富士电机
Fuji Electric

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VC-24 TYPE AC Metal-Clad Switchgear

# VC-V24
## 交流金属封闭铠装式开关设备


# 富士电机(中国)有限公司

富士电机
Fuji Electric

CONTENTS 目录

# 概述 Brief Introduction

## 序 Preface

首先感谢您使用上海富士电机开关有限公司生产的新型全组装中置式 VC-V24 型交流金属封闭铠装式开关设备。

We thank you in advance for the adoption of this new VC-V24 type AC metal-clad switchgear manufactured by Shanghai Fuji Electric Switchgear Co.,Ltd.

## 产品的性能概述 Features

本开关柜符合 IEC62271、GB3906、DL404 等标准要求，具有防止误分误合断路器、防止带负荷推拉断路器及隔离手车、防止接地开关在闭合位置时关合断路器、防止系统带电时误合接地开关、防止误入带电间隔等“防误”闭锁功能，是一种性能优越的配电装置。

The applicable standards for this Switchgear are IEC62271,GB3906,DL404 etc. And this Switchgear is of the interlocking function of protecting from misoperation of opening and closing of the Vacuum Circuit breaker(VCB for short) protecting from withdrawing of loading VCB or loading withdrawable disconnect-link trolley, Protecting from closing of VCB when the earthing switch is closed, protecting from closing of earthing switch when the system is on load, and protecting from entering of the loading compartment, and it is distribution equipment with advanced performance and function.

## 适用范围 Scope of Application

VC-V24 型交流金属封闭铠装式开关设备（以下简称开关柜）系三相交流 50Hz、额定电压为 24kV 的户内成套配电装置，可供发电厂、变电站、大厦、工矿企业作电气设备的控制、保护、监测、安全隔离、输配电之用，尤其适用于冶金、化工等频繁操作的场所。

VC-V24 type AC Metal-Clad Switchgear(Switchgear for Short) is a complete set of indoor distribution equipment with 3 phases, AC 50Hz, at rated voltage 24KV, which can be used in Power Station, Substation, building, Industry and Mines enterprises for the control, protection, monitoring, safe segregation of the electric equipment and power transmission and distribution, and it is especially suitable for the frequently operating working area of Metallurgy, Chemical industry.

## 使用环境条件 Application Environment conditions

### (1) 正常使用条件

a. 环境温度：室内上限：40℃，下限：-15℃，
日平均不超过 35℃
b. 海拔高度：不超过 1000m ①
c. 相对湿度：日平均不超过 95%，
月平均不超过 90% ②
d. 地震烈度：不超过 8 度
e. 无火灾、爆炸危险、严重污秽、化学腐蚀及
剧烈振动的场所
f. 严酷条件下的严酷度设计满足 2 类要求

注：① 当使用地点海拔超过 1000m 时，技术参数
按有关标准修正。( 但上限 2000m )
② 当相对湿度大于 85% 左右时，请接通柜内
加热器以防止凝露。

### (1)Normal Applicatin Conditions

a. Environment Temperature:(Indoor)-15℃~40℃
Daily average ≤ 35℃
b. Elevation ≤ 1000m ①
c. Relative humidity: daily average ≤ 95%
Monthly average≤90% ②
d. Seismic magnitude: ≤8 degree
e. Place free from danger of fire disaster, explosion,
Heavy pollution, chemical corrosion and violent vibration
f. In the harsh condition the harsh degree
Design complies with the requirement of category 2.

Note: ①when the elevation is higher than 1000m, the technical data will be revised as per the requirement of Relative standard. (but max. 2000m)
②When the relative humidity is more than 70%, Please turn on the heater inside the panel in order to prevent the dew.

### ( 2 ) 特殊使用条件

在超过 GB3906 规定的正常环境条件下使用时，由用户和制造商协商。

### (2) Special Application Condition

When the application condition is beyond the Condition regulated by GB3906 the user should Negotiate with the manufacturer.

## 产品型号的组成及含义 Type designations and legends

VC--V24 / □ □ □

环境特征代号：Legend of environment features:
TH：用于湿热带 TH：for Applicable in wet torrid zone,
TA：用于干热带 TA：for Applicable in dry torrid zone,
G：用于高海拔 G：for high elevation area

VCB 的额定短路开断电流 25:25kA,31:31.5kA,
Rated short-circuit breaking Current of VCB

VCB 的额定电流 06:630A,12:1250A,16:1600A,20:2000A,31:3150A, 40:4000A
Rated current of VCB

