GBC-40.5
型手车式高压开关柜

概述

GBC-40.5型手车式高压开关柜系三相交流50Hz单母线系统的户内保护型成套装置,作为接受和分配40.5kV的网络电能之用。

Introduction.

the lorry-style high-voltage switch board is a complete inside protective equipment which is supplied by the 50Hz triphase AC single bus bar system and used to receive and distribute 40.5kV network electric energy.

使用环境条件

本型高压开关柜适用于下列工作条件:

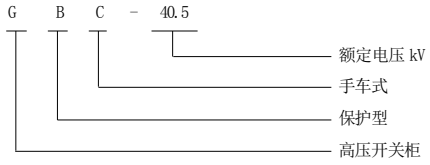
2.1 海拔高度不超过1000m;
2.2 周围介质温度不高于+40℃，不低于-20℃;
2.3 相对湿度不超过85%(+20℃时);
2.4 没有导电尘埃及足以腐蚀金属和破坏绝缘的气体的场 所;
2.5 没有爆炸危险的场所;
2.6 没有剧烈震动和颠簸及垂直倾斜度不超过5度的场所。

Ambient conditions.

The high-voltage switchboards of this type apply to the following working conditions:

2.1 The altitude must be less equal to one thousand meters.
2.2 The temperature of the surrounding medium must be less equal to +40℃ and over equal to -20℃.
2.3 The relative humidity must be less equal to 85% (When the temperature is +20℃).
2.4 Place without electric dust and gas which can be enough to corrode the metal and destroy insulator.
2.5 Place without explore risk.
2.6 Place without strenuous vibration and thrashing and its verticality cannot exceed 5°.

型号及其含义



技术数据

GBC-40.5高压开关柜所装配的一次元件包括断路器、操动机构、电流互感器、电压互感器、熔断器、避雷器、电力变压器等，在本产品的装置条件下，仍满足各自产品的技术性能。

Technical data

The primary elements which are assembled to the GBC-40.5 High-voltage Switch Board include the circuit breaker, the controlling mechanism, the current transformer, the pressure transformer, the fuse, the lightning arrester, the power transformer and soon, and they still satisfy their own technical characteristics under this product's assembly conditions.

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4.1 GBC-40.5高压开关柜的主要数据

The main data of the lorry-style high-voltage switch board are listed in the following table1 表1

序 号	项 目	单 位	数 据	
1	额定电压	kV	40.5	
2	额定电流	A	1000	
3	额定短路开断电流	kA	16	20
4	额定短路关合电流(峰值)	kA	40	50
5	动稳定电流(峰值)	kA	40	50
6	热稳定电流(4s)	kA	16	20
7	外型尺寸(宽×深×高)	mm	1818 × 2000 × 2500	
8	重量(油断路器柜)	kg	1500(其中油断路器手车重620)	
9	附柜外形尺寸(宽×深×高)(架空进出线)	mm	1818 × 825 × 2500	

4.2 ZN23-40.5真空断路器技术数据

ZN23-40.5/1600-25型户内真空断路器(以下简称断路器)是三相交流50Hz的户内装置,适用于切合电容器组和控制保护电弧炉、变压器等频繁操作场所，也可供交流配电系统作保护和控制用。

本断路器符合GB1984-89《交流高压断路器》标准要求及本产品技术条件的各项要求,ZN23-40.5真空断路器的技术数据：

ZN23-40.5 Technical Data

The inside vacuum circuit breaker of the type ZN23-40.5/1600-25 is 50Hz triphase AC inside equipment, it applies to the frequent manipulation of opening and closing the capacitor bank, controlling and protecting the electric arc furnace and the transformer etc. It can also be used to protect and control the alternating-current distribution system. This circuit breaker complies with the standard criteria of GB1984-89 the alternating high-voltage circuit breaker and all the requirements of this product's technical conditions. The data of the ZN23-40.5 vacuum circuit breaker is:

