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KYN28-24 METAL ARMORED MID MOUNTED SWITCHGEAR
金属铠装中置式开关柜

Operation Manual

使用说明书

CNHK® **黄华集团有限公司**
HUANGHUA GROUP CO., LTD.

1、Overview 概述

KYN28-24 metal armored mid mounted switchgear (hereinafter referred to as switchgear) is a complete set of distribution equipment for 3.6-40.5 kV three-phase AC 50Hz single busbar and single busbar segmented system. Mainly used for power plants, small and medium-sized generators for power transmission, industrial and mining enterprise distribution, as well as secondary substations in the electrical system for power collection, transmission, and starting of large high-voltage motors. For practical control, protection, and monitoring purposes, this switchgear meets the requirements of KL/T404, IEC62271-200, GB3906 and other standards. It has interlocking functions to prevent loaded push-pull circuit breaker handcart, prevent accidental opening and closing of circuit breakers, prevent closing of circuit breakers when the grounding switch is in the closed position, prevent accidental entry into live compartments, and prevent accidental closing of grounding switches when live. It can be used with both VS1 vacuum circuit breakers and ABB's VD4 vacuum circuit breakers. It is actually a high-performance distribution device.

KYN28-24金属铠装中置式开关柜（以下简称开关设备），系3.6~40.5千伏三相交流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。实控制保护、监测之用，本开关设备满足KL/T404，IEC62271-200、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，既可配用VS1真空断路器，又可配用ABB公司的VD4真空断路器。实为一种性能优越的配电装置。

2、Environmental conditions for use 使用环境条件

2.1 Normal environmental conditions:

2.1 正常环境条件:

2.1.1 Surrounding air temperature: upper limit+40 °C, lower limit -10 °C;

2.1.1 周围空气温度：上限 +40°C、下限 -10°C；

2.1.2 Altitude: not exceeding 2000m;

2.1.2 海拔：不超过2000m；

2.1.3 Relative environmental humidity: daily average not exceeding 95%, monthly average not exceeding 90%;

2.1.3 相对湿度：日平均不大于95%，月平均不大于90%；

2.1.4 Earthquake: attendance does not exceed 8 degrees;

2.1.4 地震：烈度不超过8度；

2.1.5 The surrounding air should not be significantly polluted by corrosive or combustible gases, water vapor, etc;

2.1.5 周围空气应不受腐蚀性或可燃气体、水蒸汽等明显污染；

2.1.6 There is no severe pollution or frequent violent vibration, and the severity design under harsh conditions meets Class 1 requirements.

2.1.6 无严重污秽及经常性的剧烈振动，严酷条件下严酷度设计满足1类要求。

2.2 Special working conditions:

2.2 特殊工作条件：

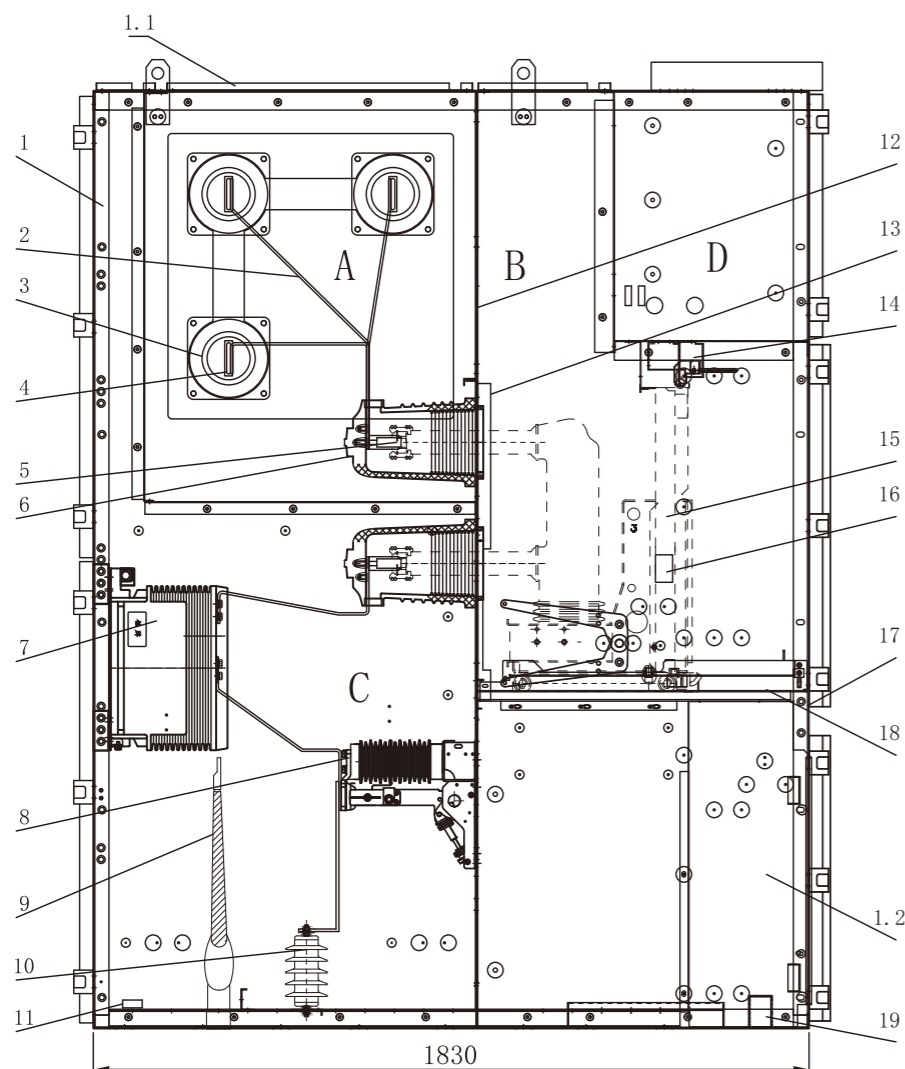
When used under normal environmental conditions beyond the prescribed limits, the user and manufacturer shall negotiate.

