

ZF4B-126/T 型气体绝缘金属封闭开关设备

ZF4B-126/T Gas Insulated Metal Enclosed Switchgear and controlgear

一、概述

北京北开电气股份有限公司自1983年开始生产气体绝缘金属封闭开关设备(GIS),拥有20多年设计、生产制造的历史,迄今已生产了7000余间隔,装备了约800个变电站,并出口印尼、马来西亚、土耳其等国家, GIS设备以其先进的技术,稳定可靠的产品质量,热情周到的售后服务,备受国内外用户青睐。

ZF4B-126/T气体绝缘金属封闭开关设备是新一代紧凑型GIS设备。它总结了过去20多年来国内外GIS设备的设计、制造、运行等方面的经验,以先进的技术和严格的质量控制过程保证了设备的高度安全可靠,是北京北开电气立足国内外市场的主导产品。

二、主要特点

- 1.体积小、重量轻:主母线前置,结构简单紧凑;断路器及其两侧接地开关成为一体;各个元件经过电场优化设计,实现了高可靠性前提下的小型化;整机间隔宽度800mm;间隔空间安装尺寸:1000(宽)×5000(长)×3200(高);整机可采用铝合金壳体,间隔重量3-7吨。
- 2.可靠性高、寿命长、无需维护:断路器采用自能灭弧原理;配置高可靠性弹簧机构,机构寿命10000次,电寿命20次,一、二次零部件大量选择进口或合资产品,确保了产品的高质量。
- 3.绝缘水平高、绝缘裕度大:各绝缘环节均进行了电场优化设计,三极为等边三角形布置。设备绝缘按145kV电压等级设计并给予较大的设计裕度,工频320kV、雷电冲击750kV、SF₆气体零表压下工频耐压达170kV,较大的安全裕度确保了绝缘可靠。
- 4.开断能力强,开断裕度大:其满容量开断能力达50kA。型式试验全部按145kV电压等级,顺利完成包括异相接地的全部型式试验。灭弧室采用自能式灭弧原理,具有优异的故障电流开断能力和小电流开合性能,全国首次成功实现满容量50kA开断体现了较大的开断裕度。

I General

Beijing BeiKai Electric Co., has been engaged in manufacturing gas insulated switchgear (GIS) since 1983. After twenty-year's mature experience in design and manufacture, we have produced more than seven thousand bays, parts of which were exported to Indonesia, Malaysia, Turkey and totally assembled over eight hundred substations. Due to the advanced technologies adopted, reliable and consistent product quality as well as convenient post-sales services, our ZF4B-126/T(GIS) is well received by customers indoors and outdoors.

ZF4B-126/T gas insulated switchgear is a newly-built compact equipment that collects past twenty year's design, manufacturing, commissioning experience from china and abroad. Advanced technology and strict quality control process ensure its high safety and reliability, and it is a leading product in BBE that occupy market in china and abroad.

II Main characteristics

1. Compact and light-weight: pre-positioned main busbar; simple & compact structure, integration of circuit breaker and earthing switches on both sides; the optimal design of electric field for each component enable miniaturization while keeping reliable. Width of each bay: 800mm; Installation dimension: 1000(w)×5000(l)×3200(h); Weight of each bay: 3~7 tons, and aluminum-alloy enclosed.
2. Trustworthy reliability, long endurance and maintenance-free; The circuit breaker is in