表2

序 号	名 称			单 位	数 据
1	额定电压			kV	40.5
2	额定电流			A	1600
3	额定短路开断电流			kA	25
4	额定短路电流开断次数			次	≥8
5	额定短路关合电流			kA	63
6	动稳定电流(峰值)			kA	63
7	热稳定电流(4s)			kA	25
8	额定开断、关合电容器组容量			kVar	24248
	相当额定电容器组开断电流			A	400
9	动静触头允许磨损累计厚度各为			mm	2
10	一次自动重合闸无电流间隔时间			s	0.3
11	合闸时间			s	≤0.2
12	固有分闸时间			s	≤0.06
13	机械寿命			次	6000
14	机构参数	额定分合闸操作电压		V	-110,-220
		额定操作电流	合闸	A	294(110V),147(220V)
		额定操作电流	分闸	A	5(110V),2.5(220V)
		重量		kg	57
15	总重量(包括机构)			kg	500
16	外型尺寸		高	mm	1690
			宽	mm	1212
			深	mm	1017

4.3 LN2-40.5主要技术数据

LN2-40.5Ⅰ、Ⅱ、Ⅲ型六氟化硫断路器符合GB1984-89《交流高压断路器》及ZBK43001-88《高压六氟化硫断路器通用技术条件》、国家标准和IEC国际有关标准的规定，其主要技术参数见表。

4.3 LN2-40.5 Technical Data

The sulfur hex fluoride circuit breaker of type LN2-40.5 I. II. III complies with the stipulations ZBK43001-88 the high-voltage sulfur hex fluoride circuit breaker general technical specifications, national standards and IEC international relating standards. Its main technical

LN2-40.5Ⅰ、Ⅱ、Ⅲ型六氟化硫断路器技术数据：

the technical data of the LN2-40.5 I. II. III type sulfur hexafluoride circuit breaker: 表3

序号	名称		单位	数据		
				LN2-40.5Ⅰ	LN2-40.5Ⅱ	LN2-40.5Ⅲ
1	额定电压		kV	40.5		
2	绝缘水平	雷电冲击全波耐压(峰值)	kV	185		
		工频耐压(1min)	kV	80		
3	额定电流		A	1250	1250	1600
4	额定短路开断电流		kA	16	25	25
5	额定操作顺序			分-0.3s-合分-180s-合分		
6	额定短路关合电流		kA	40	63	63
7	动稳定电流(峰值)		kA	40	63	63
8	热稳定电流		kA	16	25	25
9	热稳定时间		s	4		
10	开合单个电容器组开断电流		A	400		
11	额定失步开断电流		kA	4	6.3	6.3
12	合闸时间		s	≤0.15		
13	分闸时间		s	≤0.06		
14	机械寿命		次	6000	3000	3000
15	重量	断路器本体	kg	130	130	135
		六氟化硫气体	kg	1.5		
16	年漏气率			≤1%		
17	六氟化硫气体额定压力(20℃时表压)		Mpa	0.65		
18	闭锁压力(20℃时表压)		Mpa	0.59		

结构说明

本开关柜为手车式结构，采用空气绝缘为主，各相带电体之间及相地绝缘距离不小于300mm，只有个别方案柜的个别部位及相间距离不足时才设置极间障。

开关柜主母线采用矩形铝母线水平架空装于柜顶，前后可以观察。联络母线一般采用直径50×5铝管呈三角形布置在柜的下部，特殊情况下，(当电缆进出线兼联络时)采用交联聚乙烯塑料电缆改制的固体绝缘联络母线。

开关柜的正面，背面柜间及柜的两侧，均采用钢门板或封板加以保护。

开关柜基本结构———柜体和手车及联锁装置分述如下：

5.1 柜体：(见图1至图3)

