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TGOOD
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川开电气有限公司
Chuan Kai Electric Co., Ltd.



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KYN37B-40.5 铠装移开式金属封闭开关设备 AC Metal-clad Withdrawable Switchgear

技术资料 Technical Data



川开电气有限公司
Chuan Kai Electric Co., Ltd.



企业概况 Company Profile

川开电气有限公司(Chuan Kai Electric Co.,Ltd.,简称“川开电气”),位于天府之国成都。系青岛特锐德电气股份有限公司(创业板第一股,股票代码:300001)全资子公司,占地301亩,注册资本金3.0468亿元。

川开电气专业从事输配电成套设备研发、设计、制造、销售、安装、技术咨询、融资租赁等一体化服务,是原机械部、电力部定点生产许可企业。整体规模和实力名列西南地区第1名,全国电气开关行业前10名。先后荣获国家级高新技术企业、四川省先进企业、四川省重合同守信用企业、四川省名牌产品企业等荣誉称号。

川开电气主要产品及服务包括:252kV及以下高、中、低压开关柜、110kV预装式中心变电站、电气元件、12-40.5kV预装式变电站(开关站)、交/直流一体化系统、EPS应急电源、配电箱、动力箱、电缆桥架、封闭母线槽、共箱母线、预分支电缆及融资租赁、电力工程总包施工、电力设备维保等。2006年全国首家通过核级中低压成套设备国家级鉴定。产品适用于电厂、电网、核电、军工、航空航天、轨道交通、通信、石油石化、冶金、市政、机械、电子、轻工、建材等各领域,畅销全国,远销东南亚、中亚及非洲国家,以其高品质性价比及优良、快捷、完善的服务,赢得了社会各界和广大客户的一致认同和好评。

川开电气以人为本,重视人力资源开发和综合素质培养,聚集了一大批高素质的管理和技术人才。建立了院士专家工作站、国家输配电重点实验室实训基地及四川省级企业技术中心。始终奉行与巨人同行的原则,与西门子、ABB、阿尔斯通、GE、施耐德等世界著名电气公司开展了全方位的技术引进和OEM合作,不断提升产品可靠性、安全性;率先引进美国、日本、德国、瑞士等国家先进加工设备;产品的设计、制造全部过程采用CAD、CAPP、CAM、INVENTOR,建立了产品数据管理系统(PDM);通过ISO9001质量管理体系、ISO14001环境管理体系认证、OHSAS18001职业健康安全管理体系认证、核工业质量管理体系认证证书,并完善了计量管理体系。所有产品均按国际、国家和行业标准通过了型式试验和相应认证。

川开电气的发展,得到了社会各界的信赖和支持。川开电气将秉承“感动客户、以人为本、和谐高效、回报社会”的核心价值观,以成为国内电力设备制造业的领军者,带动中国电力设备制造业步入国际梯队为目标,把川开电气打造成行业内最受尊重的伟大公司。

川开电气致力于为您提供最优的整体输配电解决方案,点亮和谐美好生活!

Chuan Kai Electric Co., Ltd. (Chuan Kai Electric) is located in Chengdu, the land of abundance. It was established in 1980 and originally attached to Chuan Kai Industry Group Co., Ltd. Chuan Kai Electric achieve the reorganization of assets and with Qingdao TGOOD Electric Co., Ltd.(the first gem shares, stock code: 300001) in November 2015 and became its wholly owned subsidiary with registered capital of RMB 304.68million.

Chuan Kai Electric specializes in R&D, design, manufacturing, sales, installation, technical consulting, financial lease and other integrated services on power transmission and distribution equipment, which makes it become a enterprise with production license designated by the former Machinery Department and Power Department. Its overall scale and strength rank first in the southwest and top 10 in the national electrical switch industry. It wins many honorary titles such as the national high-tech enterprise, advanced enterprise in Sichuan Province, Enterprise in Good Credit in Sichuan Province, Famous Brand Product Enterprise in Sichuan Province.

The main products and services of Chuan Kai electric include: 252kV and below high, medium and low voltage switchgear, 110kV preinstalled central substation, electrical components, 12-40.5kV preinstalled substation (switch station), AC / DC integrated system, EPS emergency power supply, power distribution box, power box, cable bridge, closed bus slot, common bus bus, preview. Supporting cable and finance leasing, power engineering general contracting construction, power equipment maintenance and so on. In 2006, the first national evaluation of nuclear power equipment in China was carried out. The products are suitable for power plants, power grids, nuclear power, military industry, aerospace, rail transportation, communications, petroleum and petrochemical, metallurgical, municipal, mechanical, electronic, light industry, building materials and other fields. It is sold to the whole country and exported to Southeast Asia, Central Asia and African countries, with its high quality, good, fast and perfect service. The consensus and recognition from all walks of life and customers.

Chuan Kai Electric keeps people-oriented, pays attention to the development of human resources and comprehensive quality training, gathering a large number of high-quality management and technical personnel and sets academician expert workstation, the training base of national transmission and distribution key laboratory and Sichuan provincial enterprise technology center. It always adheres to following the step of the excellent counterparts, so it carries out a full range of technology introduction and OEM cooperation with Siemens, ABB, ALSTOM, GE, Schneider and other world famous electric company for continuously product improvement in reliability and safety. In addition, Chuan Kai Electric takes the lead in the introduction of advanced processing equipment from the United States, Japan, Germany, and Switzerland and so on. The design and manufacturing process of product adopts CAD/CAPP/CAM/INVENTOR, which establishes the product data management system (PDM); it has passed the ISO9001 quality management system, ISO 14001 environmental management system, OHSAS18001 occupational health, Certification of the quality management system of the nuclear industry and safety management system, and improved the measurement management system. All products of Chuan Kai Electric pass the type test and the corresponding certification in accordance with international, national and industry standards.

The development of Chuan Kai Electric has gained the trust and support of social circles. Chuan Kai Electric will be adhering to the core values of the customer touched, people-oriented, harmony and efficiency, and society reward to become the leader of domestic power equipment manufacturing industry, and aim at bringing along Chinese power equipment manufacture into the international echelon, and building the Chuan Kai Electric into a company with high respect in same industry.

Chuan Kai Electric is dedicated to provide you with the best whole power transmission and distribution solutions for harmonious and better life!

KYN37B – 40.5 铠装移开式金属封闭开关设备

AC Metal–clad Withdrawable Switchgear

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KYN37B – 40.5 铠装移开式金属封闭开关设备

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概 述 General

KYN37B–40.5型铠装移开式交流金属封闭开关设备（以下简称开关设备）是川开电气有限公司自主开发和设计的40.5KV中压开关设备。它适用于三相交流50Hz电力系统，用法接受和分配电能并对电路实行控制、保护及监测。

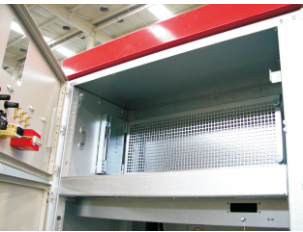
KYN37B–40.5开关设备具有各种防止误操作的功能，包括防止误分、误合断路器，防止带负荷移动手车、防止接地开关闭合位置合断路器、防止带电合接地开关和防止误入带电隔室等功能。

KYN37B–40.5开关设备首选配置我公司的ZN88、ZN85真空断路器，以及国内其它品牌断路器或合资品牌相应的断路器等。开关设备二次回路配置先进可靠的控制保护元件；柜体选用优质冷轧钢板及进口覆铝锌板经数控设备加工成型后，通过高强度螺栓、螺母和铆螺母链接而成；母线采用热缩绝缘材料及环氧涂覆的绝缘手段，优化电极形状，柜体结构紧凑。KYN37B–40.5型开关设备是技术先进、性能稳定、结构合理、使用方便、安全可靠的配电设备。

The KYN37B–40.5 type armoured shifting metal enclosed switchgear (hereinafter referred to as switchgear) is a 40.5KV medium voltage switchgear developed and designed by Sichuan open Electric Co., Ltd. It is suitable for three phase AC 50Hz power system. It is used to accept and distribute electric energy and to control, protect and monitor the circuit.

KYN37B–40.5 switchgear has various functions to prevent misoperation, including preventing misoperation and misoperation of circuit breakers, preventing load carrying mobile cars, preventing closing switches of earthing switches, closing circuit breakers, preventing electrified ground switches and preventing misalignment of live compartments.

KYN37B–40.5 switching equipment is preferred to configure our company's ZN88, ZN85 vacuum circuit breakers, and other domestic brand circuit breakers or joint venture brand corresponding circuit breakers. The two switch circuit is equipped with advanced and reliable control and protection components; cabinet is made of high quality cold–rolled steel plate and imported aluminum zinc coated plate by processing and molding of CNC equipment, formed by high strength bolt, nut and rivet nut link; bus using insulation means pyrocondensational insulating materials and epoxy coated, optimization of electrode shape, compact structure of cabinet. Type KYN37B–40.5 switch equipment is a kind of distribution equipment with advanced technology, stable performance, reasonable structure, convenient use and safe and reliable.