在超过规定的正常的环境条件下使用时，由用户和制造厂协商。

3、Main technical parameters 主要技术参数

Rated voltage (kV)	24
额定电压 (kV)	24
Power frequency withstand voltage (kV)	65 (Imin)
工频耐受电压 (kV)	65 (Imin)
Impulse withstand voltage (kV)	125
冲击耐受电压 (kV)	125
Rated frequency (Hz)	50
额定频率 (Hz)	50
Rated current (A)	630~4000
额定电流 (A)	630~4000
Rated thermal stability current (kA for 4 seconds)	16~50
额定热稳定电流 (kA 4s)	16~50
Rated dynamic stable current (kA)	40~125
额定动稳定电流 (kA)	40~125
Rated short-circuit breaking current (kA)	16~50
额定短路开断电流 (kA)	16~50
Rated short-circuit making current (kA)	40~125
额定短路开合电流 (kA)	40~125
Rated voltage for opening and closing and auxiliary circuits (V)	DC: 24, 30, 48, 60, 110, 220, AC: 110, 220.
分合闸和辅助回路的额定电压 (V)	DC: 24, 30, 48, 60, 110, 220, AC: 110, 220.
Protection level	IP4X/IP2X
防护等级	IP4X/IP2X

4、Internal structure 内部结构



- A - 母线室
- B - 断路器手车室
- C - 电缆室
- D - 继电器仪表室
- 1.1 - 泄压装置
- 1.2 - 控制小线槽
- 1 - 外壳
- 2 - 分支小母线
- 3 - 母线套管
- 4 - 主母线
- 5 - 静触头装置
- 6 - 静触头盒
- 7 - 电流互感器
- 8 - 接地开关
- 9 - 电缆
- 10 - 避雷器
- 11 - 接地主母线
- 12 - 装卸式隔板
- 13 - 隔板(活门)
- 14 - 二次插头
- 15 - 断路器手车
- 16 - 加热装置
- 17 - 可抽出式水平隔板
- 18 - 接地开关操作机构
- 19 - 底板

- A-Bus compartment
- B-Circuit breaker handcart compartment
- C-Cable Room
- D-Relay instrument room
- 1.1-Pressure relief device
- 1.2- Control of small cable trays
- 1-Shell
- 2-Branch small busbar
- 3-Busbar bushing
- 4-Main busbar
- 5-Static contact device
- 6-Static contact box
- 7-Current Transformer
- 8-Grounding switch
- 9-Cable
- 10-Lightning arrester
- 11- Grounding main busbar
- 12-Loading and unloading partition
- 13-Partition (valve)
- 14-Secondary plug
- 15-Circuit breaker handcart
- 16-Heating device
- 17-Detachable horizontal partition
- 18-Grounding switch operating mechanism
- 19- Bottom plate