柜体骨架由角钢板弯制焊接而成，分隔成手车室、隔离触头室、电缆室、继电器室、端子室以及仪表板等。

柜前中部为手车室，打开两扇门，手车可以出入，二扇门上均设有观察窗，二次插头固定在右中门上，左中门上标有手车处于试验位置的标志。左侧小门上装有名牌和指示柜内一次线路方案的标志。门内一般不设小室，仅所用变柜(101柜)设置小室，以安装供控制所用电用的低压空气开关。右侧小门上，专供安装按钮和控制开关以及需要手动复位的继电器等，该门内是端子室，装置二次接线端子组，端子组上方装有供柜内照明的灯具，下方设有接地螺栓。

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柜前上部是两扇对开的钢板门，门上可安装仪表、指示器等，其有效安装面积为2×(800×450mm)。门内为安装继电器的小室，其有效安装体积为1600×350×260mm；柜间小母线沿小室上部敷设，小母线端子组设于小室的左侧，最多可敷设小母线15根，其中有两根供合闸之用。

柜后下部为下隔离静触头室，当采用电缆进出线时，电缆头亦装于此室下方，具有联络母线的开关柜其联络母线也是从本室与邻柜进行联络。后柜上部为上隔离静触头室。上、下一次静触头室均可根据需要，装设支柱绝缘子触头座或电流互感器、穿墙套管；上部最多可装设电流互感器六台，下部最多装设三台。

为保证局部检修的安全，上、下一次静触头之间，手车室与柜顶主母线之间，均设有金属隔板。对于断路器柜，在手车室内侧顶部加设绝缘隔板，以防止断路器喷气造成相间闪络。下隔离触头与手车室之间设有绝缘隔板 。

开关柜尚设有识别装置，方法是：在中门门框左边角钢直柱的下方装有柱销2只，使其与装于手车上的档块配合，以保证同类型手车可以互换，不同类型的手车不能推入。

5.2 手车：

手车骨架由角钢及钢板弯制焊接而成。根据一次线路方案，共分为断路器，三相或单相电压互感器、避雷器，隔离及变压器等七种手车。

各种手车的操作面均有金属封板加以保护，上部和下部的保护板上开有观察车内情况的视察窗，中部是操作板，用于装设操作手柄、联锁机构，与柜体之间的二次回路联接的P48K5S型插座装于小车的右下部，手车的底部设有接地触头。

使不同手车不能互换的识别挡块装于车的左侧下方，与柜体的识别柱销配合使用。

对于变压器手车，车上装有一只CJT1-100/3型交流接触器，作为切断所用变压器二次侧负荷之用。该种手车的左侧设有将变压器二次侧电源引进柜体空气开关室的动触片。

5.3 联锁装置：

根据使用的不同要求，开关柜设有机械的或电气的联锁装置，分述如下：

5.3.1 断路器手车的机械联锁装置。断路器的电磁操动机构与定位机构(CS6)装有机构联锁，它能确保在拉动断路器手车时断路器处于分闸状态。

5.3.2 断路器手车和装于别柜的隔离手车的电气联锁装置。为保证断路器手车和隔离手车的操作程序性，在隔离手车上和开关柜柜体上分别装有电磁锁(DS)和行程开关(LX)进行双重电气联锁。该联锁装置保证隔离手车当固定在工作或试验位置时，与其联锁的断路器才能合闸，在两位置之间不能合闸。当两种手车一次均接通，且断路器处于合闸状态，此时隔离手车不能被拉动。

上述要求的原理简介如下：电磁锁(DS)和行程开关(LX)与被联锁的断路器手车上的CD10电操辅助开关串接，当隔离手车推入柜内处在工作或试验位置时，装于本手车上的碰块即压动行程开关(LX)，此时，合闸回路被接通，有关断路器才能合闸，当隔离手车离开工作或试验位置，碰块即脱离行程开关(即LX复位)，合闸回路被切断，分闸回路接通，有关断路器立即分闸且不能被再合闸。另外，当有关断路器处于合闸状态时，装于隔离手车手柄上的电磁锁(DS)回路将被反映在关断路器位置的辅助开关(DL)的常闭接点所切断，电磁锁轴销紧锁在CS6机构的锁孔内，从而保证了处于工作或试验位置的隔离手车不能被拉动。