额定电压 V24：24 kV
Rated Voltage

基本型号 VC：富士交流金属封闭铠装式开关设备
Basic type VC: Fuji AC Metal-clad Switchgear

## 开关柜的内部基本结构、外形尺寸及重量，（见图 1 及 表 1）
## Configuration, Overall Dimension and Weight of Switchgear (See Fig.1 Table.1)

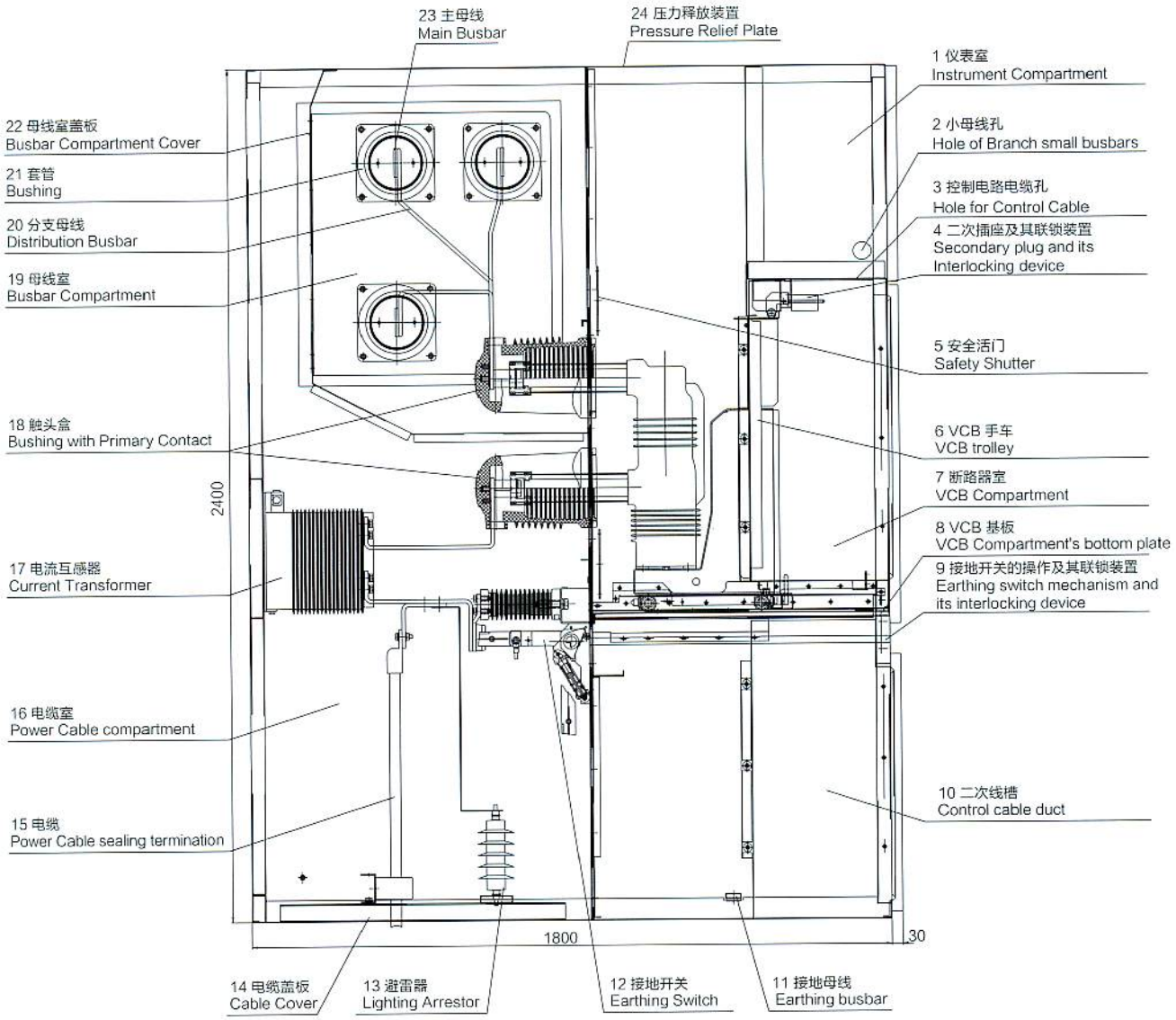



图 1 内部基本结构图　Fig.1 Configuration

表 1. 外形尺寸和重量　Table1.Overall dimension and weight

| | | | |
|---|---|---|---|
| 外形尺寸<br>宽 X 深 X 高<br>Overall Dimention<br>W x D x H | 电缆进出线<br>Cable Incoming & Outgoing | 630A~3150A/31.5kA | 1000 X1850 X2400 |
| | 架空进出线<br>Overhead Incoming & Outgoing | 630A~2000A/31.5kA | 1000 X2150 X2400 |
| | | 3150A~4000A/31.5kA | 1000 X2250 X2400 |
| 重量（Kg）<br>weight | 850~1500 | | |

## 开关柜的技术参数（见表2） Technical Data of Switchgear (see Table 2)

表 2. 开关柜的技术参数 Table 2.Technical Data of Switchgear

| | | | |
|---|---|---|---|
| 适用的技术标准<br>Applicable standard | | 中国标准 GB3906，DL404<br>Chinese standard | |
| 型号<br>Type | | VC-V24 | |
| 额定电压 (kV)<br>Rated voltage | | 24 | |
| 1min. 额定工频耐受电压 (kV)<br>Rated 1 min. Power-frequency withstand voltage | | 65( 断口 79) | |
| 额定雷电冲击耐受电压 (kV)<br>Rated lightning impulse withstand voltage | | 125( 断口 145) | |
| 额定频率 (Hz)<br>Rated frequency | | 50 或 or 60 | |
| 主母线的额定电流 (A)<br>Rated current for main busbar | | 630,1250,1600,2000,2500,3150,4000 | |
| VCB 的额定电流 (A)<br>Rated normal current for VCB | | 630,1250,1600,2000,3150,4000 | |
| 额定短时耐受电流 (kA)<br>Rated short-time withstand current | | 25 | 31.5 |
| 额定短路持续时间 (sec)<br>Rated duration of short-circuit | | 4 | |
| 额定峰值耐受电流 (kA)<br>Rated peak withstand current | | 63 | 80 |
| 母线形式<br>Busbar system | | 全绝缘 | |
| 防护等级<br>(GB11022)<br>Degree of protection | 门、外壳<br>Door, enclosure | IP4X | |
| | 柜内隔板<br>Partition | IP2X | |
| 外形尺寸<br>Dimension | 宽 W (mm) | 1000 | |
| | 深 D (mm) | 1850 | |
| | 高 H (mm) | 2400 | |
| 重量 (kg)<br>Weight | | 850~1500 | |

表 3. 富士 HS 型真空断路器主要技术参数表　Table 3. Technical Data of Fuji HS Type of Vacuum Circuit Breaker

| 型号<br>Type | | HS3120P(M)-06MF-CGSH | |
|---|---|---|---|
| 额定电压<br>Rated voltage | (kV) | 24 | |
| 额定短路开断电流<br>Rated short-circuit breaking current | (kA) | 25,31.5 | |
| 额定电流<br>Rated current | (A) | 630,1250,1600,2000,3150,4000 | |
| 额定频率<br>Rated frequency | (Hz) | 50/60 | |
| 额定峰值耐受电流<br>Rated peak withstand current | (kA) | 63 | 80 |
| 额定短时耐受电流<br>Rated short-time withstand current | (kA) | 25 | 31.5 |
| 额定短路持续时间<br>Rated duration of short-circuit | (s) | 4 | |
| 额定短路关合电流<br>Rated short-circuit making current | (kA) | 63 | 80 |
| 1min. 额定工频耐受电压<br>Rated 1min.Power-frequency withstand voltage | (kV) | 65( 断口 79) | |
| 额定雷电冲击耐受电压<br>Rated lighting impulse withstand voltage | (kV) | 125( 断口 145) | |
| 额定操作顺序<br>Rated operating sequence | | 分 -0.3S- 合分 -180S- 合分<br>0-0.3S-C0-180S-C0 | |
| 合闸时间<br>Closing time | (ms) | 30-70 | |
| 分闸时间<br>Opening time | (ms) | 20-60 | |
| 操作方式<br>Operating system | | 电机弹簧式 (M)<br>Motor-spring stored-energy(M) | |
| 弹簧储能时间<br>Spring charging time | (S) | < 8S | |
| 机械寿命<br>mechanical endurance | ( 次 ) | 10000 | |
| 额定短路开断电流开断次数<br>Rated short-circuit current breaking times | ( 次 ) | 274(E2 级 ) | |
| 额定单个电容器组开断电流 | (A) | 630 | |
| 相距 | (mm) | 275 | |
| 平均合闸速度<br>Average closing speed | (m/s) | 0.6 ± 0.2 | |
| 平均分闸速度<br>Average opening speed | (m/s) | 1.3 ± 0.2 | |

# 结构与功能 Structure Functions

## 结构 Structure

开关柜按《GB3906-2006 3.6-40.5kV 交流金属封闭开关设备和控制设备》标准设计。框架由敷铝锌钢板经 CNC 机床加工的型钢用拉铆螺母和高强度螺栓联结而成。经特殊处理接地连续性好，接地电阻小于 1000μΩ。柜体为全组装结构，外形美观，结构精巧，体积小，零部件通用性强，易于快速组织生产。整体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，即断路器室 7，母线室 19，电缆室 16，仪表室 1。从正面看，由上到下分别是仪表室门，断路室门及电缆室门，接地开关的操作及联锁装置位于断路室下部的手车基板右面。开关柜主要电气元件都装在其独立的隔室内，各室之间防护等级为IP2X，外壳防护等级为IP4X。除仪表室外，其它三个隔室都有通向柜顶的泄压通道（压力释放装置）24，以排泄故障产生的高压气体，减小事故危害，最大限度地保障人身及设备的安全。具有电缆进出线，架空进出线及其它功能方案。经排列组合后可成为各种接线形式的配电系统方案。可以从正面维护和调试，也可面对面做双列布置。

The Switchgear Panel is designed as the standard《Alternating-current metal-enclosed switchgear and controlgear for rated voltages above 3.6 and up to and including 40.5kV》. And the frame is made of the steel plate plated with AL-Zn, the draw rivet nut and high strength bolts were used for its connection. By special processing the electrical conductivity of the panel is good, its grounding resistance is less than 1000μΩ. And it is whole assembly structure. Its configuration is beautiful in pattern, the structure is exquisite, the dimension is compact, components, parts and elements with the some type are replaceable, and it is easy to organize fast fabrication. The panel consists of two major parts of the of frame and the withdrawable parts(i.e.VCB trolley), (please see Fig.1). The frame is made of Four Sole Compartments, i.e. the VCB compartment 7,Busbar Compartment 19, power cable compartment 16, Instrument compartment 1. Seeing in front from the top to the bottom of the panel there are the instrument door, VCB compartment door and power cable compartment door respectively. The earthling switch mechanism and its interlocking device are located in the right side of the VCB compartments bottom plate. The main electric components are all arranged inside of their sole compartments respectively, the protection Class for the between compartments is IP2X, and the protection class for the enclosure is IP4X,except the instrument compartment, in the other compartments there are pressure relief plate(24) reaching the panel top in order to relieve the high pressure gas occurring during the failure, minimizing the damage of failure and maximizing the protection of persons and equipment safety. The function scheme is of the cable incoming and outgoing, overhead line incoming and outgoing scheme. By arranging and combination, the power distribution system is of every kind of connection scheme. The maintenance and adjustment work can be carried out in front of panel, and the panels can be arranged face to face in position.