图1 开关设备结构示意图

Figure 1 Schematic diagram of switchgear structure

5、Introduction to Structure 结构简介

The switchgear is designed according to the armored metal enclosed switchgear in GB3906. The whole is composed of two main parts: a cabinet and a central withdrawable component (i.e. a handcart), as shown in Figure 1. The cabinet is divided into four separate compartments, with an enclosure protection level of IP4X. When the doors of each compartment and circuit breaker room are opened, the protection level is IP2X. Having overhead incoming and outgoing lines, cable incoming and outgoing lines, and other functional schemes, it can be arranged and combined to form various forms of distribution devices. This switchgear can be installed, debugged, and maintained from the front, so it can be arranged in a double arrangement back to back and installed against the wall, improving the safety, flexibility, and reducing the footprint of the switchgear.

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1。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IP2X。具有架空进出线、电缆进出线及其它功能方案，经排列、给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进行安装调试和维护，因此它可以背靠背组成双重排列和靠墙安装，提高开关设备的安全性、灵活性、减少了占地面积。

5.1 Handcart

5.1 手车

The handcart frame is assembled from thin steel plates processed by CNC machine tools. The handcart and cabinet are insulated and coordinated, and the mechanical interlocking is safe, reliable, and flexible. According to different purposes, handcart can be divided into circuit breaker handcart, voltage transformer handcart, metering handcart, and isolation handcart. Various types of handcrafts vary in modular and block style, and handcrafts of the same specification can be freely exchanged 100%. The handcart has a disconnection position/testing position and a working position inside the cabinet, each position has a positioning device to ensure reliable interlocking. It must be operated according to the interlocking anti misoperation program. All handcart uses worm gears and worm gear to move and exit, making it easy and flexible to operate. It is suitable for various handcart duty personnel to operate the handcart. When the cabinet needs to be moved, a dedicated rotating cart can be used to easily remove it for various inspections and maintenance. Moreover, it adopts a central type, and the entire handcart has a small volume, making inspection and maintenance extremely convenient.

手车骨架采用薄钢板经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，每一位置都分别有到位装置，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蜗轮、蜗杆摇动推进，退出，其操作轻便、灵活，适合于各种手车值班人员操作手车当需要移开柜体时，用一只专用转动车，就可以方便取出，进行各种检、维护；而且采用中置式，整个小车体积小，检查、维护都极方便。

The circuit breaker handcart is equipped with a vacuum circuit breaker and other auxiliary equipment. When the handcart is transported into the cabinet circuit breaker room by a transfer vehicle, it can be reliably locked in the open position/test position; And the cabinet position indicator light displays the location. And only when fully locked can the propulsion mechanism be shaken to push the handcart towards the working position. After the handcart reaches the working position, the push handle cannot be shaken, and the corresponding position display light will show its position. The mechanical interlocking of the handcart can reliably ensure that the circuit breaker can only be closed when the handcart is in the working or testing position; And the circuit breaker can only move when the handcart is in the open state.

断路器手车上装有真空断路器及其他辅助设备。当手车用转运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；而且柜体位置指示灯使显示所在位置。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，其对应位置显示灯便显示其所在位置，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。

5.2 Housing

5.2 外壳

The shell of the switchgear is made of aluminum zinc coated thin steel plate, processed by CNC machine tool, and adopts multiple folding processes. This not only gives the entire cabinet high precision, strong corrosion and oxidation resistance, but also, due to the use of multiple folding processes, makes the cabinet lighter in weight, higher in mechanical strength, and more aesthetically pleasing in appearance compared to other similar equipment cabinets. The cabinet adopts an assembled structure, connected by rivet nuts and high-strength bolts. This shortens the processing and production cycle, enhances the universality of components, and reduces the footprint, making it easier to organize production.

开关设备的外壳选用敷铝锌薄钢板，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，使柜体比其它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。

5.3 Chambers

5.3 隔室

The main electrical components of switchgear have their own independent compartments, namely: circuit breaker handcart room, busbar room, cable room, relay instrument room. The protection level between each compartment reaches IP2X; Except for the relay room, the other three compartments have their own pressure relief channels. Due to the adoption of a mid mounted form, the position of the cable compartment is greatly increased, allowing the equipment to connect multiple cables.

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，其它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。

5.4 Interlocking devices to prevent misoperation

5.4 防止误操作的联锁装置

The switchgear is equipped with safe and reliable interlocking devices, fully meeting the requirements of the five defenses.