隔离手车与断路器手车的联锁，依据主接线的不同而异。可以是一台隔离手车对一台断路器手车联锁；也可以是一台隔离手车同时对二台断路器手车联锁。

5.3.3 所用变压器手车配用的联锁装置。为保证所用变压器手车不能带负荷被拉动，在变压器手车之CS6操作机构上装有行程开关(LX)，其接点受CS6操作机构之操作手柄控制，当变压器手车处于合闸状态，若将操作手柄拉动，此时，LX在一次隔离触头未脱离之前先行断开，使装于手车作为切断变压器二次负荷用的交流接触器分断，从而保证了在带负荷下若拉动手车时变压器的二次负荷将自动被切除。

以上种种联锁的电气接线和要求，使用单位应在二次原理接线图中予以体现。

Instructions to the Structure

This switchboard is handcart structured. Air insulation is mainly adopted. The insulation space among the electric bodies in each phase is over equal to 300mm. The barrier between polar is installed only when the individual parts of the individual versions of boards and their interphase space are inadequate.

The main bus tars are installed on the top on the board horizontally and overheadly by using rectangular aluminous bus bars, which can be observed from ahead and behind. The interbuses are generally the aluminum poles with 50×5 diameters and they are installed at the bottom of the board with the shape of a triangle. In special situations, (in-and-out cable connecting) the solid insulation interbuses, which are adapted from cross-link vinyon cables, are used.

Steel shutter or blocking board is used to protect the front of the board, the rear boards and the bilateral boards.

The basic structure of the switch board—— the body of the board, the handcart and the interlocking device are explained respectively as follows:

5.1 The body of the board (consult from illustration one to illustration three)
Its framework is bended and welded from steel angle and steel plate. It is divided into the handcart house, the isolating ports house, the cables house, the relay house, the terminal house and the meter panel etc.
The middle part of the front board is the handcart house. The handcart can go in and out when the two middle doors. Both doors have observing windows. The quadratic plug is fixed on the right middle door. The band and the label which shows the once circuit scheme inside the board are fixed on the left small door. Often there is no small house in doors except in the transform board (101board), which is in use for installing the low-voltage air switch that is used to control the electricity in use. The right small door is especially for installing buttons, controlling switches and the handle-resetting relays etc. The terminal house is inside this door. The quadratic wiring terminal group is installed here. On the upper part of the group there are light fittings for inside illumination; on the lower part, earthing bolts are installed.
The upper part of the front board are two opposite steel plate doors with 2×(800×450mm) effective installing areas. Meters and indexers can be installed on them. Inside the doors, there is a small house which relays can be installed in and which has a 1600×350×260mm effective installing volume. Inside the board, small bus bars are laid down along the small house. Small bus bars terminal group is installed on the left of the board. At most 15 small bus bars can be laid down, among which two are used for closing.
The lower part of the rear board is a house for low isolating static ports. When in-and-out cables are used, the cable head is installed below this house. The interbuses of the switch board contact with the neighboring board from this house. The upper part of the rear board is a house for upper isolating static ports. The pole insulation sub ports plug, the current transformer or the wall bushing can be installed in the upper and lower once static ports houses according to needs; on the upper part
at most 6 current transformers can be installed and 3 on the lower part.
In order to guarantee the safety of partial inspection, there should be metal partitions between the upper and the lower once static ports as well as between the handcart house and the main bus bars on the top of the board. As for the board of circuit breaker, insulation partitions are added on the top part of the inside handcart house in order to prevent the circuit breaker from injecting air which will result in interphase flashover. Insulation partitions are installed between the lower insulation ports and the handcart house.
The identification equipment is installed in such a way: enable the two plugs installed below the straight steel angle pole that is on the left part of the middle door frame to cooperate with the link stopper installed on the handcart, thus guaranteeing that handcarts of the same type can interchange while those belonging to different types are not allowed in