## 手车 Trolley

根据用途可分为断路器手车（VCB），电压互感器手车（PT），隔离手车等。并根据需要做积木式组合，同规格手车达到完全互换。

### A. 摇进式：

手车采用中置式，进出操作用手柄来完成，操作前将门关闭并锁紧，操作时平稳，摇进—顺时针 30 圈、摇出—逆时针 30 圈，手车在试验位置、工作位置的操作准确，每一个位置的联锁非常可靠，提高了运行的安全可靠性。但必须严格按防误操作程序进行操作。（见图 2）

断路器手车上装有真空断路器及其它辅助设备，当将手车用转移车推入柜内后，断路器能分别可靠的锁定在试验位置 / 工作位置，并通过位置开关或指示牌显示手车当前所处位置，手车上的机械联锁装置能可靠的保证仅当手车处于试验位置或工作位置时，断路器才能合闸，只有断路器处于分闸状态时手车才可移动。

Depending on usage, handcarts can be divided into VCB handcart, PT handcart and disconnect cart. They can be combined together as building blocks if required. Handcarts with the same specification are interchangeable.

### A. Rock-in type:

The handcart is of middle-placed type. The in-out operation is conducted with handle. Before operating, close and lock the door. For swing-in operation, turn clockwise through 30 rotations. While for swing-out operation, turn counter-clockwise through 30 rotations. Operation of handcart in test position and working position is precise and interlocking in each position is reliable so that the safe and reliable operation is guaranteed. However, the misoperation-proof procedure shall be followed strictly.

The VCB handcart is provided with VCB and other accessories. When pushing the handcart into the cabinet by using the shifting cart, the VCB can be locked in test position or working position properly and reliably. The position of the handcart is indicated by the position switch or in the indicator. The mechanical interlocking device on the handcart can guarantee that the VCB can be closed only when the handcart is in test position or working position and the handcart can be moved only when the VCB is in OFF state.


图 2.Fig.2

## 隔室及功能 Segregate Compartment and its functions

### (1) 断路器室

位于开关柜中部（见图 3）。底部是手车进出的基板，它同时起支持手车和分隔电缆室的作用。左右两边为手车导轨。室前左侧为控制电缆走线槽，右侧为柜内二次走线槽，两者均用盖板封盖，室后两侧装有启闭安全活门的开门机构（见图 4）。安全活门 5 位于手车室后部分为两块，随着手车的进出而自动开闭，检修时可根据需要分别启闭和锁定，上面一块贴有红底白字的“BUSBAR”即母线侧标志，下面一块贴有黄底黑字的“CABLE”即电缆侧标志。活门后是六个触头盒 18，内装静触头。当活门关闭时，可完全盖住触头盒内的静触头。室内顶部右侧是二次插座及其联锁装置 4，该联锁装置用以防止手车未退及试验位置插拔二次插头而造成事故，底部装设有用于手车与开关柜框架可靠接地的接地静触头。当断路器室门关闭时，可通过门上的观察窗观察隔室手车所处位置，合分闸及储能状态。

### (1) VCB Compartment

The VCB compartment is located in the middle section of the switchgear panel(Fig3). Its basic is bottom plate for the VCB trolley to be moved in or withdrawn out, at the same time it is of the function to support the VCB trolley and segregate power cable compartment. And its left and right side are the trails for trolley. In the left front of the compartment there is control cable conduit, and in the right front of the compartment there is the panels second wiring cable slot, and both are covered with cover plate. In the rear of the compartment of its both side there is the lift mechanism for open or close the safety shutter(Fig4). The safety shutter 5 is located on the rear of VCB compartment, and it is divided to two pieces, opening or closing automatically according to the VCB trolley pushed in or withdrawn out. During maintenance or repair it can be opened. Closed and interlocked as per the requirement, in the center of top piece of the shutters the white letter “BUSBAR” with red color bases tag is adhered, and in the bottom piece of the shutters the black letter “CABLE” with yellow color bases tag is adhered, in the back of the shutter there are 6 PCs bushings with primary contacts 18. When the shutter is closed the primary contacts inside the bushings are fully covered by the shutter. Inside the compartment on the top right there are the secondary socket and its interlock mechanism 4, which prevent the accident occurring when the VCB trolley’ s position, the status of open or close and tension of spring are visible through the observing window on the door.

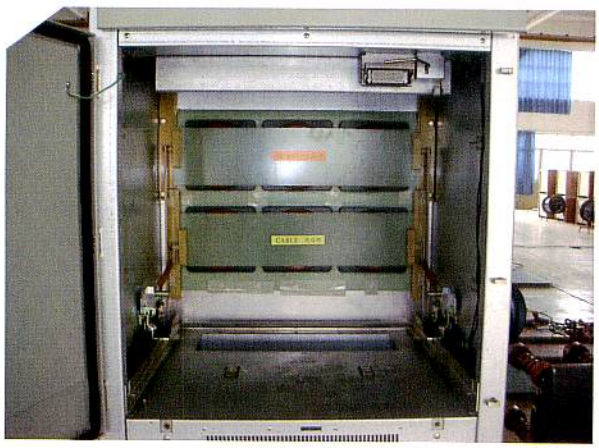


图 3.Fig.3

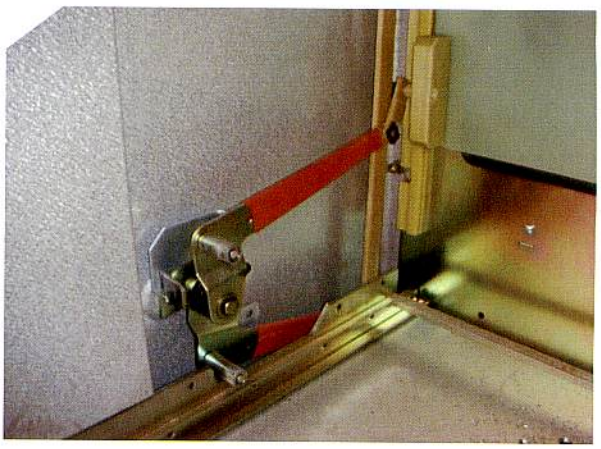


图 4.Fig.4

### (2) 母线室

主母线 19 是单台或多台拼接相互贯穿联接( 见图 5 )。通过分支母线 20 和静触头盒固定。主母线、分支母线和联络母线均为圆角铜排；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和主母线，不需要其它支撑。对于特殊需要，母线可用热缩套管、联接螺栓绝缘套和端帽覆盖。相邻柜母线用套管 21 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 21 能有效把事故限制在隔室内而不向其它柜蔓延。

### (2) Busbar Compartment

The main busbar 19 consists of single set or multicast connection by patching and crossing each other(Fig.5), which fixed with the bushing with primary contacts by distribution busbar 20. Main Busbar and coupling Busbar are made of copper bar with filleted corner. For the heavy current loads it is made of twin busbar patching each other. The distribution busbar are connected with bushing with primary contacts and main busbar by bolts without supporting member. For special requirements the busbars can be covered with thermal shrinking hose, bolts insulation cover and end capcover. The main busbars between the neighbor panels are fixed by bushing 21. So the air inside the busbar compartment and outside busbar is of buffer function. IN case of inner failure are occurring, it can protect the panel from partial burn through and melted, the bushing 21 will effectively limit the inner failure inside the compartment and protect it from accelerating, deteriorating and reaching other panels.