KYN37B–40.5开关设备

KYN37B–40. 5开关设备依据下列标准进行设计与制造：

KYN37B–40.5 switchgear is designed and manufactured in accordance with the following standards:

- | | |
|---------------------|--|
| ● GB3906 | 3.6 ~ 40.5kV交流金属封闭开关设备和控制设备
3.6 ~ 40.5kV A.C. Metal–enclosed Switchgear |
| ● GB1984 | 高压交流断路器 AC. High Voltage Circuit Breaker |
| ● GB/T11022 | 高压开关设备和控制设备标准的共用技术要求
Standard Common Rules of High Voltage Switchgear and Controlgear |
| ● DL/T404 | 户内交流高压开关设备订货技术条件
Ordering Technical Specifications for Indoor Type A.C. High Voltage Switchboard |
| ● IEC60694 | 高压开关设备和控制设备标准的共用技术要求
Standard Common Specifications for High–voltage Switchgear and Controlgear |
| ● IEC62271–200 | 额定电压1kV以上52kV以下交流金属封闭开关设备和控制设备
AC Metal–enclosed Switchgear and Controlgear for Rated Voltages Above 1 kV and Up to and Including 52 kV |
| ● IEC62271–100；2001 | 2001高压开关设备和控制设备第100部分：高压交流断路器
High–voltage Switchgear and Controlgear, Part 100: High–voltage AC Circuit Breaker |

KYN37B – 40.5 铠装移开式金属封闭开关设备

AC Metal–clad Withdrawable Switchgear

使用环境条件

Service Condition

正常使用条件

Normal service conditions

- a) 环境温度：最高温度：+40℃；最低温度：–15℃
- b) 环境湿度条件如下
- 日相对湿度的平均值不超过95%；月相对湿度平均不超过90%
- 日水蒸气压力的平均值不超过2.2kPa；月水蒸气压力平均不超过1.8kPa
- c) 海拔不超过1000m
- d) 周围空气没有明显地受到尘埃、烟、腐蚀性/可燃气体、蒸气或盐雾的污染
- e) 来自开关设备和控制设备外部的振动或地动是可以忽略的
- f) 在二次系统中感应的电磁干扰的幅值不超过1.6kV

- a) Ambient temperature : Max +40℃, Min. –15℃
- b) Ambient Humidity
- Daily relative humidity average value shall not exceed 95%, monthly relative humidity average value shall not exceed 90%
- Daily vapor pressure average value shall not exceed 2.2kPa, monthly vapor pressure average value shall not exceed 1.8kPa
- c) Altitude does not exceed 1000m
- d) The ambient air is not obviously polluted by dust, smoke, corrosive/ flammable air, vapor or salt fog
- e) Vibration comes out of switchgear and controlgear or ground motion can be neglect
- f) The amplitude of secondary system inductive electromagnetic interference shall not exceed 1.6kV

特殊使用条件

Special Service Conditions

在超过GB/T11022和本使用说明书规定的正常环境条件下使用时，本公司和用户可就超出正常运行条件的特殊运行条件进行协商，并达成协议。

为防止凝露现象，开关设备设有加热器。当开关设备处于备用状态时，即应投入使用。即使在正常运行中，也应注意投用。开关设备的散热问题可通过附加的通风设施来解决。

When operation condition exceeds conditions defined in GB/T11022 and the normal condition in this instruction, the user shall negotiate with the manufacturer.

Heater is fitted to prevent condensation. When switchgear is at standy state, heater should be put into service. Even if switchgear is at normal operation, attention shall be paid on this. Cooling of the switchgear can be solved by additive ventilation equipment.

KYN37B – 40.5 铠装移开式金属封闭开关设备

AC Metal–clad Withdrawable Switchgear

技术参数

Technical Data

开关设备主要技术参数(表一)

Main Data of Switchgear (Table 1)

表一 Table 1

序号 No.	项目 Item		单位 Unit	参数 Data	
1	额定电压 Rated voltage		kV	40.5	
2	额定频率 Rated frequency		Hz	50	
3	额定绝缘水平 Rated insulation level	1min 工频耐受电压（有效值） 1 min. power frequency withstand voltage (rms.)	kV	相间 Between phases	隔离断口 Across isolating distance
				95	118
		雷电冲击耐受电压(峰值)Lightning impulse withstand voltage (peak)		185	215
		辅助控制回路 1min 工频耐受电压 1 min. power frequency withstand voltage of auxiliary control circuit	V	2000	
4	额定电流 Rated current		A	1250, 1600, 2000, 2500	
5	额定短路开断电流 Rated short circuit breaking current		kA	20, 25, 31.5	
6	额定短路关合电流（峰值） Rated short circuit making current (peak)		kA	50, 63, 80	
7	额定短时耐受电流（4s） Rated short duration withstand current (4S)		kA	20, 25, 31.5	
8	额定峰值耐受电流 Rated peak withstand current		kA	50, 63, 80	
9	辅助控制回路额定电压 Rated voltage of auxiliary control circuit		V	–110, –220, ~220	

KYN37B – 40.5 铠装移开式金属封闭开关设备

AC Metal–clad Withdrawable Switchgear

ZN88–40.5真空断路器技术参数(表二) Technical Data of Vacuum Circuit Breaker ZN88–40.5 (Table 2)

表二 Table 2

序号 No.	项目 Item		单位 Unit	参数 Data
1	额定电压 Rated voltage		kV	40.5
2	额定频率 Rated frequency		Hz	50
3	额定绝缘水平 Rated insulation level	工频耐受电压 Power frequency withstand voltage	kV	95
		雷电冲击耐受电压 Lightning impulse withstand voltage		185
4	额定电流 Rated current		A	630,1250,1600,2000,2500
5	额定短路开断电流 Rated short circuit breaking current		kA	20,25,31.5
6	额定短路关合电流 Rated short circuit making current		kA	50,63,80
7	额定短时耐受电流(4s) Rated short time withstand current (4s)		kA	20,25,31.5
8	额定峰值耐受电流 Rated peak withstand current		kA	50,63,80
9	额定电容器组开断电流 Rated breaking current of capacitor bank		A	630
10	额定短路开断电流开断次数 Rated short circuit breaking times		次	20
11	额定操作顺序 Rated operation sequence			O–0.3s–CO–180s–CO
12	分闸时间 Opening time		ms	20~60
13	合闸时间 Closing time		ms	40~100
14	机械寿命 Mechanical endurance		次	10000
15	触头开距 Clearance between open contacts		mm	20 ± 2
16	超行程 Over travel		mm	7 ± 1
17	触头允许磨损累积厚度 Allowable contactor wear thickness		mm	3
18	平均合闸速度 Average closing speed		m/s	0.5~0.8
19	平均分闸速度 (刚分 10mm) Average opening speed		m/s	1.4~2.0
20	触头合闸弹跳时间 Contact closing bounce time		ms	≤2
21	三相触头分闸不同期性 Opening non–synchronism of 3 phase contactors		ms	≤2

KYN37B – 40.5 铠装移开式金属封闭开关设备

AC Metal–clad Withdrawable Switchgear

22	三相触头合闸不同期性 Closing non–synchronism of 3 phase contactors	ms	≤2
23	每相回路直流电阻 Circuit DC resistance per phase	μ Ω	≤50
24	合闸状态额定触头弹簧压力 Contact spring pressure when closed	N	2000 ± 200 (20kA, 25kA) 2400 ± 200 (31.5kA)
25	相间中心距 Central distance between phases	mm	300 ± 1.5

VD4真空断路器技术参数(表三) Technical Data of VD4 Vacuum Circuit Breaker (Table 3)

表三 Table 3

序号 No.	项目 Item		单位 Unit	参数 Data
1	额定电压 Rated voltage			40.5
2	额定绝缘水平 Rated insulation level	1min 工频耐受电压 1min power frequency withstand voltage	kV	95
		雷电冲击耐受电压 Lightning impulse withstand voltage		185
3	额定电流 Rated current		A	1250,1600,2000,2500,3150
4	额定短路开断电流 Rated short circuit breaking current		kA	31.5
5	额定短路关合电流 Rated short circuit making current			80
6	额定短时耐受电流（3S） Rated short time withstand current (3S)			31.5
7	额定峰值耐受电流 Rated peak withstand current			80
8	机械寿命 Mechanical endurance		次 Cycles	10000
9	合闸时间 Closing time		ms	55~67
10	分闸时间 Opening time			33~45
11	燃弧时间 Arcing time			≤15
12	额定操作顺序 Rated operation sequence	自动重合闸 Auto reclosure		O 0.3 CO 180s CO
		非自动重合闸 Non-auto reclosure		O 180s CO 180s CO
13	开断时间 Opening Time		ms	48~60

HD4六氟化硫断路器技术参数(表四)

Technical Data of HD4, SF6 Circuit Breaker (Table 4)

表四

Table 4

序号 No.	项目 Item		单位 Unit	参数 Data
1	额定电压 Rated voltage		kV	40.5
2	额定绝缘水平 Rated insulation level	1min 工频耐受电压 1min power frequency withstand voltage		95
		雷电冲击耐受电压 Lightning impulse withstand voltage		185
3	额定电流 Rated current			1250,1600,2000,2500,3150
4	额定短路开断电流 Rated short circuit breaking current		A	25, 31.5
5	额定短路关合电流 Rated short circuit making current		kA	63, 80
6	额定短时耐受电流（3s） Rated short time withstand current (3S)			25, 31.5
7	额定峰值耐受电流 Rated peak withstand current			63, 80
8	机械寿命 Mechanical endurance			10000
9	合闸时间 Closing time		次	43~55
10	分闸时间 Opening time		ms	35~48
11	燃弧时间 Arcing Time			10~15
12	额定操作顺序 Rated operation sequence	自动重合闸 Auto reclosure		O 0.3 CO 180s CO
		非自动重合闸 Non-auto reclosure		O 180s CO 180s CO
13	开断时间 Opening Time		ms	46~63
14	SF6 气体额定气压（20℃） Rated pressure of SF6 Gas（20℃）		kPa	550

LZZB9–36/250W1G1系列电流互感器技术参数(表五)

Technical Data of LZZB9–36/250W1G1 Series CT (Table 5)