5.2 Handcart:
The framework of the handcart is bended and welded from steel angle and steel plate. According to the once circuit scheme, handcarts can be divided into seven typed including the circuit breaker, the tri-or single pressure transformer, the lightning arrester, the insulation and the transformer etc.
All the manipulation faces of the handcarts are protected by metal blocking boards. On the upper and lower parts of the protective boards, there are inspection windows for inspecting the situations inside the handcarts. There is a manipulation board in the middle. It is used for installing controlling hand grip and the interlocking mechanism. The P48K5S Type plug which is connected to the quadratic loop inside the board is installed on the right lower part of the handcart. There is no earthing port on the bottom of the handcart.
The identification link stopper which prevents different handcarts from interchanging is installed on the left lower part of the handcart and is used cooperatively with the identification plug of the board.
As for transformer handcarts, there is a CJT1-100/3 Type AC contactor which functions to cut the quadratic side load of the transformer in use. The dynamic chip which can introduce the quadratic side electricity of the transformer into the air switch house of the board is installed on the left part of this kind of handcarts.

5.3 Interlocking Mechanism:
According different using requirements, mechanical or electric interlocking mechanism is installed in the switch board. They are explained respectively as follows:
5.3.1 The interlocking mechanism of the circuit handcarts. Mechanical interlocking is installed in the electromagnetic controlling mechanism and the allocation mechanism (CS6) of the circuit. It can guarantee that the circuit is open when the circuit handcart is pulled.
5.3.2 The circuit handcarts and the electric interlocking mechanism which is installed in the insulation handcarts of other boards. In order to guarantee the manipulation program of the circuit and insulation handcarts, the electromagnetic lock (DS) and the march switch (LX) are respectively installed on the insulation handcarts and the bodies of the switch board for double electric interlocking. This interlocking device guarantees that only when the insulation handcarts are fixed on the positions of working or experiment, can the circuit interlocked with the insulation handcarts be closed and cann't

be closed when they are between the two positions. When the two types of handcarts are connected once and the circuit is closed, the insulation handcarts cann't be pulled.

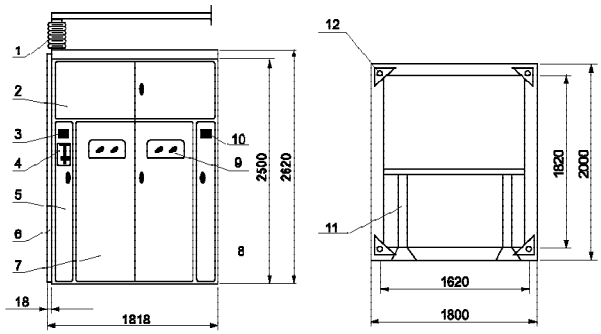
The brief introduction of the principles of the above requirements is as follows: the electromagnetic lock (DS) and the march switch (LX) are concatenated with the CD10 electric manipulation auxiliary switch of the circuit handcart which is interlocked. When the insulation handcart pushes into the board and is in the position of working or experiment, the touching block which is installed on the handcart will immediately press the march switch (LX). Meanwhile, the closing loop is cut, the opening loop is connected, and the concerned circuit opens immediately and can no longer be closed. In addition, when the concerned circuit is closed, the loop of the electromagnetic lock (DS) which is installed on the hand grip of the insulation handcart will be cut by the common close and connection point of the auxiliary switch (DL) which shows the position of the concerned circuit. The electromagnetic lock pin is tightly locked in the lock hole of the CS6 mechanism, thus guaranteeing the insulation handcart in positions of working and experiment can't be pulled.

The interlocks of the insulation handcarts and the circuit handcarts differ according to the difference of the maintie lie. It is possible for an insulation handcart to interlock with a circuit handcart and it is also possible for an insulation handcart to interlock with two circuit handcarts.