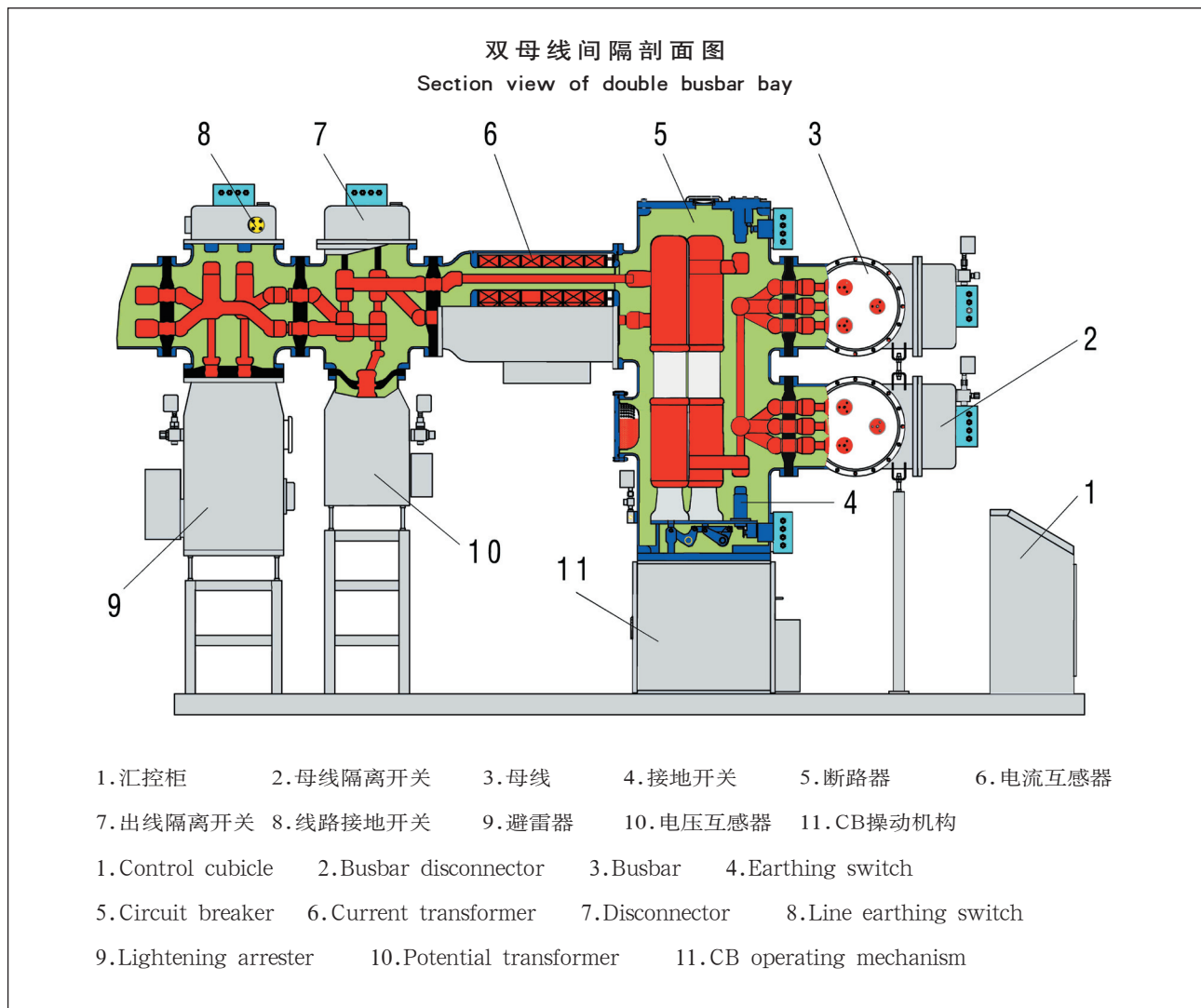
5. 弹簧操作机构性能优越：断路器操作机构为改进型弹簧操作机构；专业生产制作，机构成熟可靠，已经历十余年的运行考核，性能优异，机械寿命10000次。因取消了压缩空气供给系统，也不需要液压油，真正做到无气化，无油化，运行更可靠，更安全。

6. 密封性能良好，年泄漏率小于0.5%：新型优化的整体布置方式大大减少了密封环节，SF6系统采用分散监控方式，取消了SF6阀门及SF6管路系统。采用新型的自封接头及SF6密度计，从而去除了GIS的外部泄漏环节，使GIS具有更低的SF6泄漏率。

7. 结构设置灵活，便于现场试验，标准化程度高，大量采用标准的四通元件，同时满足母线、隔离、接地的要求，配置绝缘接地以便检测，全部采用标准模块、标准间隔设计。

the principle of self-energy arc-extinguishing and equipped with highly-reliable spring mechanism. Its lifespan can reach 10000 and 20 times mechanically and electrically, respectively. To ensure consistent product quality, a lot of primary and secondary components are imported from abroad or joint-venture company.

3. High insulation degree and big insulation allowance: optimal design of electric field for all the insulations; Equilateral triangle arrangement for three poles. The equipment is designed according to 145 kV insulation level with a big design allowance. Its power-frequency voltage is 320 kV and the lightning impulse voltage is 750 kV; and power-



frequency voltage can reach 170 kV under zero gauge pressure.