表五

Table 5

额定一次电流 Rated primary current (A)	准确级 组 合 Accuracy Class	相应准确级下的额定输出 Rated output in relevant accuracy class (VA)			短时耐受电流 Short time withstand current (kA/s)	额定峰值耐受电流 (峰值) Rated peak withstand current (peak) (kA)
		0.2	0.5	5P20		
20~100	0.2/0.2	10	15	15	200In/1	500In
150~200		10	15	15	31.5/1	80
300~500	0.2/0.5	10	15	15	31.5/2	80
600~1250	0.5/0.5	15	30	20	31.5/4	80
1500~2000	0.2/5P20	20	40	30	40/4	125
2500	0.5/5P20	20	40	20	40/4	125

LDBJ8–40.5系列环氧树脂浇注全封闭触头盒式电流互感器技术参数(表六)

Technical Data of LDBJ8–40.5 Series Epoxy Resin Casting Fully Sealed Contact Block Type CT (Table 6)

主要技术参数:

额定绝缘水平: 95/185kV

表面爬距: 830mm

额定二次电流: 5A (或2A, 1A)

局部放电量: < 20PC

准确级次: 0.2S, 0.2, 0.5S, 0.5, 10P10

Main Data :

Rated insulation level: 95/185kV

Surface creepage distance: 830mm

Rated secondary current: 5A (或2A, 1A)

Partial discharging volume: < 20PC

Accuracy class: 0.2S, 0.2, 0.5S, 0.5, 10P10

表六

Table 6

额定一次电流 (A) Rated primary current (A)	准确级组合与相应的额定输出 (VA) Rated output in relevant accuracy class				额定短时耐受电流(1S 有效值) (kA) Rated short time withstand current (1S rms.)	额定峰值耐受电流 (峰值) Rated peak withstand current (peak) (kA)
	0.2/10P10	0.5/10P10	0.2/0.5	10P10/10P10		
5~300	10/30	20/30	10/20	20/20	150In	375In
400~500	10/40	15/40	10/15	25/25	63	130
600~800	20/50	30/50	20/30	30/30	63	130
1000~1600	30/50	50/50	30/50	40/40	80	180
2000~3150	40/50	50/50	40/50	50/50	100	180

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JN22–40.5/31.5接地开关技术参数(表七)

Technical Data of JN22–40.5/31.5 Earthing Switch

表七 Table 7				
序号 No.	项目 Item		单位 Unit	参数 Data
1	额定电压 Rated voltage		kV	40.5
2	额定绝缘水平 Rated insulation level	1min 工频耐受电压 1min power frequency withstand voltage		95
		雷电冲击耐受电压 Lightning impulse withstand voltage		185
3	额定短时耐受电流（4s） Rated short time withstand current (4S)		kA	31.5
4	额定峰值耐受电流 Rated peak withstand current			80
5	额定短路关合电流 Rated short circuit making current			80

结构 Structure

概 述 General

KYN37B–40.5开关设备由固定的柜体和可移开部件（简称手车）两大部分组成。根据柜内电器设备的功能，柜体用隔板分成四个不同的功能单元，即如图一所示的母线室A、断路器室B、继电器仪表室C、电缆室D。柜体的外壳和各功能单元之间的隔板均采用敷铝锌钢板弯折后铆接而成。

开关设备可移开部件可配置真空断路器、六氟化硫断路器、电压互感器、避雷器、所用变熔断器、隔离手车等。

开关设备内可装设检测一次回路运行情况的带电显示装置。该装置由高压传感器和显示器两部分组成。传感器安装在被检测的高压端，显示器安装在开关设备的继电器室面板上。

开关设备外壳防护等级为IP4X，断路器室门打开时防护等级为IP2X。

KYN37B–40.5开关设备从结构上考虑了开关设备内部故障电弧的影响，并根据IEC62271200的规定以及GB3906中7.15规定进行了严格的引弧试验，能有效地保证操作人员和设备的安全。

KYN37B–40.5 Switchgear consists of 2 parts: the fixed cubicle body and the withdrawable parts (i.e. truck). Based on the functions of the electric apparatuses, the cubicle is segregated into 4 functional units by partition, i.e. Busbar Compartment (A), Circuit Breaker Compartment (B), Relay & Instrumentation Compartment (C), Cable Compartment (D), as shown in Figure 1. The cubicle enclosure and the partition between each compartments are riveted by Al–zn plated steel sheets after bending.

The withdrawable parts can be equiped with vacuum circuit breaker, SF6 circuit breaker, PT, lightning arrester, fuse, station service transformer, isolation truck and so on.

The switchgear can be equipped with voltage presence indicator device to detect the primary circuit operation status. This device is composed of HV transducer and display, the transducer is mounted on the HV point that is to be detected, and the display is mounted on the relay compartment door of switchgear.

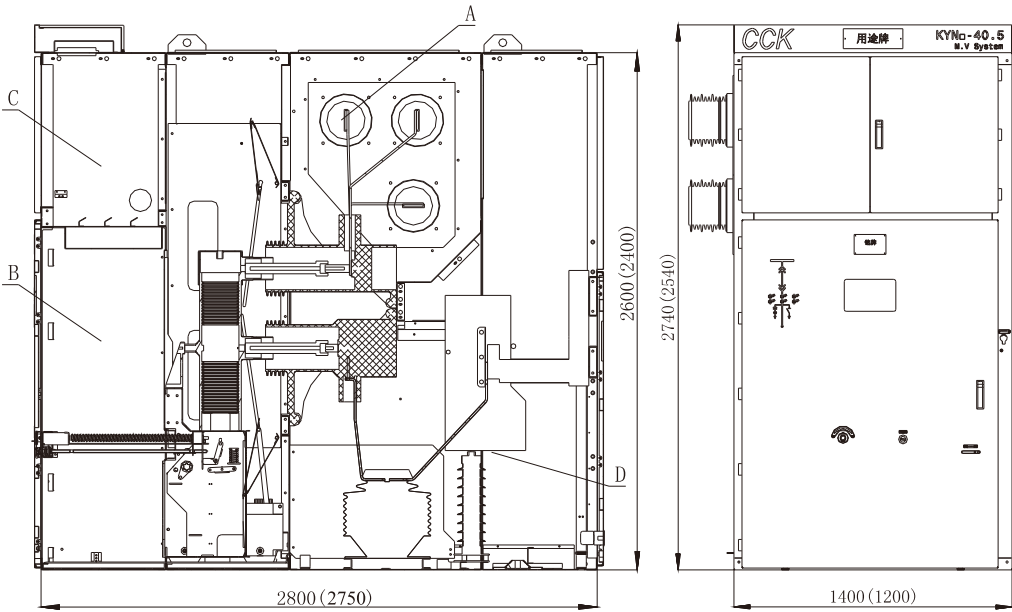
Protection degree of switchgear enclosure is IP4X, and is IP2X when circuit breaker compartment door opens.

The structure of KYN37B–40.5 switchgear takes into account of the effect of inner fault arc. Arcing test is conducted strictly in accordance with IEC62271–200 and Clause 7.15 of GB3906, which proves that the safety of the operation personnel and the equipment itself are effectively guaranteed.

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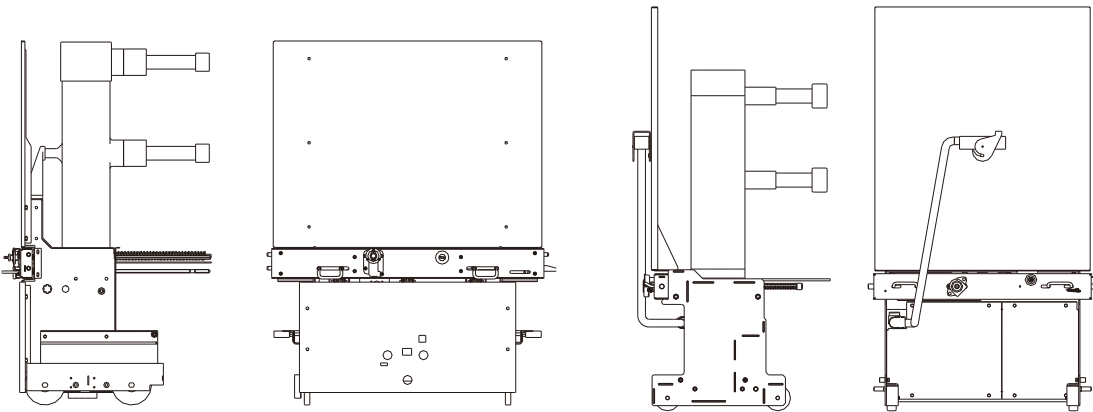
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开关设备外形示意图一，断路器外形示意图二、三。
Figure 1 shows the switchgear outline diagram, Figure 2 and Figure 3 show the circuit breaker outline diagram.



图一 开关设备示意图
Figure 1 Switchgear Outline Diagram

注：1、图中括号内尺寸用于配VD4和HD4断路器
2、开关设备的重量为1800 ~ 2300kg
Notes : 1. The sizes in the brackets are for equipping with VD4 and HD4 circuit breaker.
2. The weight of the switchgear is 1800 ~ 2300kg.