5.3.3 The interlocking mechanism of the transformer handcarts. In order to guarantee that the transformer handcart in use cann't be pulled with load, the march switch (LX) is installed on the CS6 manipulation mechanism of the transformer handcart. Its connection point is controlled by the manipulation hand grip of the CS6 manipulation mechanism. When the transformer handcart is closed, if the manipulation hand grip is pulled, LX will drop out before the once isolation port is off. And this makes the AC contactor which is installed on the handcart and is used to cut the quadratic load of the transformer drop out, thus guaranteeing that if the handcart is pulled with load, the quadratic load of the transformer will be cut automatically.

The using units should show the above various interlocking wiring of the electric equipment and requirements in the quadratic principle wiring illustrations.

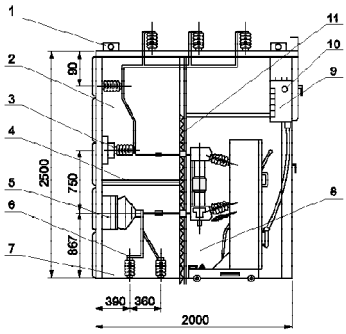
外型尺寸及典型结构示意图(见图1至图3)
Diagrammatic Sketch of the Outline Size and Typical Structure



1. 绝缘子 2. 仪表门 3. 产品铭牌 4. 模拟标牌 5. 左小门 6. 侧护板 7. 手车室 8. 端子门
9. 观察窗 10. 带电显示器 11. 轨道 12. 安装孔

1. insulator 2. meter door 3. product brand 4. analog index tag 5. left small door 6. side protective board
7. handcart house 8. terminal door 9. observation window 10. electric indicator 11. track 12. installing hole

图1 柜体外形及安装尺寸
Illustration 1 the outline of the board and installing size



1. 吊攀
2. 隔离触头室
3. 上隔离触头
4. 金属隔板
5. 电流互感器的下隔离触头
6. 联络母线
7. 下隔离触头室
8. 手车室
9. 继电器室
10. 小母线孔
11. 绝缘隔板

1. jointhinge
2. insulationportshouse
3. upperinsulationport
4. metalpartition
5. lower insulationport of the current transformer
6. interbus
7. lower insulation port house
8. handcart house
9. circuit house
10. small bus bar hole
11. insulationpartition

图2 断路器柜(方案34结构示意图)
Illustration 2 the Circuit Board (The diagrammatic sketch of the structure of scheme34)

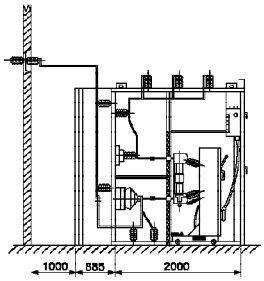


图3 柜后架空进(出)线示意图
Illustration 3 the diagrammatic sketch of the overhead in (and out) cables connected to the rear of the board

基础及排列形式(见图4至图10)Basis and the arraying pattern (See Illustration 4 to 10)

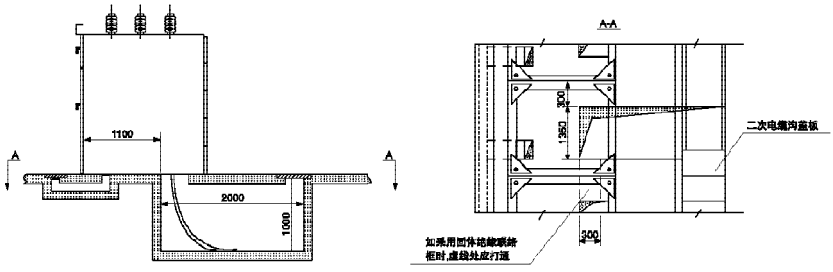


图4 电缆进、出线基础参考图
Illustration 4 the basis reference diagram of the in-and-out cables

注：本电缆沟深度按单根塑料电缆设计，当采用油浸电缆时，电缆沟应适当加深。
Noting: The depth of this cable trench is designed according to single plastic cable.
When oil immersed cables are adopted, the cable trench should be deepened properly.