4.High switching capability: full breaking capacity is up to 50kA. We are the first to realize 50 kA breaking capability. The product passed type test including arbitrary two point earthing test. Puffer chamber is characterized by capability of breaking fault current and low current making.

5.Good performance of spring mechanism: The operation mechanism of circuit breaker is an enhanced spring mechanism, which is exquisitely produced, mature and reliable. Through over a decade of practical use, its performance has been proved to be excellent with a mechanical life of up to 10000 times. All the organs are electric/spring mechanism, which replace the compressed air supply system and need no hydraulic oil. Therefore, they are really gas and oil-free, more reliable and safer.

6.Excellent sealing, less than 0.5% annual leakage rate: The newly-optimized overall layout greatly reduces the taches for sealing. SF6 adopts a distributed control system and eliminates SF6 valve as well as SF6 pipeline system. It adopts the new-type self-enclosed joints and SF6 densimeters, which eliminate the external leakage of GIS and make GIS have a lower SF6 leakage rate.

7.It is flexibly structured, which facilitates the on-site tests. Due to its high standardization degree, it adopts a lot of four-way components. Meanwhile, it can meet the requirements for busbar, isolation and earthing, and insulation earthing is for consideration of testing. It completely adopts standardized modules and the design of standard bays.

三、技术参数/III Technical Parameters

安装及使用环境条件/Installation and service conditions

名称/Item	单位/Unit	数据/Technical specifications	
使用地点/Service site		户内/户外 / Indoor/Outdoor	
海拔高度/Altitude	m	≤2500	
环境温度/Ambient air temperature	℃	-30~+40	
相对湿度/Relative humidity	%	日平均不大于95；月平均不大于90 average of daily: less than 95%； average of monthly: less than 90%	
太阳辐射/Solar radiation	W/cm ²	0.1	
风速/Wind velocity	m/s	≤35	
地震裂度/Seismic degree	deg.	水平0.4G；垂直0.2G Horizontal 0.4G；Vertical 0.2G	
结构形式/Construction		三相共箱/Three phases in one shell	
间隔宽度/Bay width	m	1	
间隔重量/Mass	t	3~7	
检修用吊车/Crane for maintenance	吊重/Hoisting height	t	2~3
	吊高/Hoisting weight	m	>6
进出设备门/Requirement for entry	高/Height	m	>4
	宽/Width	m	>3

通用技术参数/General technical specifications

名称/Item	单位/Unit	数据/Technical specifications	
额定电压/Rated voltage	kV	126	145
额定电流/Rated current	A	1250/1600/2000/2500/3150	
额定频率/Rated frequency	Hz	50	
额定短路开断电流/Rated short circuit breaking current	kA	40	
额定短路耐受时间/Rated short circuit withstand time	s	4	
额定峰值耐受电流/Rated withstand current (crest)	kA	100	
额定工频耐受电压(1分钟) Rated power frequency withstand voltage (1 min.)	kV	230	275
额定雷电冲击耐受电压(峰值) Rated lightning impulse withstand voltage (crest)	kV	550	650
SF6气体零表压工频耐受电压 SF6 zero pressure power frequency withstand voltage	kV	1.3倍最高工作相电压 1.3 times of highest line-to-neutral voltage	
额定SF6气体压力(20℃表压)/Rated gauge pressure (20℃)	MPa	断路器: 0.6/CB camber:0.6	
		三相电压互感器: 0.5/VT camber:0.5	
		其它: 0.4/Other camber: 0.4	
SF6气体年漏气率 不大于/Annual gas leakage	%	0.5	
SF6气体水份含量 不大于/Moisture content: less than	PPm(V/V)	断路器: 150; 其它: 250 CB camber: 150; Other camber: 250	

SF6断路器/SF6 circuit breaker

名称/Item	单位/Unit	数据/Technical specifications	
额定电压 Rated voltage	kV	126	145
额定电流 Rated current	A	1250/1600/2000/2500/3150	
额定短路开断电流 Rated short circuit breaking current	kA	40	
额定短路关合电流(峰值)/Rated short circuit making current (crest)	kA	100	
额定峰值耐受电流 Rated peak value withstand current	kA	100	
额定短时耐受电流(4秒) Rated short time withstand current (4s)	kA	40	
首开极系数 First pole-to-clear factor		1.5	
额定雷电冲击耐受电压(峰值)/Rated lightning impulse withstand voltage (crest)			
对地、相间/To earth, phase to phase	kV	550	650
断口间/breaks	kV	550+103	650+118
额定工频耐受电压(有效值)/Rated power frequency withstand voltage (r.m.s.)			
对地、相间/To earth, phase to phase	kV	230	275
断口间/breaks	kV	230+73	275+84
额定短路电流开断次数/Rated short circuit breaking times	—	20	
机械寿命/Mechanical life operations	次/times	10000	
额定操作循环/Rated operating sequence	—	O-0.3S-CO-180S-CO	
合闸时间/Closing time	ms	70 ± 10	
分闸时间/Opening time	ms	30 ⁺⁵ ₋₂	