图二 ZN88 断路器示意图
Figure 2 ZN88 Circuit Breaker Outline Diagram

图三 VD4 和 HD4 断路器示意图
Figure 3 VD4 and HD4 Circuit Breaker Outline Diagram

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外壳、隔板和压力释放装置 Enclosure, Partition and Pressure Release Device

开关设备的外壳和隔板是采用敷铝锌板经CNC机床加工和折弯之后组装,用高强度螺栓联接而成。因此,装配好的开关设备能保证尺寸上的统一性,有很高的机械强度。

开关设备的前后门面板采用静电喷涂后焙烤,表面抗冲击、腐蚀性能好,外形美观。

在断路器室、母线室和电缆室的上方均设有压力释放装置,当发生内部故障时,伴随电弧的出现,开关设备内部气压升高,顶部装设的压力释放金属板将被自动打开,释放压力和排泄高温气体。

断路器室 Circuit Breaker Compartment

在断路器隔室B内装有手车导轨,供手车在隔室内行进。活门由金属板制成,安装在手车室的后壁上。手车从"试验/隔离"位置移动至"工作"位置过程中,活门自动打开,手车反向移动时活门自动关闭,从而保证操作人员不会触及带电体。

手车能在开关设备的门处于关闭情况下进行操作,通过观察窗可以看到手车在柜内所处的位置和断路器分合闸位置指示、弹簧的储能/释能状态指示。

开关设备上的二次线与手车的二次线连接是通过二次插头来实现的。二次插头的动触头通过一个尼龙波纹管与手车相连,二次插座装设在开关设备断路器室的右上方。当手车处于试验/隔离位置时,才能插上和拔下二次插头。手车处于工作位置时,二次插头被锁定。当断路器手车安装有闭锁电磁铁时,在二次插头未接通之前,由于闭锁电磁铁未通电,无法手动合闸,仅能进行手动分闸操作。

手车 Truck

手车框架由冷轧钢板经折弯后焊接制成,根据用途,手车可分为断路器手车、电压互感器手车、所用变熔断器手车、隔离手车和避雷器手车等,相同规格的手车均能互换。

断路器手车在柜内有工作位置和试验/隔离位置,每一位置均设有定位闭锁装置,保证手车处于特定位置时才允许进行相应操作。

移动手车必须满足联锁条件,手车移动之前断路器必须分闸。

手车在柜内的位置能从推进机构面板上的位置指示器指示,也能从门上的观察窗看到。断路器的机械操作机构、分合闸指示器设在手车的面板上。

The enclosure and partition of the switchgear is composed of Al-Zn plated steel sheets which are processed and bended by CNC machine tool and joined by high strength bolts. So the fabricated switchboard is of high mechanical strength and reliable identical size.

The front and back door of the switchgear are electrostatic spraying painted and torrefied, with aesthetic appearance as well as good performance of anti stress and corrosion.

Above the circuit breaker compartment, busbar compartment and the cable compartment there is pressure release device, when inner fault occurs, arc appears, the pessure within the switchgear rises, the pressure release metal plate on the top shall opens automatically, releases the pressure and expells the high temperature air.

In the circuit breaker compartment there's guide rail for moving in and out of the truck. The shutter is made of metal plate and mounted on the back wall of the truck compartment. During the process when the truck moves from TEST/ DISCONNECT to OPERATION position, the shutter opens automatically, when the truck moves reversely, the shutter shall close automatically, so as to ensure that the operation personnel shall not contact the live part.

The truck is operable when the compartment door is closed. Through the sight glass the position of the truck, the position indication of the circuit breaker, the CHARGED/ DISCHARGED indication of the spring can be observed.

The secondary connection between the truck and the switchgear is made by secondary plug. The movable contact of the plug connects with the truck through nylon bellows, the secondary socket is mounted on the upper right of the circuit breaker compartment. When the truck is at TEST/ DISCONNECT position, the secondary plug can be pushed in and pulled out. The plug shall be locked when the truck is at OPERATION position. If the circuit breaker truck is equipped with latching electromagnet, when the secondary plug is not connected, the electromagnet is not energized, the breaker can not be closed manually, only manually open is operable.

The frame of the truck is made of welded cold-rolled steel plates after bending. According to function, trucks can be divided into CB truck, PT truck, station transformer fuse truck, isolation truck, arrester truck, etc. The same specification trucks are interchangeable.

CB truck has OPERATION and TEST/ DISCONNECT position within the cubicle, with position locking device at each position, securing that the truck is operable at specific position.

Moving the truck must comply with the interlocking condition, i.e. CB must open before moving the truck.

The truck position in the cubicle can be observed from the indicator on the driving mechanism faceplate as well as from the sight glass on the door. The operation mechanism and status indicator of CB are on the truck faceplate.

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触指系统 Contact Finger System

KYN37B-40.5开关设备一次回路中的静触头和手车上的动触头之间的导电装置采用花瓣式触指系统。触指系统结构设计合理,具有接触电阻小,承受短时耐受电流及峰值耐受电流大等优良的电气性能。当手车摇入或摇出时,触指系统接触或分离自如,手车操作非常方便。

The electric conduction device between the primary fixed contact of the switchgear and the movable contact on the truck employs petal type contact finger system. The system is of reasonable design, low contact resistance, high short time and peak withstand current. When the truck moves in or out, the contact finger system contacts or seperates smoothly, the truck is convenient to operate.

母线室 Busbar Compartment

主母线,通过分支母线和母线套管支撑。相邻柜间用母线套管隔开,能有效防止事故蔓延,同时对主母线起到支撑作用。母线采用收缩型绝缘套管或硫化涂覆工艺,从而形成可靠的复合绝缘。

The main busbar is supported by branch busbar and busbar bushing. The adjacent cubicles are segregated by busbar bushing to stop the accident from expansion as well as support the busbar. The busbar adopts contraction type insulated bushing or fluidisation coating process, so as to form reliable compound insulation.

电缆室 Cable Compartment

电缆室可安装电流互感器、接地开关(带有手动操动机构),并可连接多根并联的电缆。电缆室内空间很大,非常便于电缆安装。

The cable compartment can be fitted with CT, earthing switch (with manual operation mechanism), and can connect several cables in parallel. The compartment is of large space to facilitate cable mounting.

继电器仪表室 Relay & Instrumentation Compartment

继电器仪表室内可安装继电保护控制元件、仪表以及特殊要求的二次设备。二次线路铺设在由金属板制成的线槽内,可使二次线与高压部分隔离。

This compartment can be fitted with relay protectional & control components, instrumentation and special secondary equipment. The secondary circuit is set in the wire channel made of metal plates, which can be segregated from HV parts.

防止误操作联锁装置 Anti-misoperation Interlocks

●推进机构与断路器之间的联锁

为防止在断路器合闸状态下推拉手车而造成带负荷推拉手车的恶性事故发生,开关柜手车上设有机械联锁。

a)当手车处于工作位置或试验位置,手车联锁操作手柄转动到相应锁定位置,此时摇进机构孔被遮挡。若断路器合闸,断路器操动机构输出大轴的拐臂阻挡联锁杆向上运动,使手车联锁操作手柄无法转动,确保手车只能处于锁定状态。只有当断路器处于分闸状态,手车联锁操作手柄才能转动,当手柄转至插入抽出位置时,摇进机构摇把插孔被完全打开,手车才可以运动,防止了带负荷推拉手车。

b)当手车未进入锁定位置或推进摇把未及时拔除时,手车联锁操作手柄无法从插入位置转为锁定位置时;同时,手车的机械联锁挡住断路器的合闸机构,使电动或手动合闸均无法进行。从而保证了运行的安全性。

此外,在有可靠机械联锁的同时还有电气联锁作为后备闭锁,手车位置的行程开关接点接入断路器的合闸回路,手车只有在锁定位置才能接通合闸回路。

●Inter-lock Between Driving Mechanism and CB

In order to prevent the accident that moving the loaded truck when CB is closed, the CB truck is equipped with mechanical interlocks.

a)When CB is at OPERATION or TEST position, the truck interlock handle turns to the relavant locking position, the rock-in hole is blocked. If CB closes, the operation mechanism prevent the interlocking lever moving upwards, the interlocking handle of the truck can not be winded, securing that the truck in lock state. Only when CB opens, the interlocking handle of the truck can be winded, when the handle turns to moving in/ out position, rock-in crank hole opens, the truck can be moved, which avoided moving the truck with load.

b) If the truck is not at the lock position, or the rock-in crank is not pulled out, the truck interlock handle can't turn from moving in position to lock position, meanwhile, the truck mechanical interlock shall block the CB closing mechanism, either manually or electrically closing the CB is not possible. By this way safety is guranteed.

Furthermore, besides the reliable mechanical interlocks, there's electrical interlock. The truck travel switch is connected to the CB closing circuit, only when the truck is at lock position can the circuit be energized.

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●手车与接地开关之间的联锁

接地开关操作孔小门只有在推进机构的联锁操作手柄处于试验位置时，联锁板缩进，联锁销接触阻挡，小门才可打开，合上接地开关；接地开关合上时联锁销始终处于顶升位置，进车挡板被阻挡，堵上推进机构孔，使摇把不能插入，阻止手车由试验位置进入工作位置，从而实现反闭锁。

●二次插头和手车锁定机构之间的联锁

插好二次插头，手车进入工作位置后，锁定装置将二次插头锁定，使其无法拔出，手车退到试验位置后，锁定装置解除。

●隔离手车的联锁

由于隔离手车没有分断、关合负荷电流的能力，为了避免隔离手车在相关断路器没有分闸的情况下推拉。在手车摇进机构上装有闭锁电磁铁，电磁铁锁住与手车联锁操作手柄联动的圆盘，只有电磁铁有电（通常电源由相关断路器手车的试验位置接点控制），电磁铁吸合，闭锁解除，手车联锁操作手柄才能转动。进车挡板才能向下压至插入抽出位置并打开摇进机构孔。

●开关设备后门（进线室或电缆室相对应的门）与接地开关间的联锁

开关设备后门与接地开关间采用机械联锁，只有合上接地开关时才能打开后门；后门处于打开状态时，联锁小门盖住接地开关操作孔，使接地开关操作手柄不能插入操作，只有关上后门才能分接地开关，实现了后门对接地开关的反闭锁。
不装接地开关的断路器柜或电缆室装有高压元件时，柜后门的联锁使用电气联锁进行闭锁操作。

●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的，功能上能满足开关柜“五防”闭锁的要求，但是操作人员不能因此而忽视操作规程的要求。只有组织措施与技术措施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（如操作阻力突然加大）应首先检查是否有误操作的可能，而不应强行操作以致损坏设备，甚至导致操作事故的发生。

●Interlock Between Truck and Earthing Switch

Only when the driving mechanism interlock handle is at TEST position, the earthing switch operation hole can be opened, and the earthing switch can be closed. After the earthing switch is closed, the drivig mechanism hole is blocked, the crank can not be pushed in, the truck can not be moved from TEST to OPERATION position, and backlocking is actualized.