GBC-40.5
Type Lorry-style High-voltage Switch Board

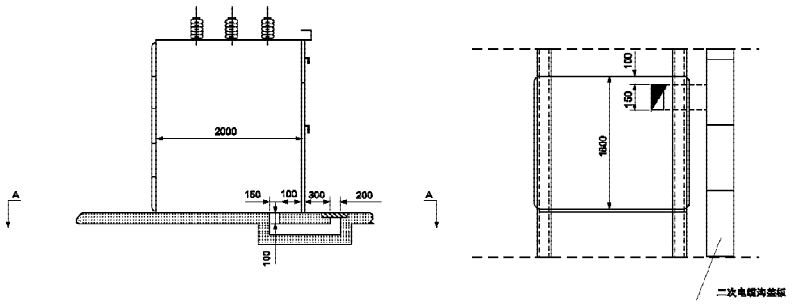


图5 二次电缆沟基础形式参考图

Illustration5the reference diagram of the basic pattern of the trench cover of the quadratic cables

注：当选用所用变压器柜时，二次侧馈线引出电缆沟亦可参照本图，但分沟在柜之后侧。

Noting: When the pressure transformer board is chosen, the cable trench introduced by the quadratic side feeder can be referred to this illustration, too. But the branch trench is at the rear of the board.

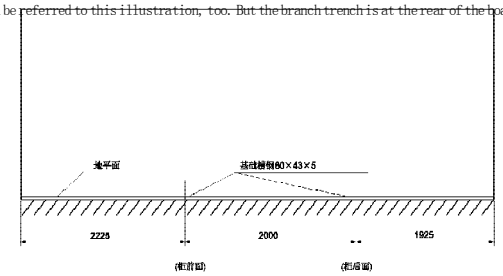


图6 基础槽钢埋放示意图(单面排列)

Illustration6 the burial diagrammatic sketch of the basic box iron (single-sided arraying)

注意：基础槽钢埋入地面应平整，与地面处于同一水平面，切勿突出地面。

Noting: The basic iron box should be smoothly buried and be at the same level as the horizon. Avoid ledge.

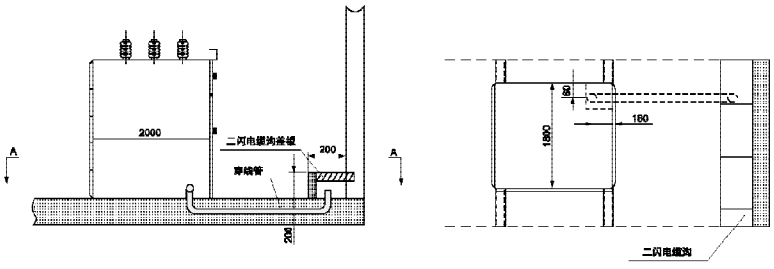


图7 二次电缆沟基础形式参考图(二)

Illustration7 the reference diagram of the basic pattern of the trench of the quadratic cables (II)

注：1、本图可使用于楼上或楼下布置。穿线管理入前应将引至开关柜的二次线穿入管内。

2、当选用所用变压器柜时，二次侧馈线引出电缆沟亦可参照本图，但穿线管应埋在柜之左侧。

Noting: 1. This illustration applies upstairs layout or downstairs layout. Before the thread tube is buried, the quadratic cable attached to the board should be introduced into the tube.

2. When the pressure transformer board is chosen, the cable trench introduced by the quadratic side feeder can be referred to this illustration, too. But the tread tube should be buried on the left part of the board.