### (3) 电缆室

开关设备采用中置式，同时VCB基板可抽出，因而电缆室空间大( 见图6 )。电流互感器 17 装在柜体后部，接地开关 12 装在隔室壁下部。避雷器 13 可安装于电缆室底部，根据用户需要而定。注：额定电流为 3150A 时，在 VCB 室柜顶部装有散热用轴流风机。

### (3) Power Cable Compartment

The switchgear is of withdrawable VCB, and the basic frame of VCB can be withdrawn out also, so the space of the power cable compartment is large(Fig 6). The current transformers are assembled on its back partition, and the earthing switch 12 is assembled on the bottom of the segregating partition. Surge Arrester 13 can be assembled in the bottom of the cable compartment as per the users requirement.

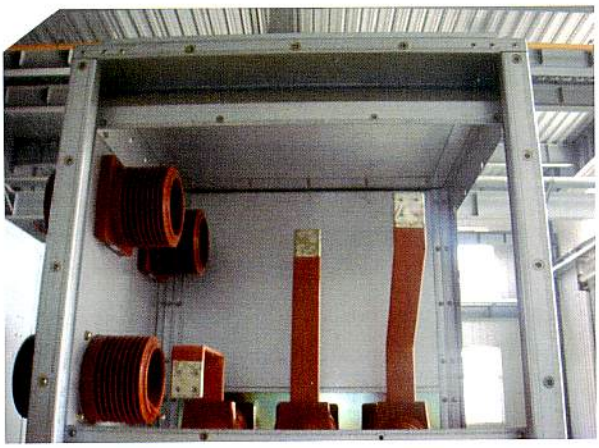


图 5.Fig.5

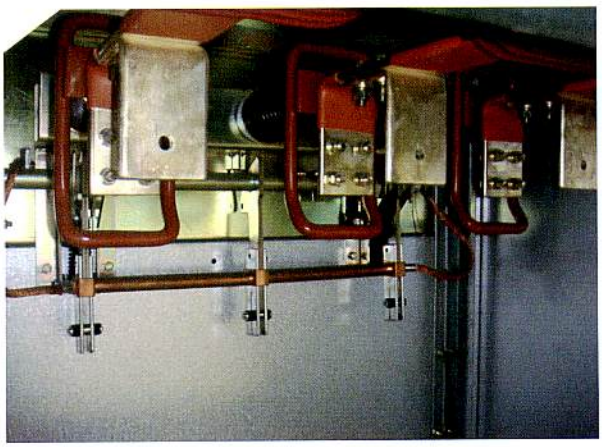


图 6.Fig.6

### (4) 仪表室

仪表室内可安装继电保护元件，仪表，带电显示器，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母线的引进预留的，开关自身内部的二次线敷设在右侧。在继电器仪表室的侧板上还留有便于施工的小母线穿越孔。

### (4) Instrument Compartment

The relay protection element, instrument, potential indicator, and the special required secondary equipment can be installed inside the instrument Compartment. And the control cable can be arranged inside the cable conduit being of metal cover segregating the control cable from H.V. compartment. The left cable conduit is reserved for the coming in and going out of the small control busbar, and the right cable conduit is for the secondary cables of panel itself. On the side partition of the instrument compartment there are holes for the installation of the small busbar.

## 压力释放装置 Pressure Relief Plate

在断路器室，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，开关柜内部气压瞬间升高，顶部装备的泄压金属板将被自动打开，释放压力和排泄气压，以确保操作人员和开关柜的安全。

The pressure relief plate is assembled in the top of the VCB compartment, Busbar compartment and Power cable compartment respectively. When the inner failure are occurred in VCB or busbar the gas instant pressure inside the panel enhanced suddenly. The pressure relief plate will be automatically pushed open, relieving the gas pressure to protect the safety of the operation staff and the panel.

## 防止凝露和腐蚀 Preventing dew and corrosion

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凝露和腐蚀发生。

In order to prevent the panel from dewing and its consequent damage, which serves at the high relative humidity place or the temperature Changed Violently daily, the heater is assembled in the VCB compartment and power cable compartment respectively.

## 接地 Earthing

由于开关柜采取了特殊措施，使组装后的框架具有良好的接地连续性，手车与柜体之间有专门的接地装置。主回路的接地用带关合能力的快速接地开关来实现，开关柜底部用铜排作为贯通的接地母线，所有柜内接地回路均与此连通。所以，本产品的接地系统完全符合GB3906 的要求，是安全可靠的。

By adopting the special precaution, the assembled panel frame is of excellent earthing continuity, between the trolley and the panel frame there is special earthing device. The speed earthing switch with open and close ability is used for main circuits earthing. And the copper bar located at the bottom of the panel is used as the crossing earthing busbar connected with all earthing circuit inside the panel. So the earthing system of this product is utterly in compliance with the requirement of GB3906, and safe and reliable.

# 防误操作联锁装置
# Interlocking device preventing misoperation

开关柜有安全可靠的联锁装置，完全满足防误操作的要求。

Switchgear panel is equipped with safe and reliable interlocking device, utterly complying with the requirement of preventing misoperation.

## 机械闭锁功能 The function of mechanical interlock

### （1）断路器进出线柜

A. 使用提示性按钮或者 KK 型转换开关，以防止误分、误合断路器。

B. 断路器手车在试验位置 / 工作位置时，断路器才能进行合分操作且当断路器合闸后，手车即被锁定而不移动。防止了带负荷误推拉断路器。

C. 只有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，只有断路器处于试验 / 断开位置时，接地开关才能进行合闸操作（带电显示器显示无电压），这样就实现了防止带电误合接地开关处于闭合状态时关合断路送电。（见图 .7）

D. 只有当接地开关处于合闸位置时，才能打开电缆室门。

### (1)Incoming and Outgoing Panles

A. The push button with reminding ability or KK type selector switch is used to prevent VCB from misopen and misclose.

B. Only when VCB trolley is located at the test position/working position the VCB can be operated, opening or closing. And after the closing of the VCB, the VCB trolley is interlocked and can’ t be moved, preventing the withdrawing or pushing of VCB with load.