●Interlock Between Secondary Plug and Truck Locking Mechanism

Plug in the secondary plug, the truck moves to OPERATION position, the locking device shall lock the secondary plug and it can't be pulled out. When the truck is back to TEST position, locking relieves.

●Interlock of Isolation Truck

The isolation truck has no capability to close and open the load current, in order to avoid moving the truck without opening the relevant CB, latching electromagnet is equipped on the truck rock-in mechanism. The latching electromagnet locks the truck interlock handle, only when the electromagnet is energized, locking relieves, the truck interlock handle can be turned, the truck moving in baffle plate moves downwards to moving in/ out position, and the rock-in mechanism hole is opened.

●Interlock Between Switchgear Back Door (Cable Incoming Compartment Door) and Earthing Switch

Between the switchgear back door and the earthing switch employs mechanical interlock, only when the earthing switch is closed can the back door be opened. When the back door is open, the earthing switch operation hole is blocked, the operation handle can't be pushed in. The earthing switch can be opened only when the back door is closed, so backlocking is realized.
The CB cubicle without earthing switch or the cable compartment with HV components employ electrical interlock to actualize locking of the back door.

●Notes in Applying Interlocks

a) The interlocking function of this product is implemented through mechanical interlock and electrical interlock, it satisfies the requirements of 'Five-anti-error' interlocking function, but the personnel shall not neglect the operation rules. Only the combination of organizational measures and technical measures can fully exert the safeguard function of interlocking device and prevent the accident of misoperation.
b) The launching and relieve of interlocking function is mostly actualized along with normal operation and need no extra process, if operation disturbance is found, firstly check if there 's possibility of misoperation, but not forced operation lesting destroying the equipment, or even cause an accident.

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接地装置 Earthing Switch

手车与柜体间设有可靠的接地装置；
电缆室内单独设有5×50（mm）接地铜排，此铜排能贯穿整个排列并与柜体接触良好，供直接接地元件使用，从而使整个柜都处于良好的接地状态之中。

Between the truck and the cubicle body there's reliable earthing device.
In the cable compartment there's independent 5X50mm earthing copper busbar, which is for connection of direct earthing components. The copper busbar stretches the whole range and contacts well with the cubicle body, so the entire cubicle is well earthed.

泄压装置 Pressure Release Device

在断路器室、母线室和电缆室设有泄压通道，各泄压盖板的一端用金属螺栓固定，另一端用塑料螺栓固定。当发生故障时，内部高压气体能容易地将泄压盖板冲开释放压力，以确保操作人员和开关设备安全。

The CB compartment, Busbar compartment and Cable compartment is equipped with pressure release channel. The cover plate is fixed in one side by metal bolts, and the other side by plastic bolts, when fault occurs, the inner high pressure air break the cover plate easily to relieve the inner pressure, the safety of the personnel and the equipment is guranteed.

电压显示装置 Voltage Presence Indication Device

开关设备设有监视一次回路带电状态的带电显示装置。该装置不但可以显示高压回路带电状态，而且可以与电磁锁配合实现强制闭锁，从而提高产品的防误性能。

The switchgear is equipped with voltage presence indication device to monitor the primary circuit electrization status. This device can not only indicate the HV circuit electrization status, but also in association with electromagnetic lock to carry out force lock, and improve the anti-error function.

防凝露措施 Anti-condensation Measure

为了防止在高湿度或温度变化较大的气候环境中产生凝露所带来的危害，在断路器室和电缆室分别装设加热器。

In order to avoid the harmfulness of condensation in high humidity or distinct temperature variation environment, the CB compartment and the Cable compartment is fitted with heater.

运输与储存 Transportation and Storage

出厂条件 Ex-factory Conditions

开关设备出厂前应根据合同检查开关柜的完整性，还应遵照开关柜技术条件进行出厂试验。

The switchgear shall be inspected of completeness in accordance with the contract, and shall be tested in compliance with technical specifications.

包装 Packing

开关设备的包装应遵循公司发布的包装规范。手车、母线、紧固件和其它附件应单独包装。

Packing shall comply with packing specification of our company, trucks, busbars, fixing pieces and other accessories shall be paked individually.

运输 Transportation

每台开关设备都装有吊环，作为一个运输单元。（请注意在运输开关柜时必须采用合适的起吊装置，并检查所有影响人身及物品安全的因素。）
开关设备应直立运输，运输前应采取适当的保护措施确保工作人员与财产的安全。吊车装卸时，连向吊钩的绳子和水平线之间的角度保持在60°以上。起吊时推荐使用吊车横担。
运输手车时必须采用专用横担及合适的手车吊绳。
在运输断路器时必须采用合适的起吊装置，并检查所有影响人身及物品安全的因素。由于断路器的重心较高，要注意防止断路器倒翻，切勿将吊绳固定或靠在断路器的极柱上，以免造成损坏。

Each switchgear is fitted with lifting lugs to be one shipping unit. (Please attention that suitable lifting devices shall be applied, and check all the aspects affecting safety of personnel and equipment.)
Switchgears shall be shipped in uprightness, and suitable measures shall be taken to gurantee the safety of personnel and equipment. When applying crane, the rope connecting crane hook shall remain an angle with the horizontal line of above 60°. Recommend to use the crossarm of the crane.
Applying special crossarm and suitable sling when shipping trucks.
Applying suitable lifting appliance when transporting circuit breakers, and check all aspects affecting safety of perasonnel and eqipment. Because the CB center of gravity is of high position, attention to avoid CB overturn downwards. Do not fasten or contact the sling on the CB post, lesting it may destroy the equipment.

验收及储存 Acceptance and Storage

●开关设备抵达现场时，收货人应有责任（但不限于）作好如下工作：
检查货物外包装是否完整，有无损坏，如有怀疑则应通知供货方到场共同开箱检查。
详细记录任何短缺物件、缺陷和运输损伤，在两周内通知有关责任方。

●Consignee is obligated (but not limited to) to conduct the following when switchgear arrives at destination :
Check for completeness of packing, if there's suspicion, inform the supplier to open and check together.
Record any shortage pieces, defects and transportation damage in detail, and inform the relevant responsible party in 2 weeks.

●开关设备应直立存放，不要拆除或损坏包装并且不宜长期在户外存放。仅带防尘塑料薄膜包装的开关设备应放置于干燥、通风良好的户内仓库中，以防腐蚀。

●The switchgear shall be stored in uprightness, do not remove or damage its packing and it's not suitable for outdoor storage for a long time. Switchgear with only dust-proof plastic membrane package shall be stored in drying, well ventilated indoor house to avoid corrosion.

开关设备的现场安装 On-site Erection of Switchgear

为了保证安装质量，开关设备的现场安装应在专职技术人员指导和监督下进行。
In order to guarantee quality of erection, site erection of switchgear must be done under guide and supervision of professional technologist.

安装现场的一般要求 General Requirements of Erection Site

开关设备的现场安装应在配电室的土建工程彻底完工，且具备照明及现场安装用电源之后进行。配电室应干燥、能上锁，且配备有通风装置，穿墙孔和电力电缆控制电缆的电缆沟槽等准备工作必须做好。配电室天花板梁底的高度应不低于4000mm。除了具有书面认可的特殊运行条件，配电室应满足有关标准及本使用说明书规定的户内开关运行条件。

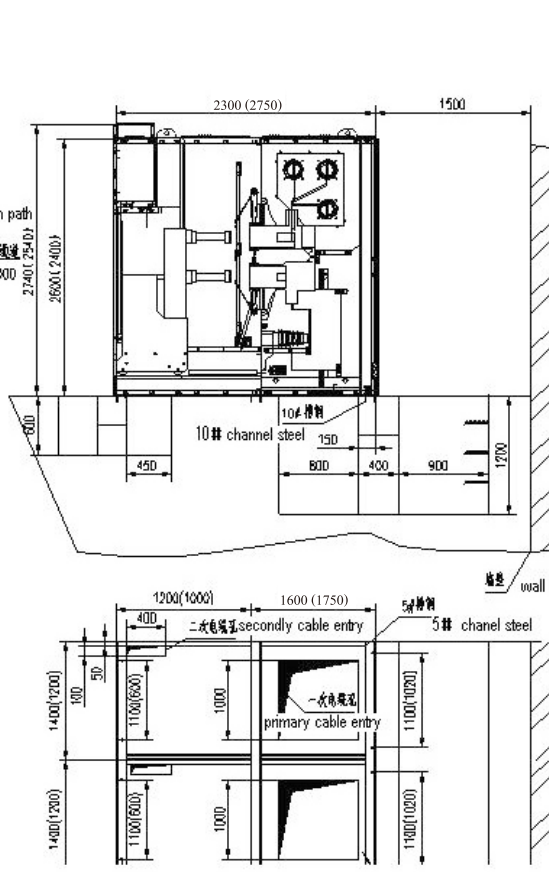
On-site erection of switchgears should be carried out after building work of distribution room has been thoroughly finished and lighting and on site erection power supply are equipped. The distribution room should be dry and with lock, and be equipped with ventilation devices. Prepare work such as cable trench for power cables and control cables and wall through hole should be well done. The height of distribution room ceiling shall be above 4000mm. In addition to special operation conditions in written, the distribution room should satisfy relative standards and indoor switchgear operation conditions by this instruction.