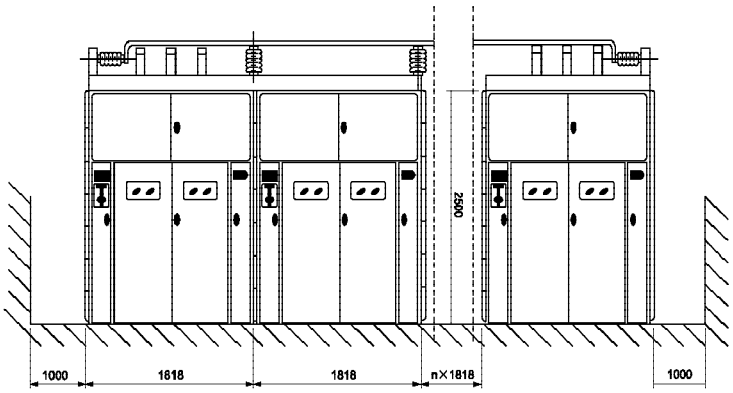


图8 拼柜安装尺寸
Illustration8 the installing size of the splice board

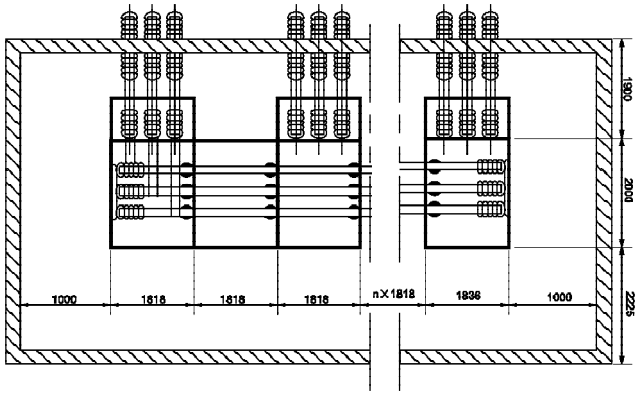


图9 单列平面布置参考
Illustration9 the layout reference of the uniseriate flat surface

注：架空进出线应注意，不要设置在相邻两柜上，以保证检修安全距离。
Noting: Attention should be paid to the overhead in-and-out cables. They shouldn't be installed on the two neighboring boards in order to guarantee the safe space of inspection.

GBC-40.5
Type Lorry-style High-voltage Switch Board

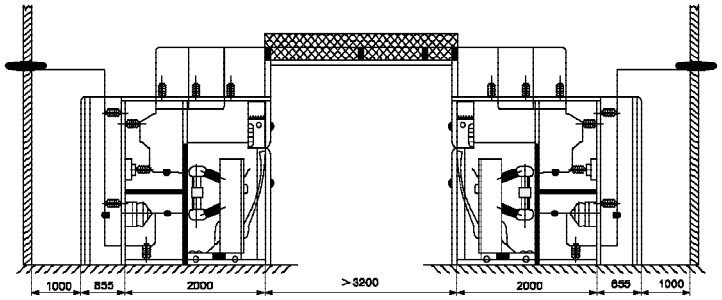


图10 双列布置架空出线及母线桥示意图
Illustration 10 the diagrammatic sketch of the biserial layout overhead out cables and the bus bar bridge

订货须知

订货时应提供下列资料：
7.1 一次线路方案编号或一次系统图，并标明其额定电流。电流互感器需标明变比，准确级次。
7.2 二次线路原理图，如套用GG-1A型高压柜的129种直流操作标准方案时应标明方案号及控制回路电压值。
7.3 高压柜平面排列图。
7.4 如需选用非标准一次线路方案或另订备用手车应在订货时提出，协商处理。
7.5 当采用电缆进出线时，其允许长期工作电流及热稳定电流受电缆截面限制。

Ordering Notice

Supply information following:
7.1 Once circuitry bule print serial number oe once system fig and mark this rated current. transformer must mark rated change and nicety grade.
7.2 Secondary circuitry principium fig, when use indiscriminately 129 kinds of DC operation standard blue print f GG-1A type high voltage value.
7.3 High voltage switchgear plane fig.
7.4 For instance choose nonstandard once circuitry project or other order standby handcart ought to bring up when order, negotiate about transacting.
7.5 When used cable pass in and out lines, it allow long times working current and heat stabilization current was been restricted section of cable.