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。

5.4.1 The instrument room door is equipped with a prompt button or KK type transfer switch to prevent accidental closing and opening of circuit breakers;

5.4.1 仪表室门上装有提示性的按钮或者KK型转换开关，以防止误合、误分断路器；

5.4.2 When the circuit breaker handcart is in the testing or working position, the circuit breaker can only be opened and closed, and the handcart cannot move after the circuit breaker is closed, preventing the circuit breaker from being pushed or pulled incorrectly under load;

5.4.2 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；

5.4.3 The circuit breaker handcart can only move from the test/open position to the working position when the grounding switch is in the open position. The grounding switch can only be closed when the circuit breaker handcart is in the test/open position (the grounding switch can be equipped with a voltage display device). This achieves the prevention of accidental closing of the grounding switch when energized and prevents the circuit breaker from being closed when the grounding switch is in the closed position;

5.4.3 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及防止了接地开关处在闭合位置时关合断路器；

5.4.4 When the grounding switch is in the open position, both the lower door and rear door cannot be opened to prevent accidental entry into the live interval;

5.4.4 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；

5.4.5 When the circuit breaker handcart is indeed in the testing or working position and there is no voltage control, it can only be manually opened and cannot be closed;

5.4.5 断路器手车确实在试验或工作位置，而没有控制电压时，仅能手动分闸，不能合闸；

5.4.6 When the circuit breaker handcart is in the working position, the secondary plug is locked and cannot be removed;

5.4.6 断路器手车在工作位置时，二次插头被锁定不能拔除；

5.4.7 Each cabinet can be equipped with electrical interlocking.

5.4.7 各柜体可装电气联锁。

This switchgear can also be equipped with an electromagnetic locking device on the grounding switch operating mechanism to improve reliability, and its ordering is selected according to user needs.

本开关设备还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。

5.5 Live display device

5.5 带电显示装置

If the user has a demand, an optional component, namely an energized display device, can be installed inside the switchgear to detect the operation of the primary circuit. The device consists of two units: a high-voltage sensor and a portable display, which are connected together through outdoor conductive wires. This device can not only indicate the electrification status of the high-voltage circuit, but also cooperate with the electromagnetic lock to achieve forced locking of the switch handle and network door, to prevent live closing of the grounding switch, prevent accidental live separation, and improve the anti misoperation performance of the supporting products.

如果用户有所需求时，开关柜内可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，经用户外接导电线连接为一体。该装置不仅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。

5.6 Prevention of condensation and corrosion

5.6 防止凝露和腐蚀

In order to prevent the danger of condensation in climate environments with high humidity and significant temperature changes, heaters are installed separately in the circuit breaker room and cable room for use in the aforementioned environments and to prevent corrosion.

为了防止在高湿度和温度变化较大的气候环境中产生凝露带来之危险，在断路器室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、Embedding of switchgear foundation 开关柜基础埋设

The construction of the switchgear foundation should comply with the relevant provisions of the electrical device installation engineering and electrical equipment handover test standards.

开关柜基础的施工应符合电气装置安装工程、电气设备交接试验标准中的有关条款的规定。

The basic framework of the switchgear is generally required to be buried using the method of secondary pouring, and after the completion of civil construction, it will be buried by the electrical installation unit. The production of the basic framework should be based on the drawings drawn by the design department according to the requirements of the manufacturing

plant.

开关柜的基础框架埋设一般要求采取二次浇灌的方法，待土建施工完成之后由电气安装单位进行埋设。基础框架的制作应根据设计部门按制造厂要求绘制的图纸进行。

The basic framework is composed of channel steel and angle steel welded together. The basic size requirements of the framework and the layout of cable trenches are shown in the figure. There is no strict requirement for the height of the channel steel, and channel steel No. 5 or No. 8 can be selected. The extension distance of the basic frame channel steel should be consistent with the size of the main frame of the switchgear, and the total length of the frame should be determined based on the layout of the switchgear and the number of cabinets in each row.

基础框架是由槽钢及角钢焊接组成的，框架的基本尺寸要求及电缆沟道布置如图所示，对槽钢高度无严格要求，可选用5号或8号槽钢。基础框架槽钢的外延距离应与开关柜本体框架的尺寸致，根据开关柜的平面布置情况及每排开关柜的台数决定框架的总长度。

When embedding the basic framework, horizontal calibration should be carried out, and the horizontal error and straightness should not exceed 1 millimeter per meter, and the total error should not exceed 2 millimeters. And it is required that the top surface of the basic framework be about 3 to 5 millimeters higher than the final floor of the distribution room.