C. Only when the earthing switch is located at the open position the VCB trolley can be moved from test/opening Position to working position, and only when VCB is located at test/opening position the earthing switch can be operated and closed(no potential was indicated by the potential indicator), in this way it was realized, preventing of misclosing of earthing switch with load and close the VCB when the earthing switch was closed. (Fig.7)

D. Only when the earthing Switch is located at closing position the door of cable compartment can be opened.

图 7.Fig.7

(2) 开关柜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头来实现的，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，才能插拔二次插头，断路器手车处于工作位置时由于机械联锁的作用，二次插头被锁定，不能被解除。( 见图 8 )

(2) The Link between the secondary wires of panel and the secondary cable of VCB trolley is implemented by the manual secondary plug, the moving contactor of the secondary plug is connected with VCB trolley by the nylon bellows, and the static contactor of the secondary plug is assembled at the top left of VCB compartment. The secondary plug can be unplugged only when the VCB trolley is located at test/opening position. When the VCB trolley is located at working position, the secondary plug is interlocked and can' t unplug it. (Fig. 8)

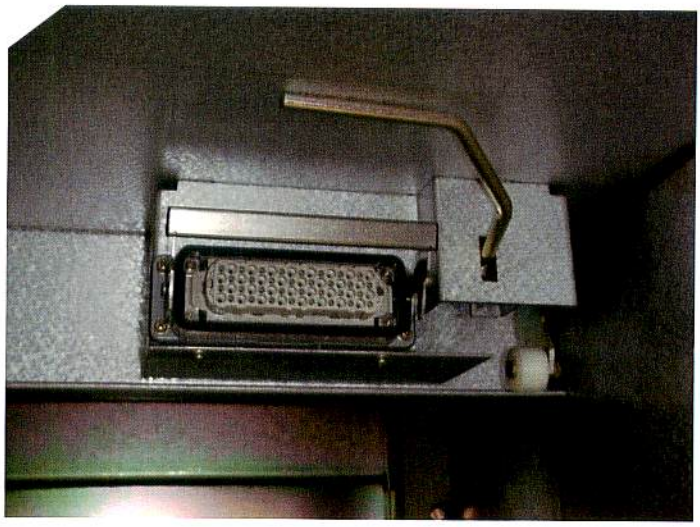


图 8.Fig.8

### (3) 电气闭锁功能，可根据工程和客户需要选择配置

A. 接地开关可装设电磁锁与电压显示器组合而实现强制闭锁，即只有电显装置显示负荷侧无电时，才能对接地开关进行合闸操作。

B. 断路器进出线柜

除具有断路器出线柜的防误操作功能外，还可加装电磁锁与辅助开关与电显组合，可以实现与进线主开关之间的强制性闭锁，即只有电显装置显示母线或电缆侧无电时，才能进行接地开关的合分操作，而当接地开关处于合闸状态时，出线断路器或上级进线主开关合不上 ( 见图 9 )。防止了带电接地及接地通电的误操作。

C. 母线联络柜

由母线联络断路器柜和母线隔离手车柜组成，断路器柜除具有出线柜的防误操作功能外，还可通过电气联锁实现二者之间的闭锁，即只有当隔离手车柜中的手车处于工作位置时，断路器才能合闸，只有当断路器柜中的断路器退至试验 / 断开位置时，隔离手车柜中的手车才能拉至试验位置。

D. 带电显示装置

开关柜内可设有检测一次回路运行的可选件即带电显示位置。该装置由高压传感器和带电显示器两单元组成，经用户外接导线连接为一体。该装置不但可以提示高压回路带电状况，而且还可以与接地开关和电磁锁配合，实现防止带电关合接地开关和防止误入带电间隔等功能，从而提高产品的防误性能。

E. 还可以加装其它电气闭锁。

F. 当机械联锁不能实现时，采用电磁锁来实现联锁，应注意当电缆室关闭时，电磁锁应闭锁（电磁锁不应在解锁状态），当断路器运行时，禁止用钥匙去打开电磁锁。

**(3) The electric interlocking function will be selected and arranged as per the requirement of the customer and the project.**

A. The earthing switch can be equipped with forced interlock by the combination of electromagnetic lock and potential indicator, i.e. only when at the load side zero potential is shown by the potential indicator, the earthing switch can be operated and closed.

B. Incoming and Outgoing feeder

Besides being of the same function of preventing misoperation of the feeder panels, it can be equipped with the combination of electromagnetic lock and auxiliary switch, and the forced interlock between this feeder and the main incoming panel can be realized, i.e. only when at the busbar side or the power cable side zero potential is shown by the potential indicator the earthling switch can be operated, closed or opened, and when the earthing switch is closed the feeder' s VCB and the up-step' s incoming' s VCB can' t be closed(Fig. 9), preventing the misoperation of earthing with load and load earthing directly.

C. Busbar coupling Panel

The busbar coupling panel is made of busbar coupling VCB panel and busbar segregation trolley panel. Besides being of the preventing of misoperation regulated, the busbar coupling VCB panel is also of the electric-interlock with the busbar segregation trolley panel, i.e. only when the segregation trolley is at the working position the VCB can be closed, and only when the VCB trolley is at the test/open position the segregation trolley can be withdrawn to the test position.

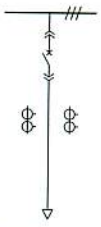
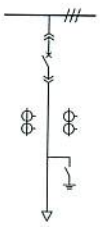
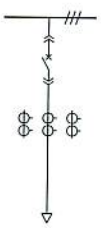
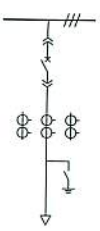
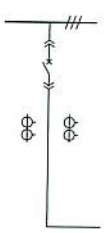
D. Potential Indicator

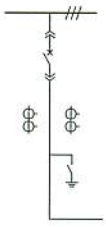
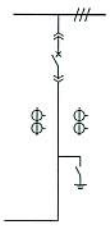
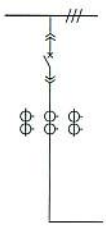
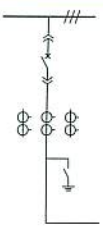
Inside the switchgear panel the potential indicator can be assembled, which indicated the primary circuit status. It consists of H.V. sensor and potential indicator, being connected with the outside conductor. This device can not only indicate the potential status of the H.V. circuit, but also cooperate with the earthing switch and electric-magnetic-lock, preventing the misoperation of closing of Earthing Switch with load, and misentering of the loaded compartment.

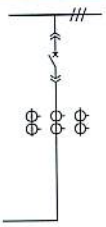
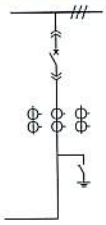
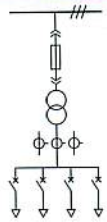
E. Other electrical-interlock can be equipped also.

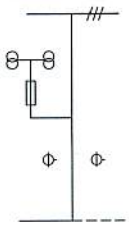
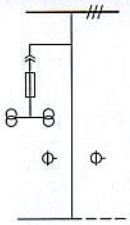
F. When mechanical interlocking is not available, interlocking is carried out by using electromagnetic lock. However, please note: the electromagnetic lock should be locked(the electromagnetic lock should be in locking state) when the door of the cable chamber is closed, and unlocking the electromagnetic lock using the key is prohibited when the disconnecter is running.

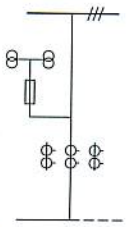
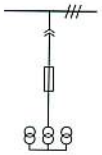
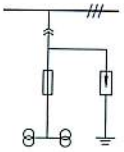
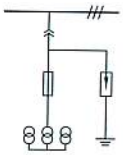
# 一次系统接线图 Primary System Connection Diagram

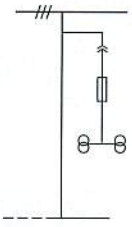
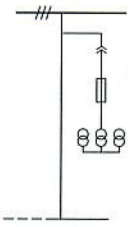
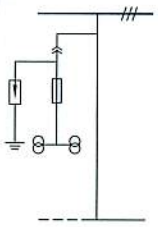
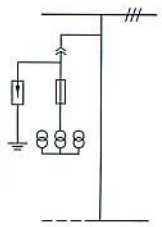
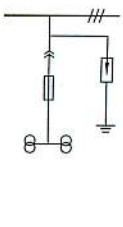
| 方案编号 Diagram No. | | 001 | 002 | 003 | 004 | 005 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  |  |  |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | 630~4000 | 630~4000 | 630~4000 |
| 主要设备 Main Equipment | 真空断路器 HS V.C.B HS | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 AS12 C.T AS12 | 2 | 2 | 3 | 3 | 2 |
| | 接地开关 JN24 Earthing switch JN24 | | 1 | | 1 | |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | 同左 Ditto | 同左 Ditto | 同左 Ditto |
| | | | | | | |
| | | | | | | |
| 用途 Application | | 受电、馈电 Receiving, Feeder | 受电、馈电 Receiving, Feeder | 受电、馈电 Receiving, Feeder | 受电、馈电 Receiving, Feeder | 联络 ( 右 ) Bus-tie (right ) |
| 备注 Remarks | | | | | | |

