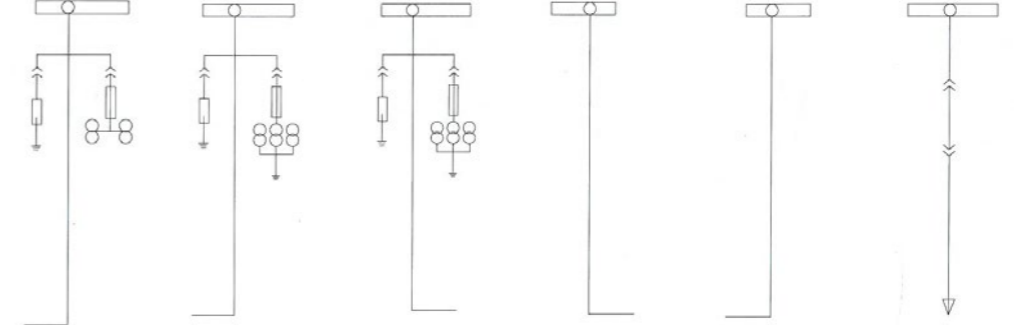
一次接线方案
Primary wiring scheme



| | | | | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|

| 方案号 Solution No. | 049 | 050 | 051 | 052 | 053 | 054 |
|---------------------|-----|-----|-----|-----|-----|-----|
|---------------------|-----|-----|-----|-----|-----|-----|

一次接线方案
Primary wiring scheme



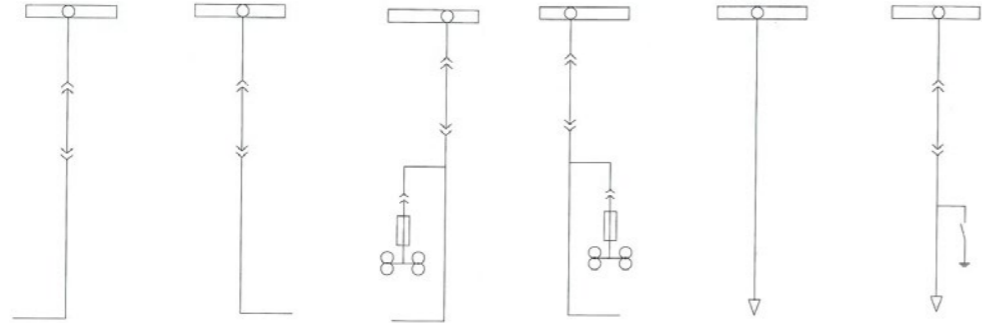
| | | | | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|--|--|--|--|---|-------------|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | | | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | | | | | | |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZX10-10A 3 | JDZ10-10A 2 | JDZ10-10A 2 | JDZX10-10A 3 | JDZX10-10A 3 | JDZ10-10A 2 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | 3 | | | | | 3 |
| 回路名称 Circuit name | 电缆进线 + 避雷针 Voltage measurement + arrester | 电缆进线 + 母联 incoming cable+bus coupling | 电缆进线 + 母联 incoming cable+bus coupling | 电缆进线 + 母联 incoming cable+bus coupling | 电缆进线 + 母联 incoming cable+bus coupling | 电缆进线 + 避雷针 + 母联 Cable into line + lightning rod + bus coupling | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|---|---|--------------------|--------------------|--------------------|--|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | | | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | | | | | | |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZ10-10A 2 | JDZX10-10A 3 | JDZX10-10A 3 | | | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | | | |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | 3 | 3 | 3 | | | |
| 回路名称 Circuit name | 电压测量 + 避雷针 + 母联 Voltage measurement + arrester + bus | 电压测量 + 避雷针 + 母联 Voltage measurement + arrester + bus | 电压测量 + 避雷针 + 母联 Voltage measurement + arrester + bus | 母联 Bus coupling | 母联 Bus coupling | 母联 Bus coupling | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 方案号 Solution No. | 055 | 056 | 057 | 058 | 059 | 060 |
|---------------------|-----|-----|-----|-----|-----|-----|
|---------------------|-----|-----|-----|-----|-----|-----|