基础框架预埋时应进行水平校准，要求水平误差及平直度不超过每米1毫米，总误差不超过2毫米。并要求基础框架的顶面比配电室最终地坪高出约3至5毫米。

6.1 Installation foundation diagram

6.1 安装基础图

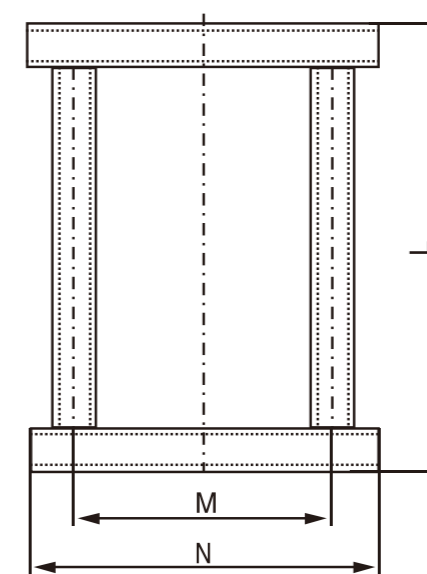


图2 开关设备地基安装图

Figure 2 Installation diagram of switchgear foundation

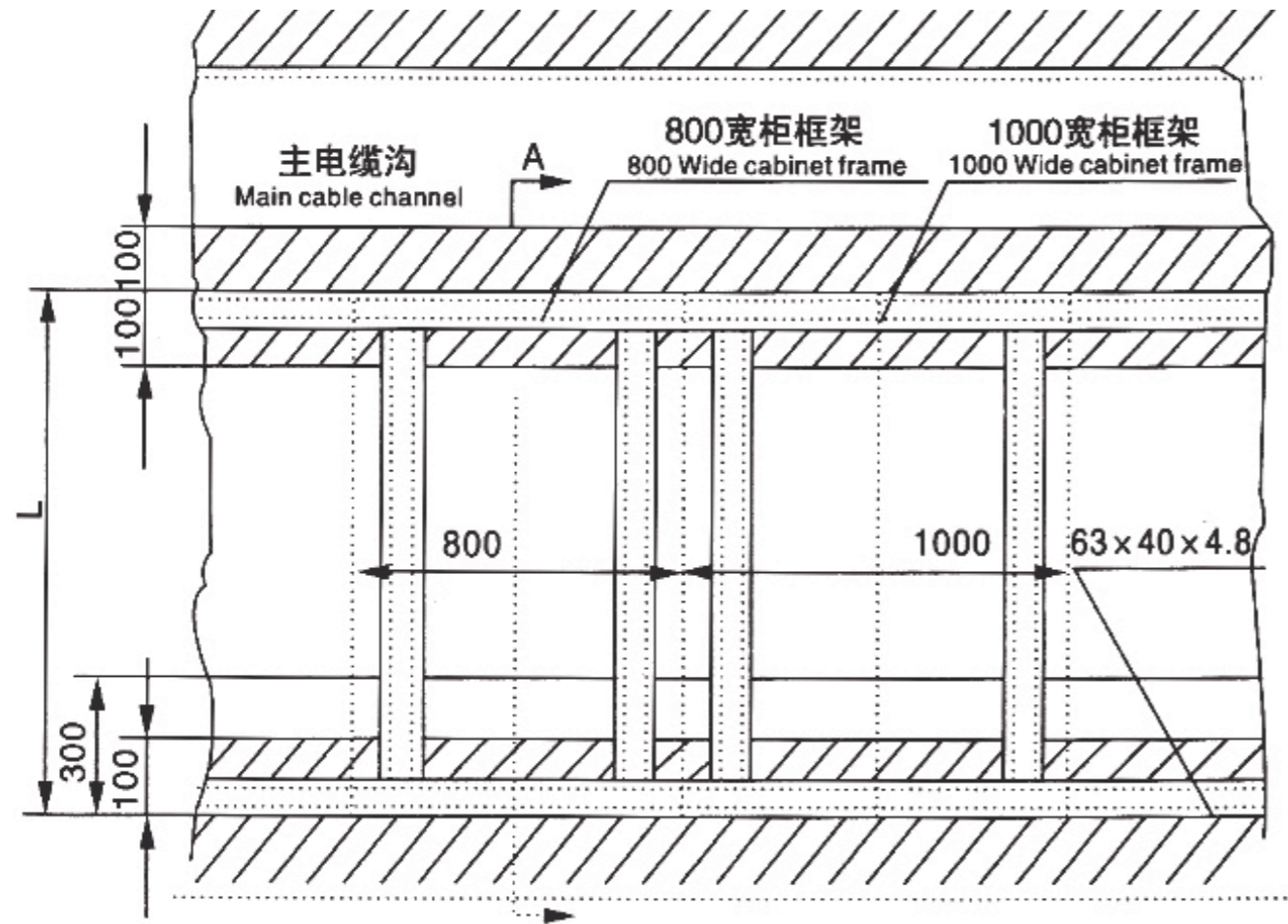
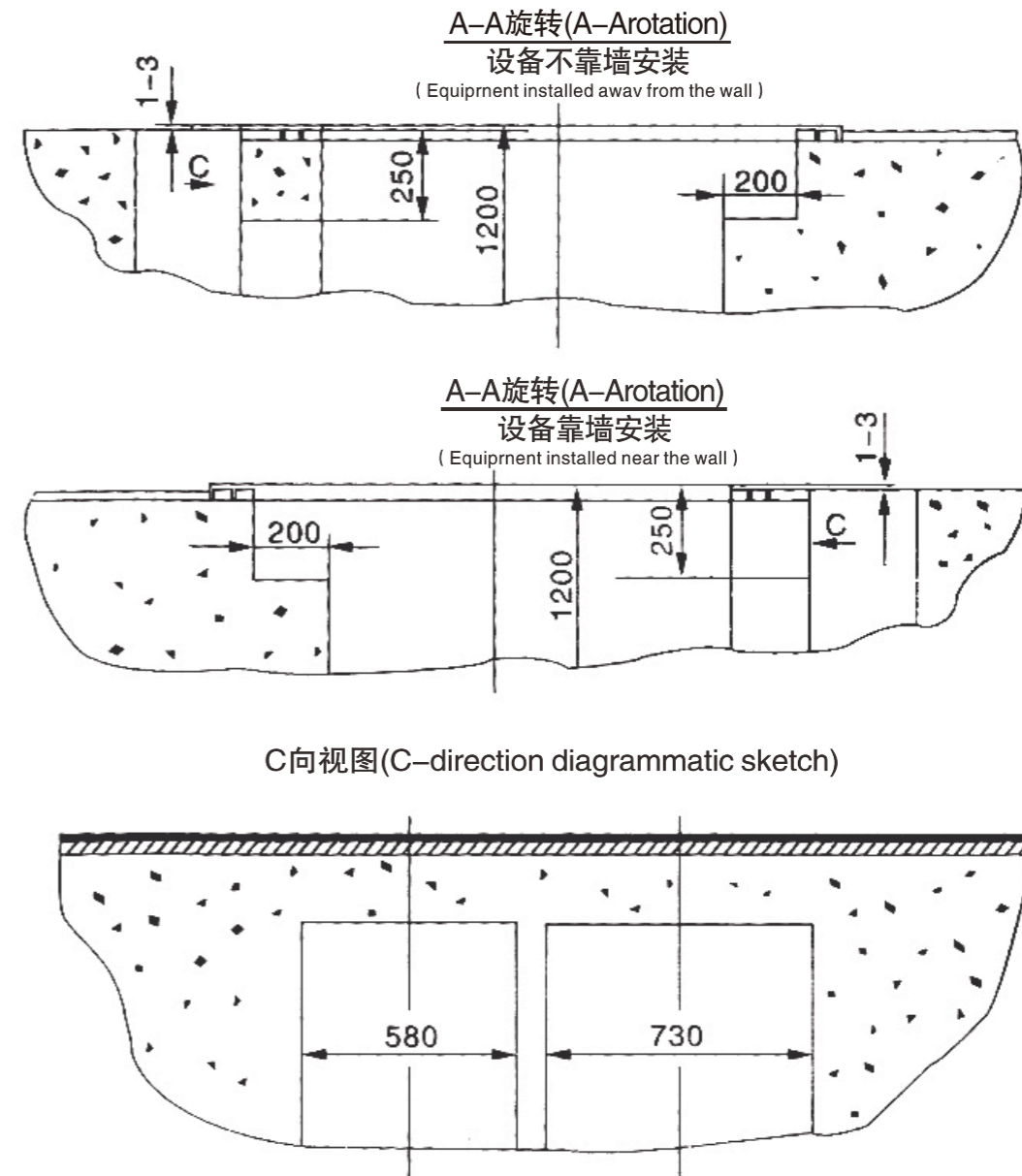