合分时间/Close-open time	ms	≤60
自动重合闸无电流间隔时间/Dead time	S	0.3
SF6气体额定表压(20℃)/SF6 gauge pressure (20℃)	MPa	0.6
SF6气体监视表压(20℃)/SF6 alarm pressure	MPa	0.55
SF6气体闭锁表压(20℃)/SF6 interlocking pressure	MPa	0.5
每台用六氟化硫气体质量/Weight of gas filled in per circuit breaker	kg	50
每台断路器质量/Weight of per circuit breaker	kg	1500
操作机构形式/Operating mechanism		弹簧机构/Spring mechanism

断路器弹簧机构/Spring mechanism of C.B.

名称/Item	单位/Unit	数据/Technical specifications
辅助回路电压/Auxiliary voltage	V	DC220/110 AC220/110
分、合闸线圈电压/Voltage of closing and opening coil	V	DC220/110
分、合闸线圈电流/Current of closing and opening coil	A	2/4
储能电动机/Motor	额定电压/Rated voltage	DC220/110 AC220/110
	正常工作电压范围/Voltage range of normal service	65%~110%
	功率/Power	450
电机储能时间/Duration of energy storing of motor	s	≥15
手动储能力矩/Movement of manual energy storing	N·M	≥20
加热器及照明回路电压/Voltage of heater and lighting circuit	V	AC220
辅助开关额定电压/Rated voltage of auxiliary switch	V	DC220/110 AC220/110
辅助开关额定电流/Rated current of auxiliary switch	A	10
辅助开关接点对数/Pairs of contacts of auxiliary switch	对/Pairs	24

隔离开关/接地开关 Disconnecter /Earthing switch

名称/Item	单位/Unit	数据/Technical specifications	
额定电压/Rated voltage	kV	126	145
额定电流/Rated current	A	1250/1600/2000/2500/3150	
快速接地关合电流(峰值) Fast earthing making current (crest)	kA	100	
额定动稳定电流(峰值) Rated dynamic stability current (crest)	kA	100	
额定热稳定电流(4秒) Rated thermal stability current (4s)	kA	40	
额定雷电冲击耐受电压(峰值)/Rated lightning impulse withstand voltage (crest)			
对地、相间/To earth, phase to phase	kV	550	650
断口间/Breaks	kV	550+103	650+118
额定短时工频耐受电压(1分钟)/Rated short time power frequency withstand voltage (1min.)			
对地、相间/To earth, phase to phase	kV	230	275
断口间/Breaks	kV	230+73	275+84
零表压工频耐受电压(5分钟) Zero pressure power frequency withstand voltage (5min.)	kV	95	109
SF6额定表压(20℃)/SF6 rated gauge pressure (20℃)	Mpa	0.4	
SF6补气表压(20℃)/SF6 gas filling pressure (20℃)	Mpa	0.35	

DS/ES弹簧机构（配快速隔离开关、接地开关）

DS/ES spring mechanism (equipped with fast disconnecter, earthing switch)

名称/Item	单位/Unit	数据/Technical specifications
电机功率/Power of motor	W	240
操作电压/Operating voltage	V	DC220/110
分、合闸线圈电压/Voltage of open and close coil	V	DC220/110
辅助接点对数/Pairs of auxiliary contacts	对/Pairs	6开 6闭 / 6 NO 6 NC
储能时间/Duration of energy storing	s	≤4
分、合闸时间/Velocitly of closing and opening	s	≤0.15

DS/ES电动机机构DS/ES motorized mechanism

名称/Item	单位/Unit	数据/Technical specifications
电机功率/Power of motor	W	240
操作电压/Operating voltage	V	DC220/110
辅助接点对数/Pairs of auxiliary contacts	对/Pairs	6开 6闭 / 6NO 6NC
分、合闸时间(含电机带电时间) Closing and opening time (motor electrified)	s	≤6