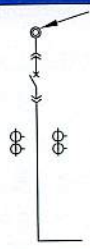
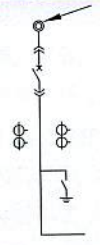
| 方案编号 Diagram No. | | 006 | 007 | 008 | 009 | 010 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  |  |  |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | 630~4000 | 630~4000 | 630~4000 |
| 主要设备 Main Equipment | 真空断路器 HS V.C.B HS | 1 | 1 | 1 | 1 | 1 |
| | 电流互感器 AS12 C.T AS12 | 2 | 2 | 2 | 3 | 3 |
| | 接地开关 JN24 Earthing switch JN24 | 1 | | 1 | | 1 |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | 同左 Ditto | 同左 Ditto | 同左 Ditto |
| | | | | | | |
| | | | | | | |
| 用途 Application | | 联络 ( 右 ) Bus-tie (right ) | 联络 ( 左 ) Bus-tie (left) | 联络 ( 左 ) Bus-tie (left) | 联络 ( 右 ) Bus-tie (right ) | 联络 ( 右 ) Bus-tie (right ) |
| 备注 Remarks | | | | | | |

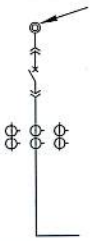
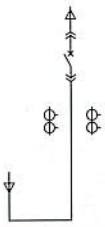
| 方案编号 Diagram No. | | 011 | 012 | 013 | 014 | 015 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  | | |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | | | |
| 主要设备 Main Equipment | 真空断路器 HS V.C.B HS | 1 | 1 | 干式变压器 SCLB8 | | |
| | 电流互感器 AS12 C.T AS12 | 2 | 2 | 3(LMZ) | | |
| | 高压熔断器 XRNT H.V Fuse XRNT | | | 3 | | |
| | 接地开关 JN24 Earthing switch JN24 | | 1 | | | |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | | | |
| | 空气开关 MCCB | | | 按用户需要 On request | | |
| 用途 Application | | 联络 ( 左 ) Bus-tie (left) | 联络 ( 左 ) Bus-tie (left) | 所有变 Transformer unit | | |
| 备注 Remarks | | | | | | |

| 方案编号 Diagram No. | | 016 | 017 | 017(A) | 017(B) | 017(C) |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | | |  | |  | |
| 额定电流 (A) Rated current | | | 630~4000 | | 630~4000 | |
| 主要设备 Main Equipment | 真空断路器 HS V.C.B HS | | | | | |
| | 电流互感器 AS12 C.T AS12 | | 2 | | 2 | |
| | 电压互感器 RZL(REL) P.T RZL (REL) | | 2 | | 2 | |
| | 高压熔断器 XRNP H.V Fuse XRNP | | 3 | | 3 | |
| | 接地开关 JN24 Earthing switch JN24 | | | | | |
| | 电压监视 Voltage detector | | 按用户需要 On request | | 同左 Ditto | |
| 用途 Application | | | 计量 Metering | | 计量 Metering | |
| 备注 Remarks | | | | | | |

| 方案编号 Diagram No. | | 018 | 019 | 020 | 021 | 022 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  |  |  |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | 630~4000 | 630~4000 | 630~4000 |
| 主要设备 Main Equipment | 避雷器 HY5WS2 Arrestor HY5WS2 | | | | 3 | 3 |
| | 电流互感器 AS12 C.T AS12 | 3 | | | | |
| | 电压互感器 RZL(REL) E.T RZL(REL) | 2 | 2 | 3 | 2 | 3 |
| | 高压熔断器 XRNP H.V Fuse XRNP | 3 | 3 | 3 | 3 | 3 |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | 同左 Ditto | 同左 Ditto | 同左 Ditto |
| | | | | | | |
| 用途 Application | | 计量 Metering | 电压测量 Voltage metering | 电压测量 Voltage metering | 电压测量、避雷器 Voltage metering,Arrestor | 电压测量、避雷器 Voltage metering,Arrestor |
| 备注 Remarks | | | | | | |

| 方案编号 Diagram No. | | 023 | 024 | 025 | 026 | 027 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  |  |  |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | 630~4000 | 630~4000 | 630~4000 |
| 主要设备 Main Equipment | 避雷器 HY5WS2 Arrestor HY5WS2 | | | 3 | 3 | 3 |
| | 电压互感器 RZL (REL) P. T RZL (REL) | 2 | 3 | 2 | 3 | 2 |
| | 高压熔断器 XRNP H.V Fuse XRNP | 3 | 3 | 3 | 3 | 3 |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | 同左 Ditto | 同左 Ditto | 同左 Ditto |
| | | | | | | |
| | | | | | | |
| 用途 Application | | 电压测量、母线 Voltage metering,Busbar | 电压测量、母线 Voltage metering,Busbar | 电压测量、母线、避雷器 Voltage metering,Busbar,Arrestor | 电压测量、母线、避雷器 Voltage metering,Busbar,Arrestor | 电压测量、避雷器 Voltage metering,Arrestor |
| 备注 Remarks | | | | | | |

| 方案编号 Diagram No. | | 028 | 029 | 030 | 031 | 032 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  |  |  |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | 630~4000 | 630~4000 | 630~4000 |
| 主要设备 Main Equipment | 真空断路器 HS V.C.B HS | | | | 1 | 1 |
| | 电流互感器 AS12 C.T AS12 | | | | 2 | 2 |
| | 高压熔断器 XRNP H.V Fuse XRNP | | | | | |
| | 接地开关 JN24 Earthing switch JN24 | | | 1 | | 1 |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | 同左 Ditto | 同左 Ditto | 同左 Ditto |
| | | | | | | |
| 用途 Application | | 母线联络 Busbar connection | 出线 Cable outgoing | 出线 Cable outgoing | 母线联络 Busbar connection | 母线联络 Busbar connection |
| 备注 Remarks | | | | | | |

| 方案编号 Diagram No. | | 033 | 034 | 035 | 036 | 037 |
|---|---|---|---|---|---|---|
| 主结线方案 Main connection diagram | |  |  |  |  |  |
| 额定电流 (A) Rated current | | 630~4000 | 630~4000 | 630~4000 | 630~4000 | 630~4000 |
| 主要设备 Main Equipment | 真空断路器 HS V.C.B HS | 1 | 1 | 1 | | |
| | 电流互感器 AS12 C.T AS12 | 3 | 3 | 2 | | |
| | 接地开关 JN24 Earthing switch JN24 | | 1 | | | |
| | 电压监视 Voltage detector | 按用户需要 On request | 同左 Ditto | 同左 Ditto | 同左 Ditto | 同左 Ditto |
| | | | | | | |
| | | | | | | |
| 用途 Application | | 母线联络 Busbar connection | 母线联络 Busbar connection | 母线联络 Busbar connection | 隔离 Disconnection feeder | 隔离联络 Disconnection bus-tie |
| 备注 Remarks | | | | | | |

## 开关设备的安装 Installation of Switchgear

(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》中的有关条款规定。

(2) 开关设备的安装基础一般要分两次浇灌混凝土。第一次为开关柜安装构件即角钢、方钢或槽钢构件安装基础。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 1~3mm。

(3) 开关设备地基安装图详见图 9。

(4) 在基础架构安装时要保证安装质量，框架安装的技术标准为 1 平方米公差 1mm。

(5) 开关设备的安装基础尺寸与安装尺寸详见图 10。

(6) 柜体单列布置时，柜前走廊以最小 1.3 米为宜，双列布置时，柜体操作走廊以最小 2.5 米为宜。

(7) 母线桥及其布置图见图 11。

(8) 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）时，拼柜工作应从中间部分开始或从母线桥处开始。

(9) 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，开关柜安装不平度不得超过 2mm。

(10) 当开关设备已完全组合（拼接）好时，可用 M12 的地脚螺栓将其固定。

(1) The construction of the installation foundation of switchgear should comply with relative regulation of《Technical Specification of Electrical Power Construction and take-over》.