图3 开关设备安装基础示意图
注：A-A剖视图见下图

Figure 3 Schematic diagram of switch equipment installation foundation
Note: The A-A section view is shown in the following figure

柜宽 The width of cabinet	柜深 The deepness of cabinet	M	N	L
800	1800电缆 1800 Cable	630	880	1750
	2150架空 2150 Aeria			2100
1000	1800电缆 1800 Cable	830	1000	1750
	2150架空 2150 Aeria			2100

柜深 The deepness of cabinet	L
1800	1750
2150	2100



柜宽(W) (The width of cabinet)	柜深(D) (The deepness of cabinet)	L1	L2	L3
800	1800电缆 1800 Cable	530	630	880
	2150架空 2150 Aeria			
1000	1800电缆 1800 Cable	730	830	1230
	2150架空 2150 Aeria			

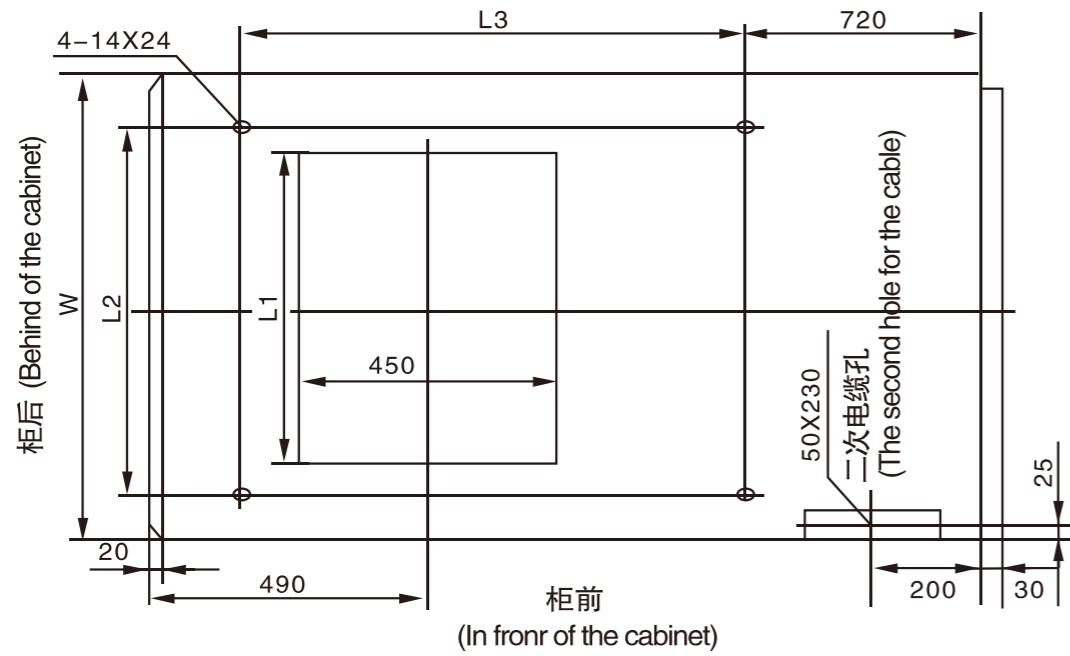


图4 开关柜安装尺寸示意图
Figure 4 Schematic diagram of installation dimensions for switchgear