基础框架 Foundation Framework

开关柜的安装基础如图四所示,其中括号内尺寸用于配VD4和HD4柜

●基础框架的安装：
为了保证基础框架表面的水平度，基础框架焊接部件，应在预定连接点焊接，并根据配电室的安装布置图，将基础框架准确地放置在混凝土地坪的规定位置上。基础框架的接地线必须用截面不小于30×4mm的镀锌扁钢连接。每个基础框架应有不少于二个接地连接点。
使用水平仪仔细调整整个基础框架的表面水平度，并保证其正确的高度。基础框架的上表面应高于完工后的配电室地坪2mm，以便开关设备安装和调整。平面度允许公差为±1mm/m，框架材料直线度允许公差为1mm/m，但在框架总长度内的偏差应不大于2mm。

Switchgear installation foundation framework is shown in Figure 4, the sizes in brackets are for equipping with VD4 and HD4 cubicle.
●Installation of Foundation Framework
In order to ensure foundation framework horizontality, welding points shall be at preconcerted joints, and locate the foundation framework correctly at the specified position on the cement floor according to arrangement diagram. Earthing wires of foundation framework must adopt galvanized flat steel whose cross section is not less than 30×4mm. Each foundation framework shall have not less than two of earthing joints.
Using level meter to adjust the level of foundation framework surface and ensure its correct height. The upper surface of foundation framework should be 2mm higher than the floor of the complete distribution room, so that it is convenient for installation and regulation of switchgears. Permitted tolerance for planeness is ±1mm/m, Permitted tolerance for straightness of frame material is 1mm/m, deviation within the whole length of frame should be not more than 2mm.



图四 安装基础

Figure 4 Foundation Framework

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AC Metal-clad Withdrawable Switchgear

开关设备的拼接 Combination of Switchgears

按配电室开关设备布置图给定排列次序，将开关设备运至待安装位置。

a) 卸掉吊耳（有母线桥时）。

b) 在基础框架上逐个地精确调整开关设备的位置和垂直度，用拼柜的螺栓依次拼接相邻各柜。（开关设备的棱边偏差垂直度不超过2mm，尤其是柜前）当开关柜多于10台时，最好从中间开始安装。

c) 母套导管其安装板应在开关柜侧板的内侧用六角螺栓由内向外固定。开关设备与基础框架采用螺栓连接或焊接，使用焊接方法时，对焊接部位要进行防腐处理。

d) 开关设备的拼柜安装应与主母线安装交替进行，这样可以避免柜体全部安装后，主母线安装的困难。

Transporting the switchgears to installation position according to arrangement diagram of switchgears in distribution room.

a) Taking off the suspension ring (when there is bus bar bridge).

b) To regulate the positon and the uprightness of switchgears exactly one by one on the basic frame, using bolts to combine each adjacent panel. (deviation of uprightness of switchgears is not more than 2mm, especially at the front of panel) when number of switchgears is over than 10, you'd better install them from the middle.

c) Bus bar bushing and aluminium partition should be fixed using hex bolts from inside to outside of the side plate of switchboard. Switchgears and basic frame should be connected by bolts or welded. If welding is adopted, the welded parts should be treated with anti-corrosion measures.

d) Combination installation of switchgears should be alternatively done with main busbar installation, which will avoid the difficulty of installation of main busbar after the whole board are installed well.

电力电缆和控制电缆的连接 Connection of Power Cable and Control Cable

移开电缆进出线孔盖板，引入电力电缆。电缆安装完毕后，盖好每一相电缆穿孔处绝缘罩，封堵电缆周边孔隙。

在开关设备前部左侧控制电缆的导槽内引入控制电缆后，封堵好电缆周边孔隙，相邻开关设备之间的控制电缆通过继电器仪表室侧板上的开孔穿越。

Removing the cover of cable incoming / outgoing holes to lead cables in. After the installation of cables, covering well the insulating cover at each perforating part for each phase of cable and seal space around the cable.

After leading in of control cables through trench at the front-left side of switchgear, sealing space around the cable well. Control cables of adjacent switchgears going through through openings on the side plate of relay meter compartment.

开关设备的接地 Earthing of Switchgear

用制好的接地母排逐柜连接开关设备的主接地母线。

将开关设备的主接地线与配电室的接地电极相连。

Using well done earthing busbar to connect main earthing busbar of switchgears one by one.

Connecting the main earthing wires of switchgear to the earthing electrode of distribution room.

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开关设备的检查和操作 Inspection and Operation of Switchgear

请注意现场的安全工作：

开关设备的操作程序以及相关的工作需由训练有素的专业技术人员来执行。他们应通晓开关设备各种技术性能，遵守专门机构规定的有关安全规程和地方电力工作规程的要求。

Pay attention to safety measures on site.

Operation of switchgear and relevant work shall be performed by trained professional technicians, they shall be knowledgable about technical performances of switchgear, conform to safety regulations and electrical engineering rules.

投运前的检查 Inspection Prior to Operation

开关设备应完成下列运前的准备工作：

检查开关设备的总体情况，目测检查开关装置、手车、隔离触头、绝缘部件等完全符合安装要求。检查主接地母线和柜外的变电站接地导体的联接是否可靠。

清理出开关设备内所有的剩余材料、物件和工具，用清洁、干燥、不掉废丝的软布擦拭绝缘部件表面粘附的灰尘和油脂。

重新安装那些在开关设备现场安装接线和试验期间拆除的隔板和盖板。卸掉真空断路器极柱上的运输塞（若还未卸出除），检查真空断路器极柱罩的安装是否正确。

如果需要，按GB3906或IEC60298进行主回路工频耐压试验。试验中应特别注意电压互感器和电缆等部位。若要从静触头引线时，可采用试验手车，这将使联线更加方便。

接通辅助控制电源，用手动或电动控制进行开关装置的操作试验，同时观察相应的位置指示器，并检查机械和电气联锁的有效性；

整定保护继电器，并且用测试设备检查其功能达到要求的整定值。必要时检查开关设备邻近区域的下列设备：电力电缆、辅助电缆、辅助电源、远方控制系统、接地系统以及配电室其它设备。

将本开关设备使用说明书放置于运行人员可以随时取到的地方。

遵守所有相关的安全规程，热别是电力设备安装规程，拆除危险工作区域内的接地线和短接线，保证开关设备内的断路器处于断开（OFF）状态。

按正常的规定程序给开关设备送电，并注意观察信号和指示器。依靠所接的高压电源进行所有的测量并检查所有的功能，并注意任何异常情况。

开关柜运行中，防凝露加热器电源不允许中断电源通电，信号母线应接通报警装置。

特别提示：当开关柜处于备用和运行状态下，柜内板式加热器必须接通，投入使用！

The following preparatory work shall be accomplished before operation.

Check switchgear of overall condition, examine in sight if switchgear, truck, isolation contactor, insulation parts etc. are complying with installation requirements. Check if the connection between main earthing busbar and the transformer station earthing conductor are reliable.

Remove all surplus material, parts and tools out of switchboard, and tidy the insulation parts surface of dust and grease with clean, dry soft cloth.

Reinstall those partitions and cover plates removed during site erection, wiring and testing. Remove the protection layer on the vacuum CB post, check if vacuum CB post shelf is correctly mounted.

If necessary, conduct power frequency withstand voltage test on main circuit according to GB3906 or IEC60298. Pay attention to PT and cable during testing. If leading wire from fixed contact, test truck can be applied which shall facilitate connection.

Get through auxiliary control power, conduct operation test by manual or electric control, observe corresponding position indication, and check validity of mechanical and electrical interlocks.

Set protection relay, and check it by testing apparatus of required setting value. Check the following equipments next to switchgear if necessary : power cable, auxiliary cable, auxiliary power, remote control system, earthing system and other equipments in power distribution room.

Place this instruction manual for operation personnel consultation in convenience.

Complying with all relevant safety regulations, especially the electrical equipment installation regulation. Remove grounding wire and shorting wire in dangerous working area, ensure that the CB is at OFF (DISCONNECT) position.

Energize switchgear in normal process, observe signal and indicator. Conduct all tests and check all functions relying on the connected HV power, attention on any abnormal situation.

During operation, the switchgear heater is not allowed to be disconnected from power, and signal busbar should be connected to alarm device.

Notes : whenever switchgear is at operation or standby condition, the inner plate type heater must be connected and put into service.

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操作 Operation

●手车进柜操作

- a) 铺好引轨。
- b) 确认联锁操作手柄在试验位置；把手车横梁左、右锁定杆向内侧拉动，并往下扣住，用手握住手车拉手，将手车从柜外移到试验位置，把锁定杆向上扳动并向外侧，将手车横梁与开关柜上的锁定块锁住。
- c) 插上二次插头，将联锁操作手柄扳到抽出位置。

●手车插入操作

- a) 确认断路器在分闸位置。
- b) 把联锁操作手柄扳到手车插入抽出位置。此时手车“工作位置”或“试验位置”的状态开关断开，断路器机械合闸机构脱开，断路器不能进行合闸操作。
- c) 将摇进手柄插入摇进机构孔，顺时针摇动，手车逐步由试验位置进入到工作位置。
- d) 当摇动手车的操作力突然减小时，表明超越离合器已起作用使进车丝杆空转，手车已经到达工作位置。
- e) 将进车挡板向上扳动，带动联锁操作手柄到手车工作位置，此时可以进行断路器合分闸操作。

●手车抽出操作

- a) 确认断路器在分闸位置。
- b) 把联锁操作手柄扳到手车插入抽出位置。此时手车“工作位置”或“试验位置”的状态开关断开，断路器机械合闸机构脱开，断路器不能进行合闸操作。
- c) 将摇进手柄插入摇进机构孔，逆时针摇动，手车逐步由工作位置退出到试验位置。
- d) 当摇动手车的操作力突然减小时，表明超越离合器已起作用使进车丝杆空转,手车已经到达试验位置。
- e) 将进车挡板向上扳动，带动联锁操作手柄到手车试验位置。此时，断路器机械合闸机构恢复，可以进行合分闸操作试验。

●合接地开关操作（没有接地开关时按标准程序7.2.9后门解锁操作）

- a) 确认手车已移至“试验位置”，电缆室没有高压，带电显示器已经解锁。
- b) 把接地开关操作孔上的盖板向下压下，操作手柄上插入操作孔，顺时针转动约270°使接地开关关上，抽出操作手柄，操作孔上的盖板自动复位。
- c) 接地开关分合指示牌指示为红色。此时联锁操作手柄被锁定在试验位置，进车挡板不能向下扳动，摇进机构孔被挡不能插入摇进手柄,后门已到机械解锁，后门可以打开。

●Truck Moving Into Switchboard

- a) Get guide rail ready.
- b) Ensure interlock operation handle is at TEST position. Pull innerwards of the left and right locking levers of truck crossbeam, and locks downwards, hold on the handhold of truck, move truck from outside to TEST position, pull upwards of the locking levers and set at outerwards, lock the truck crossbeam by clamping block on the switchboard.
- c) Plug in secondary plugs, turn the interlock operation handle to WITHDRAWN position.