(2) In general the installation foundation of switchgear should cast the concrete two times. The first casting of concrete is for the installation frame of switchgear panel, i.e. the angle-bar or squares, and the second casting of concrete is for the complement layer with 60mm thick, and the complemental layer level shall be lower 1-3mm than the installation frame level.

(3) For the detail switchgear foundation diagram please see Fig 9.

(4) When conducting the installation of the foundation frame the good quality should be guaranteed, the technical standard of the installation of the foundation frame is that every one square meter the tolerance is 1 mm.

(5) For the installation foundation dimension of switchgear and the installation dimension please see Fig 10.

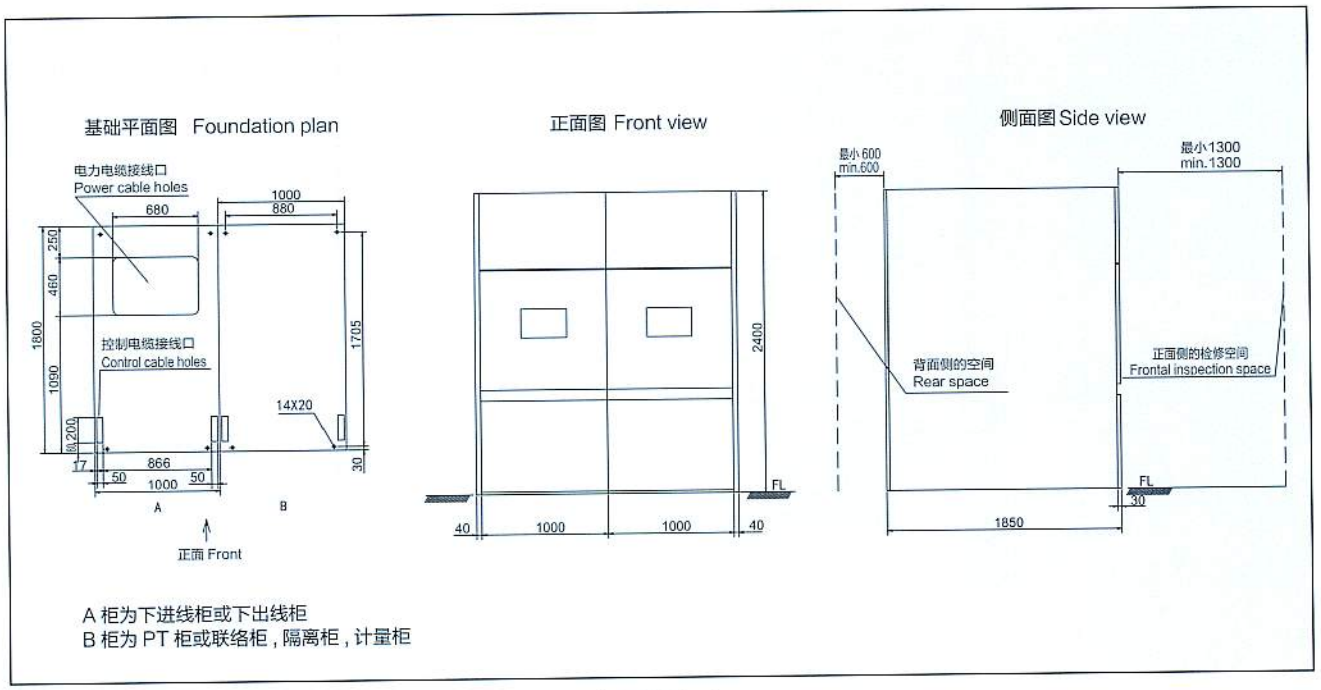
(6) When the panels are single line arranged, the width of the corridor in front of panels is around min. 1.3M, when the panels are arranged face to face, the width of the corridor between the panels is around min. 2.5M.

(7) For the detail of the busbar system/s arrangement please see Fig. 11.

(8) Where the panels were transported to the project site according to the requirements of the projects and the instruction of design drawings if the numbers of the single line are more than 10, the installation of the panels should be started from line' s middle part or from the position of busbar bridge.

(9) The installation work is finished one by one, and the uneven tolerance of the installed panels in both vertical and horizontal direction should not be more than 2mm.

(10) When the whole line panels were completely installed the panels can be fixed by the foundation bolts of M12.