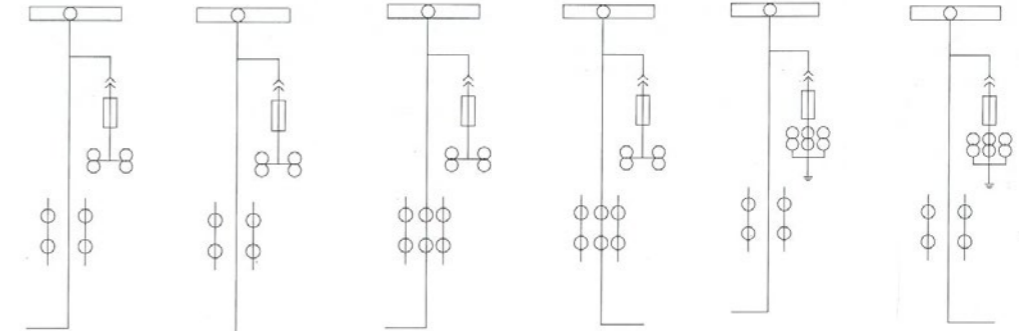
一次接线方案
Primary wiring scheme



| | | | | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|

| 方案号 Solution No. | 061 | 062 | 063 | 064 | 065 | 066 |
|---------------------|-----|-----|-----|-----|-----|-----|
|---------------------|-----|-----|-----|-----|-----|-----|

一次接线方案
Primary wiring scheme



| | | | | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|--|--|--|--|--|--|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | | | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | | | | | | |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | | | JDZ10-10A 2 | JDZ10-10A 2 | | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | | | 3 | 3 | | |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | |
| 回路名称 Circuit name | 隔离 + 联络 (左) Isolation + contact (left) | 隔离 + 联络 (右) Isolation + contact (right) | 隔离 + 联络 (左) + 电压测量 Isolation + contact (left) + voltage measurement | 隔离 + 联络 (左) + 电压测量 Isolation + contact (left) + voltage measurement | 出线变相 Outgoing wire phase conversion | 出线变相 Outgoing wire phase conversion | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|-------------------------------------|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|--------------|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | | | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 2 | 2 | 3 | 3 | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZX10-10A 3 | JDZX10-10A 3 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | |
| 回路名称 Circuit name | 计量 + 左联 Metering + left contact | 计量 + 右联 Metering + right contact | 计量 + 左联 Metering + left contact | 计量 + 右联 Metering + right contact | 计量 + 左联 Metering + left contact | 计量 + 右联 Metering + right contact | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 方案号 Solution No. | 067 | 068 | 069 | 070 | 071 | 072 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 | 800 × 1500 × 2300 1000 |

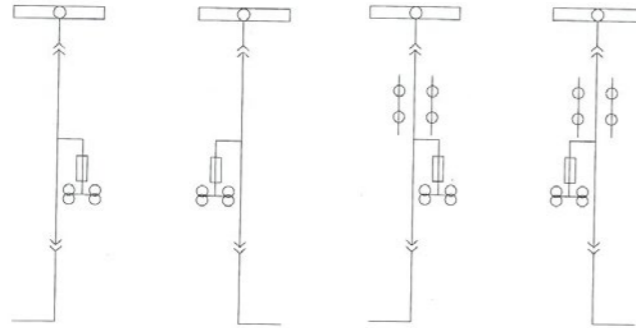
| 方案号 Solution No. | 073 | 074 | 075 | 076 | 077 | 078 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| 一次接线方案 Primary wiring scheme | | | | | | |
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 |