●Truck Plug-in

- a) Ensure CB is open.
- b) Turn the interlock operation handle to “truck moving in/ out” position, at this moment, the truck OPERATION and TEST position state switches disconnect, CB mechanical closing mechanism disengages, CB can't closes.
- c) Insert the rocking-in crank into hole, turn clockwise, the truck moves from TEST to OPERATION position.
- d) When rocking-in force decreases suddenly, overrunning clutch is in effect and makes rocking-in lead screw bland run, the truck has arrived at OPERATION position.
- e) Turn upwards of the rocking-in baffle and drive the interlock operation handle to the “truck operation” position, until now CB can opens and closes.

●Truck Moving Out

- a) Ensure CB is open.
- b) Turn the interlock operation handle to “truck moving in/ out” position, at this moment, the truck OPERATION and TEST position state switches disconnect, CB mechanical closing mechanism disengages, CB can't closes.
- c) Insert the rocking-in crank into hole, turn counterclockwise, the truck moves from OPERATION to TEST position.
- d) When rocking-in force decreases suddenly, overrunning clutch is in effect and makes rocking-in lead screw bland run, the truck has arrived at TEST position.
- e) Turn upwards of the rocking-in baffle and drive the interlock operation handle to the “truck test” position, until now CB mechanical closing mechanism engages, and can conduct CB opening and closing test.

●Close Earthing Switch (as per standard procedure 7.2.9 “Unlock Backdoor” if there's no earthing switch)

- a) Ensure the truck has moved to TEST position, there's no HV in cable compartment, the voltage presence indicator has been unlocked.
- b) Press the operation hole cover plate of earthing switch, insert handle into hole, turn clockwise about 270° to close the earthing switch. Withdraw handle, the operation hole cover plate recovers automatically.
- c) The earthing switch indicator indicates red, this moment the interlock operation handle is locked at TEST position, the rocking-in baffle can't be moved downwards, rocking-in hole is blocked, the back door is mechanically unlocked and can be opened.

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●手车移开操作

- a) 铺好引轨；拨下二次插头并固定好。
- b) 把手车横梁左、右锁定杆向内侧拉动，并往下扣住，用手握住手车拉手，将手车移到柜外。

●开启后柜门操作

- a) 确认接地开关已合闸，电缆室没有高压，带电显示器已经解锁，可开启后柜门电磁锁（如果有的话），随后开启后柜门。
- b) 后柜门开启后，接地开关操作孔上的盖板被锁住，接地开关将无法分闸。

●关闭后柜门操作

- 开启后柜门电磁锁（如果有的话），关闭后柜门，并复位电磁铁锁舌（如果有的话）使接地开关操作孔上的盖板解锁。

●分接地开关操作（没有接地开关时按标准程序7.2.10后门闭锁操作）

- a) 关上后门，使接地开关操作孔上的盖板解锁。
- b) 把接地开关操作孔上的盖板向下压下，将操作手柄插入操作孔，逆时针转动约270°，使接地开关分开，抽出操作手柄，操作孔上的盖板自动复位。
- c) 接地开关分合指示牌指示为绿色，此时后门被锁定不能打开。

●后门解锁操作（有接地开关时按标准程序7.2.4合接地开关操作）

- 确认手车已移至“试验位置”，柜后电缆室没有高压，带电显示器已经解锁，电磁锁打开使后门解锁，用钥匙打开后门锁。

●后门闭锁操作（有接地开关时按标准程序7.2.8分接地开关操作）

- 关闭后门，用钥匙关闭后门锁，使后门闭锁。

●电气联锁操作

- 所有机械联锁操作过程应结合电气联锁原理进行，参见每一工程项目的电气联锁原理图。

●操作状态确认

- 完成每一步操作后，必须对操作的最终状态进行确认。

●Draw Out Truck

- a) Get guide rail ready, pull out secondary plugs and fix them.
- b) Pull innerwards of the left and right locking levers of the truck crossbeam and locks downwards, hold on the handhold of the truck and move the truck out of the switchboard.

●Open Switchboard Back Door

- a) Ensure the earthing switch is closed. There's no HV in cable compartment and the voltage presence indicator is unlocked, the back door electromagnetic lock (if fitted) can be opened, then open the back door.
- b) After the back door is open, the operation hole cover plate of earthing switch is locked, the earthing switch can't be opened.

●Close Switchboard Back Door

- Open the back door electromagnetic lock (if fitted), close the back door, reset the electromagnetic lock tongue (if there is) to unlock the operation hole cover plate of earthing switch.

●Open Earthing Switch (as per standard procedure 7.2.10 “Lock Backdoor” if there's no earthing switch)

- a) Close the back door to unlock the operation hole cover plate of earthing switch.
- b) Press the operation hole cover plate of earthing switch, insert handle into hole, turn anticlockwise about 270° to open the earthing switch. Withdraw handle, the operation hole cover plate recovers automatically.
- c) The earthing switch indicator indicates green, the back door is locked and can't be opened.

●Unlock Switchboard Back Door (as per standard procedure 7.2.4 “close Earthing Switch” if there's earthing switch)

- Ensure the truck is at TEST position. There's no HV in cable compartment, the voltage presence indicator has unlocked, the electromagnetic lock opens and unlock the back door, then open the back door with key.

●Lock Switchboard Back Door (as per standard procedure 7.2.8 “Open Earthing Switch” if there's earthing switch)

- Close the back door, and lock the back door lock with key.

●Electric Interlock Operation

- All mechanical interlock procedure shall combine with electric interlock, please see the electric interlock schematic diagram.

●Confirm of Operation Status

- After accomplishing each procedure, the operation final status must be confirmed.

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开关设备的维护 Maintenance of Switchgear

概述 General
<p>维护工作的目的是保持开关设备无故障运行。维护工作只能由训练有素并且态度认真的专职技术人员来执行，他们应熟悉并通晓开关设备的具体特性。</p> <p>某些设备/元件（如磨损件）的检查和保养间隔（维护周期），取决于设备运行时间的长短，操作的频繁程度和断路器故障断开情况等。</p> <p>其他一些部件的维护周期则取决于具体场合的工作方式、负荷程度和环境影响（包括污染和腐蚀性空气）。</p> <p>在具体场合下，除了必须遵守本手册外，还必须遵守如下的操作指南：断路器使用说明书，接地开关使用说明书。</p>
检查和保养 Inspection and Maintenance

根据运行条件和现场环境，每3–5年应对开关设备进行一次检查和保养。

According to the operation situation and service condition, the switchgear shall be checked and maintained in every 3~5 years.

●检查工作应包括（但不限于）下列内容：

检查装置有无任何异常，尘埃以及其它环境因素的影响。

检查开关装置的功能，以及控制、联锁、保护、信号和其他装置。

检查隔离触头的表面状况（铰链活门可以借助于验电手车来打开，目测检查静触头）。若触头表面的镀银层磨损到露出铜，或表面严重腐蚀，出现损伤或过热（表面变色）的痕迹，则更换触头。

检查主开关的附件和辅助设备。

检查母线和接地系统的螺栓连接是否紧固，隔离触头系统的功能是否正常。

手车插入系统的机构和接触点的润滑剂。

在额定运行电压下，设备表面不允许出现外部放电现象。这个可以根据外部放电特有的噪音、可明显感觉到的臭氧气味和在暗处的可见辉光现象来判断。

The purpose of maintenance is to maintain the switchgear in failure-free operation. Maintenance shall be performed by trained and careful technologists, they should be knowledgeable about switchgear characteristics.

The check and maintenance intervals (cycle) of some equipments/ components (like wornparts) depends on running time of equipment, frequency of operation and CB fault breaking condition and so on.

The maintenance cycle of other components depends on the service condition on the site, load condition and environmental effect (including pollution and corrosive air).

On practical operation, besides this instruction manual, the following instructions shall be obeyed the same : the CB and earthing switch operation instructions,

● Inspection shall include (but not limited to) the following :

To check if the devices have any abnormal, or influences by dust or other environmental factors.

Checking functions of switchgears and control, interlock, protection, signal and other devices.

To check the state of surface of segregated contact (hinge valve should be opened by using electricity checking truck, check of fixed contact should use eyes). If the silver coat of contact is worn to expose its copper, or the surface appearing serious electrical erosion, damage or over heat (color of surface turned), then the contact should be altered.

To check accessories and auxiliary equipments of main switches.

To check if bolts connections of bus bars and earthing system are rigid or not, functions of segregated contact system is normal or not.

Mechanism of truck inserting system and lubricant of contacting points.

Under rated service voltage, external discharge on the surface of equipments is not permitted. We can judge according to phenomenon like the special noise because of external discharge, ozone smell can be obviously felt and visible shine in the dark.