A 柜为下进线柜或下出线柜
B 柜为 PT 柜或联络柜，隔离柜，计量柜

图 9 Fig.9

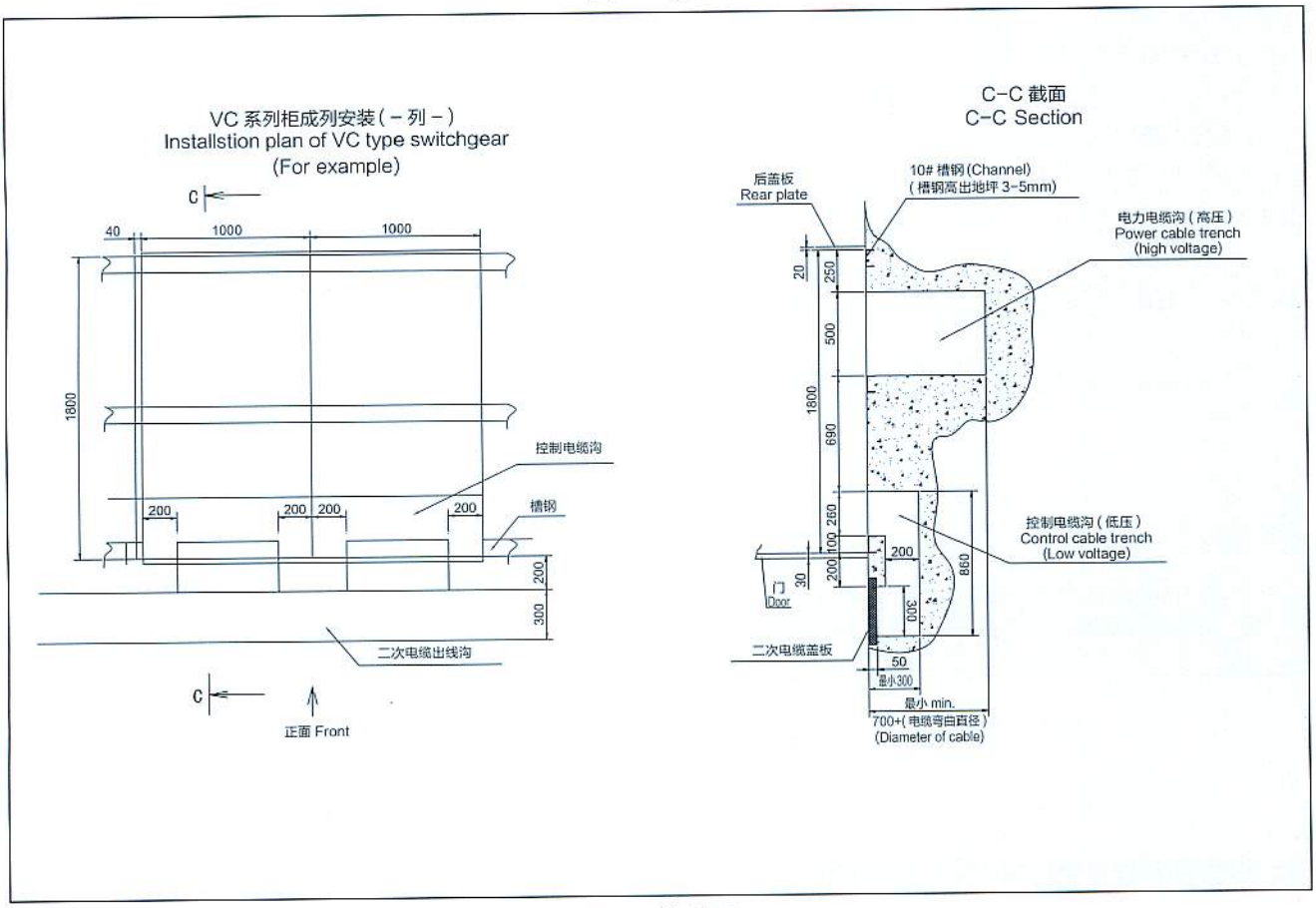
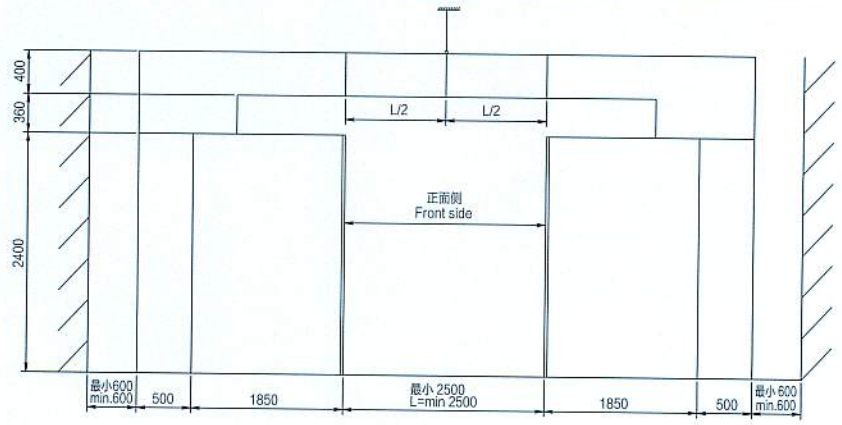
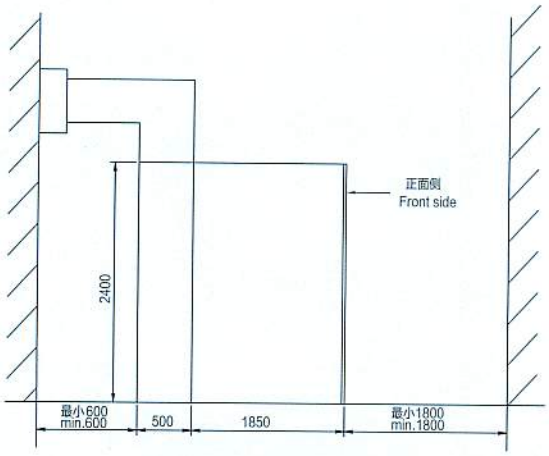



图 10 地基图

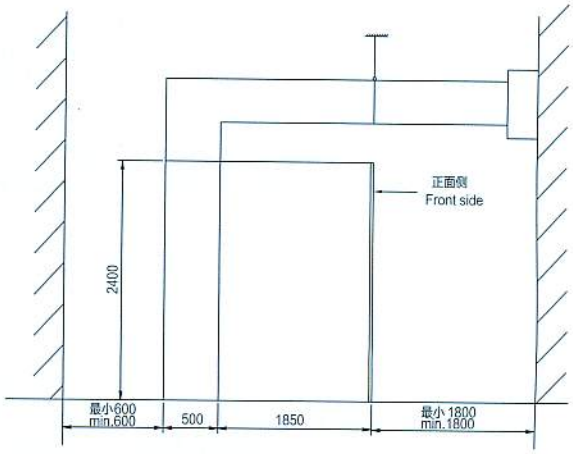
Fig.10 Foamdation dimention




双列布置联络母线桥
The busbar bridge of double line arrangement




单列布置进线母线桥（一）
Incoming busbar bridge of single line arrangement(one)




单列布置进线母线桥（二）
Incoming busbar bridge of single line arrangement(two)

图 11 架空进线 母线桥图
Fig. 11 Busbar system Arrangement

注：吊具数量及尺寸由母线桥的长短定，此图为示意图。
The suspending point number and dimension depends on the length of busbar bridge. This Fig. is sketch map.

图 11 架空进线 母线桥图
Fig.11 Busbar system Arrangement

注：吊具数量及尺寸由母线桥的长短定，此图为示意图。
The suspending point number and dimension depends on the length of busbar bridge.This Fig is sketch map.

## 订货须知 Notes for ordering

订货时应提供下列资料：

A. 主结线方案编号及接线系统图，排列图及平面布置图；

B. 二次功能图，端子排列图，若无端子排列图时按制造厂家端子排编排；

C. 开关柜的电器元件的型号，规格，数量；

D. 电气设备汇总表；

E. 需要母线桥（两列柜间母线和墙柜间母线桥）时需提供跨距，相距，高度等相关尺寸；

F. 开关柜使用在特别环境条件时应在订货时提出；

G. 需要其它或额外附件时应提出规格种类和数量。

When ordering the following information is required:

A. Main connection diagram No, and primary single-line diagram, arrangement drawings and plane arrangement drawing.

B. Secondary function diagram, terminals arrangement drawings, if no terminal arrangement drawings are available from user, the manufacturers scheme will be used for the secondary terminal arrangement.

C. The main components type, model and quantities inside the panels;

D. The summary list of Equipment.

E. If busbar bridge is needed(the busbar bridge between the panel lines and between the wall and the panels) the dimension of the distance within the panels which arranged face to face, and within the wall and the panels which single line arranged, and the high of the busbar.

F. If special ambient conditions are required by the user please mention it when ordering.

G. Other or extra accessories are required please give its specification and quantities.

## 售后服务 Service after sale

(1) 发生故障时的联络

万一发生异常，请注明如下内容与富士电机开关有限公司联络。

A. 型号

B. 制造编号

C. 购买年月及合同号

D. 故障发生时间

E. 故障内容（尽可能详细）

F. 其它要求事项

注：1. 维修检查空间正面：最小1300mm，背面：最小600mm。

(1) The liaison when failure occurring

In case some abnormal condition occurring, please send the following information to Shanghai Fuji Electric Switchgear Co., Ltd. By fax.

A. Product's Type

B. Manufacturing Series No.

C. The Contract No. and date

D. Failure time

E. The detail conditions of failure as detail as possible

F. Other requirements from user

Note:

1. Maintenance and Check Space in front is min. 1300mm wide and in rear the min. wider of the space is 600mm.


此环境象征标志显
示了富士电机集团
对环保的姿态。

富士电机(中国)有限公司

地址：上海市普陀区中山北路3000号长城大厦27-28楼

邮编：200063

电话：021 5496 1177　　传真：021 6422 4650

网址：http://www.fujielectric.com.cn/