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|------------------------------------|-------------------------------------|--|--|--|--|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | 1 | 1 | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 3 | 3 | 2 | 2 | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZX10-10A 3 | JDZX10-10A 3 | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | |
| 回路名称 Circuit name | | 计量 + 左联 Metering + left contact | 计量 + 右联 Metering + right contact | 进线 + 计量 + 计量 Incoming wire + metering | 进线 + 计量 + 计量 Incoming wire + metering | 进线 + 计量 + 计量 Incoming wire + metering | 进线 + 计量 + 计量 Incoming wire + metering |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 额定电流 (A) Rated current (A) | | 630~4000 | | | | | |
|---|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | 1 | 1 | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | 3 | 3 | 3 | 3 | | |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 | |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 | 3 | XRNT-12 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | | | 3 |
| | 变压器 SC8-10/80 Transformer SC8-10/80 | | | | | 1 | |
| | 电容器 BW12.7-16-1 Capacitor BW12.7-16-1 | | | | | | 3 |
| 回路名称 Circuit name | | 进线 + 计量 Incoming wire + metering | 进线 + 计量 Incoming wire + metering | 进线 + 计量 Incoming wire + metering | 进线 + 计量 Incoming wire + metering | 进线 + 计量 Incoming wire + metering | 所有变 All conversion 电容器柜 Capacitor Cabinet |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | | | |

| 方案号 Solution No. | 079 | 080 | 081 | 082 |
|---------------------|-----|-----|-----|-----|
|---------------------|-----|-----|-----|-----|

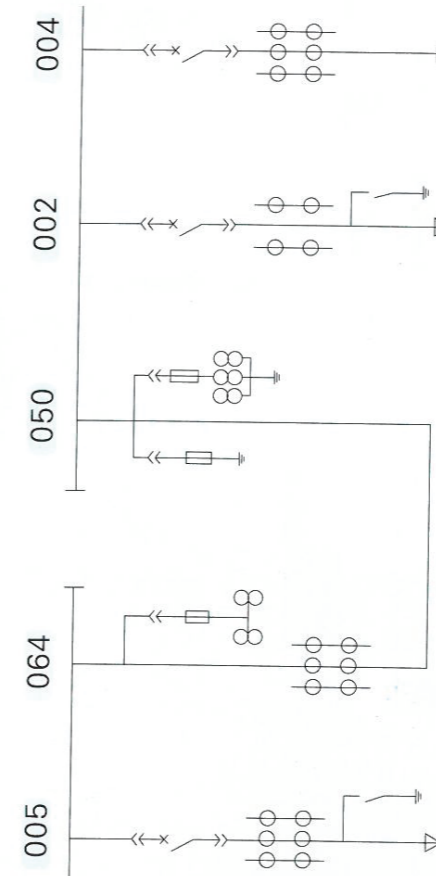
一次接线方案
Primary wiring scheme



| | | | | |
|---|------------------------------|------------------------------|------------------------------|------------------------------|
| 柜体尺寸 (W×D×H) Cabinet dimensions (W × D × H) | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 | 800 × 1660 × 2300 1000 |
|---|------------------------------|------------------------------|------------------------------|------------------------------|

| 额定电流 (A) Rated current (A) | | 630-4000 | | | |
|---|---|--|---|--|-------------------------------------|
| 一次主要设备元件 Primary main devices and elements | 真空断路器 (VD4、VT2 或 VS1、VB2) Vacuum circuit breaker (VD4, VT2, or VS1, VB2) | | | | |
| | 电流互感器 LZZBJ9-10 LMZB3-10 Current transformer LZZBJ9-10 LMZB3-10 | | | 2 | 2 |
| | 电压互感器 JDZ10-10A JDZX10-10A Voltage transformer JDZ10-10A JDZX10-10A | JDZ10-10A 2 | JDZ10-10A 2 | JDZ10-10A 2 或 (or) JSZV-10R 1 | JDZ10-10A 2 或 (or) JSZV-10R 1 |
| | 高压熔断器 XRNP-12/0.5 High-voltage fuse XRNP-12/0.5 | 3 | 3 | 3 | 3 |
| | 接地开关 JN15-12 Grounding switch JN15-12 | | | | |
| | 避雷器 HY5WS2-17/50 Arrester HY5WS2-17/50 | | | | |
| 回路名称 Circuit name | 电压测量 + 左联 Voltage measurement + left contact | 电压测量 + 右联 Voltage measurement + right contact | 电压测量 + 左联 Voltage measurement + left contact | 电压测量 + 右联 Voltage measurement + right contact | |
| 备注 Remark | 额定电流 1600A 及以上, 则柜宽 1000mm If the rated current is 1600A or above, cabinet width shall be 1000mm | | | | |

Application example(1)
方案应用实例(1)



Application example(2)
方案应用实例(2)