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●基本的保养和检查是必定要做的工作，主要包括如下内容：

发现装置肮脏（若在热带气候中，盐、霉菌、昆虫或可导电颗粒等在经常性的凝露的作用下都可能引起污染）时仔细擦拭设备，特别是绝缘材料表面。用干燥的软布擦去附着力不大的灰尘。若遇附着性较强的脏物（如：油脂性脏物）时，应用软布蘸轻度碱性的家用清洁剂擦拭，然后用清水仔细擦净，再干燥。

对绝缘材料和严重污染的元件，应用无菌清洁剂，严禁使用三氯乙烷，三氯乙烯或四氯化碳等清洁剂。

因凝露而致使出现外部放电现象，临时常用的有效方法是在放电表面涂一层薄的硅脂膜作为修补。

给开关设备的可动接触表面（如铰链活门，联锁机构和系统连杆机构以及手车滚轮等）彻底清洁并重新上润滑剂。

当开关设备运行于非正常的运行条件（包括不利的气候条件）或强烈有害的环境因素影响（如严重污染和腐蚀性空气）下，检查和保养的周期有必要缩短。

● Basic maintenance and inspection are all necessary work, which include the following contents :

If it is found dirty (if in tropic climate, salt, mildew, insects or conductive particles etc. Which were under frequent action of condensation will bring pollution) of equipments, you need to clean them carefully, especially surface of insulating material. Using dry soft cloth to brush out the lightly adhesive dust. If the dirtiness has high adhesion (such as grease type dirtiness), you should use soft cloth dipped with light basic household detergent, then use clean water to wipe up and dry well at last.

With regard to insulating material and serious polluted components, sterile detergent should be used, trichloroethanes, trichloro-ethylene or carbon tetrachloride detergents should be not used.

External discharge which was cause by condensation should be solved temporarily by painting a thin coat of silicon fat as a repair. Thoroughly cleaning and re-lubricating the movable contacting surface of switchgears (such as hinge valve, interlock mechanism, system linkage mechanism and truck roller etc.).

When switchgears operate under abnormal operation conditions (including adverse climate conditions) or influenced by intense harmful environmental factors (for example, serious pollution and corrosive air), period for inspection and maintenance shall be necessarily shortened.

产品的成套性 The Completeness of Product

产品在交货时应具备以下文件和附件：

Product shall be provided with following documents and accessories :

- a) 产品的合格证明书（包括产品合格证书和出厂检验报告）；

b) 产品的安装使用说明书；

c) 装箱单；

d) 产品的工程设计资料（如二次接线图）；

e) 专用工具,包括断路器储能摇把、手车摇进手柄、接地开关操作手柄及手车引轨；

f) 开关柜内主要元件的安装使用说明书等技术文件和附件。

- a) Qualification Certificate (include Certificate of Competency and Ex-factory Inspection Report)

b) Instruction Manual for Installation and Operation

c) Packing List

d) Engineering design data (such as secondary wiring diagram)

e) Special tools, include CB energy-storing winding crank, truck rocking-in crank, earthing switch operation handle and truck guide rail.

f) Technical documents and accessories, such as the instruction manuals of components within the switchboard.

订货须知 Notes for Order

订货时用户需提供下列资料：

Customer shall provide the following data:

- a) 一次主接线方案编号及单线系统图、排列图；

b) 二次回路接线原理图、端子排列图；

c) 开关柜内电器元件的型号、规格、数量；

d) 主、支母线的材质、规格；

e) 开关柜使用在特殊环境条件时，应在订货时提出；

f) 需要附件、备件时，应提出其种类和数量。

- a) Main primary wiring sheme serial no. and single line drawing, arrangement diagram

b) Secondary circuit wiring diagram, terminals arrangement diagram

c) Model, specification and quantity of electric components within the switchboard

d) Material and specification of main and branch busbar

e) If switchgear is to be applied in special conditions, this shall be notified in ordering.

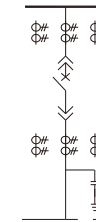
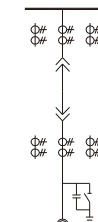
f) If there's need for accessories and spare parts, their type and quantity shall be mentioned.

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开关柜的一次主接线方案及其组合示例见后附表

Primary wiring schemes and their combination demonstration are shown hereafter.

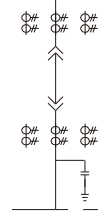
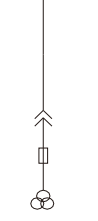
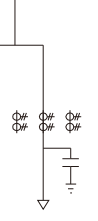
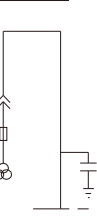
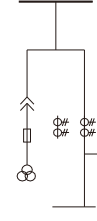
方案号 Scheme No.		1	2	3	4	5
一次主接线方案 Primary wiring scheme						
主要电器设备 Main electric components	断路器 Circuit breaker ZN88, VD4, HD4	1	1	1		
	电流互感器 CT LDBJ8	0 ~ 3(注)	0 ~ 3(注)	0 ~ 3(注)	0 ~ 3(注)	0 ~ 3(注)
	电流互感器 CT LZZBJ9	0 ~ 3	0 ~ 3	0 ~ 3	0 ~ 3	0 ~ 3
	接地开关 Earthing switch JN22	1	1		1	1
最大工作电流 (A) Max. operation current (A)		2000				
备 注 Notes:		架空进出线 Overhead incoming and outgoing	电缆进出线 Cable incoming and outgoing	左右联络 Liaison between left and right	架空进出线 Overhead incoming and outgoing	电缆进出线 Cable incoming and outgoing

注:仅配 ZN88 断路器母线侧才能装 LDBJ8 电流互感器

Note: Only equipping with ZN88 circuit breaker can the busbar side be fitted with LDBJ8 current transformer.

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方 案 号 Scheme No.		6	7	8	9	10
一次主接线方案 Primary wiring scheme						
主要电器设备 Main electric components	断路器 Circuit breaker ZN88, VD4, HD4					
	电流互感器 CT LDBJ8	0 ~ 3(注)				
	电流互感器 CT LZZBJ9	0 ~ 3		0 ~ 3		0 ~ 3
	接地开关 Earthing switch JN22					
	电压互感器 PT JDZX9-35		3	3	3	3
	高压熔断器 HV fuse XRNP		3	3	3	3
最大工作电流 (A) Max. operation current (A)		2000				
备 注 Notes:		左右联络 liaison between left and right	PT	PT 电缆进出 PT cable incoming and outgoing	PT 左右联络 PT liaison between left and right	PT 左右联络 PT liaison between left and right

注:仅配 ZN88 断路器母线侧才能装 LDBJ8 电流互感器

Note: Only equipping with ZN88 circuit breaker can the busbar side be fitted with LDBJ8 current transformer.

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方案号 Scheme No.		11	12	13	14	15
一次主接线方案 Primary wiring scheme						
主要电气设备 Main electric components	断路器 Circuit breaker ZN88 VD4 HD4					
	电流互感器 CT LDBJ8					
	电流互感器 CT LZZBJ9		0~3		0~3	
	接地开关 Earthing switch JN22					
	电压互感器 PT JDZX9-35					
	高压熔断器 HV fuse XRNP					
	避雷器 Lightning arrester HY5W	3	3	3	3	3
最大工作电流（A） Max. operation current (A)		2000				
备 注 Notes:		避雷器 Lightning Arrester	避雷器电缆进出 Lightning Arrester cable incoming and outgoing	避雷器左右联络 Lightning Arrester liaison of left and right	避雷器左右联络 Lightning Arrester liaison of left and right	PT 避雷器 Lightning Arrester for PT

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方案号 Scheme No.		16	17	18	19	20
一次主接线方案 Primary wiring scheme						
主要电气设备 Main electric components	断路器 Circuit breaker ZN88 VD4 HD4					
	电流互感器 CT LDBJ8					
	电流互感器 CT LZZBJ9	0~3				
	接地开关 Earthing switch JN22		1	1	1	
	电压互感器 PT JDZX9-35	3	3		3	
	高压熔断器 HV fuse XRNP	3	3		3	
	避雷器 Lightning arrester HY5W	3		3	3	
	高压熔断器 HV fuse XRNT					3
最大工作电流（A） Max. operation current (A)		2000				
备 注 Notes:		PT 避雷器左右 联络 Lightning Arrester of PT, liaison of left and right	PT	避雷器 Lightning Arrester	PT 避雷器 Lightning Arrester of PT	所用变 630kVA 及以下 station transformer of 630kVA and below

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方案组合示例 Example of Combination Scheme

1	10	3	6		
1250–2000A		1250–2000A			
架空进线、计量 Overhead incoming, metering		母线联络 Busbar liaison			

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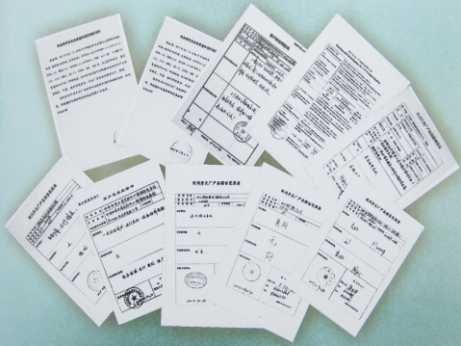
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服务方针 Principles of Service

以卓越的产品和服务，满足客户的要求和期望；
与客户、供应商紧密结合，建立合作伙伴关系，实现共同发展；
分布于国内各主要城市的服务网络，以及我们拥有的各种资源，是我们响应客户要求，赢得客户信任的关键。

Electric has meeting needs of clients with products of good quality and considerate services, and established partnership with clients and suppliers for common development;
Electric has providing services to clients through service networks in cities of China, gaining trust of clients.