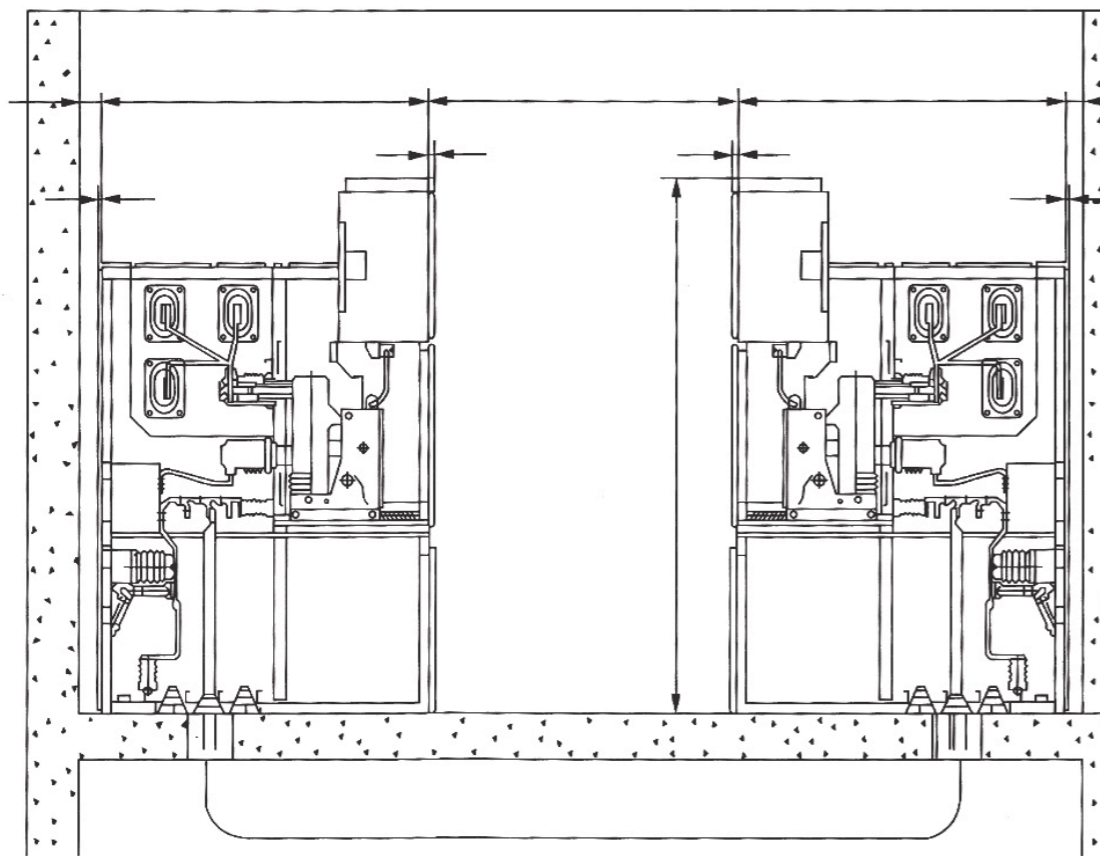


图5 开关柜面对面靠墙安装示意图
Figure 5 Schematic diagram of face-to-face wall installation of switchgear

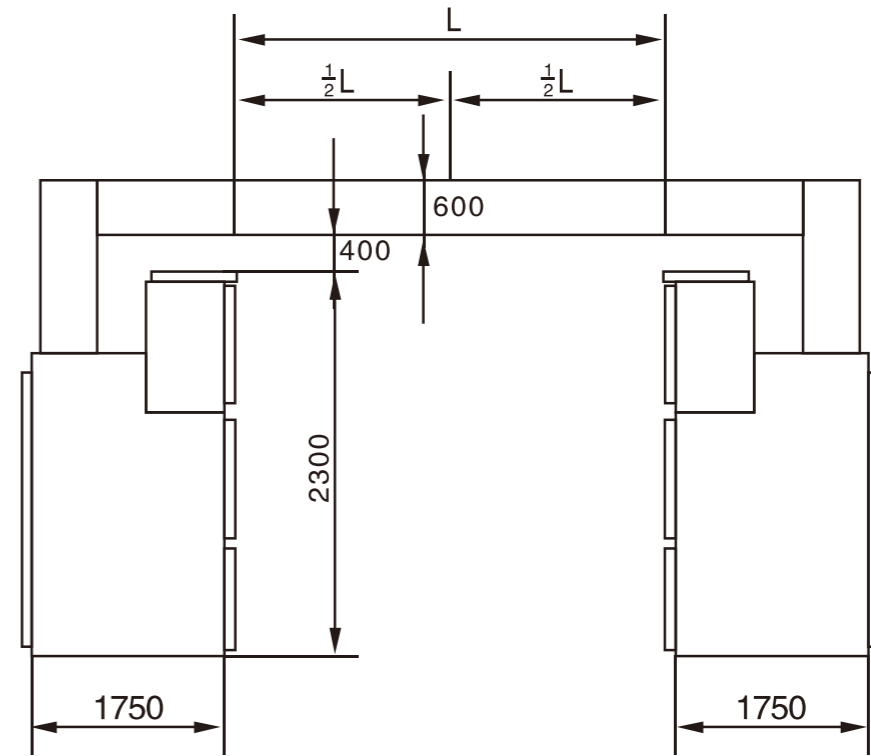


图6 母线桥安装尺寸图
Figure 6 Installation dimension diagram of busbar bridge