母线筒/Busbar

名称/Name	单位/Unit	数据/Technical specifications	
额定电压/Rated voltage	kV	126	145
额定电流/Rated current	A	1250/1600/2000/2500/3150	
额定动稳定电流(峰值)/Rated dynamic stability current (crest)	kA	100	
额定热稳定电流(3秒)/Rated thermal stability current (3s)	kA	40	
额定雷电冲击耐受电压(峰值) Rated lightning impulse withstand voltage (crest)	kV	550	650
额定短时工频耐受电压(60秒) Rated short time power frequency withstand voltage (60s)	kV	230	275
SF6额定表压/SF6 rated gauge pressure (20℃)	Mpa	0.4	
SF6补气表压(20℃)/SF6 gas filling pressure (20℃)	Mpa	0.35	

电流互感器/CT current transformer

电流互感器的技术参数根据具体工程选用的额定电流比、容量及精度，由双方协商确定。

Technical specifications of current transformer will be confirmed by both parties according to rated current ratio, burden load and accuracy in specific project.

电压互感器(本表所列参数供参考，具体工程采用参数由双方协商确定)

Voltage transformer (The specifications listed below is used only for reference, and the specifications adopted in specific project will be confirmed by both parties.)

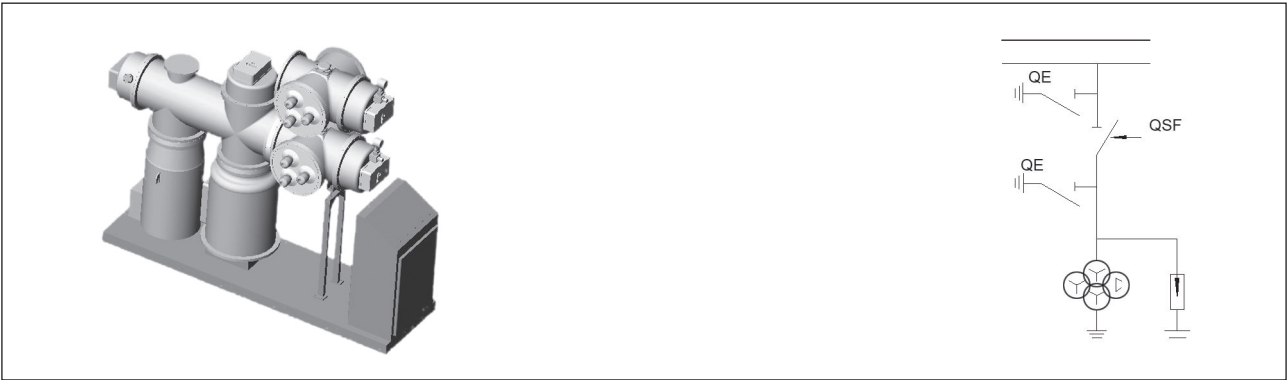
		二次绕组 I Secondary winding I	二次绕组 II Secondary winding II	剩余电压绕组 Residual voltage winding
A	额定电压V/Rated voltage V	$100/\sqrt{3}$	$100/\sqrt{3}$	100
	准确级/Accuracy	0.2	—	3P
	额定输出VA/Rated output VA	150	—	300
B	额定电压V/Rated voltage V	$100/\sqrt{3}$	$100/\sqrt{3}$	100
	准确级/Accuracy	0.5	—	3P
	额定输出VA/Rated output VA	300	—	300
C	额定电压V/Rated voltage V	$100/\sqrt{3}$	$100/\sqrt{3}$	100
	准确级/Accuracy	0.2	0.5	3P
	额定输出VA/Rated output VA	50	150	300
D	额定电压V/Rated voltage V	$100/\sqrt{3}$	$100/\sqrt{3}$	100
	准确级/Accuracy	0.2	0.5	3P
	额定输出VA/Rated output VA	75	120	300
E	额定电压V/Rated voltage V	$100/\sqrt{3}$	$100/\sqrt{3}$	100
	准确级/Accuracy	0.5	3P	3P
	额定输出VA/Rated output VA	150	300	300
F	额定电压V/Rated voltage V	$100/\sqrt{3}$	$100/\sqrt{3}$	100
	准确级/Accuracy	0.2	3P	3P
	额定输出VA/Rated output VA	75	120	300

避雷器/Surge arrester

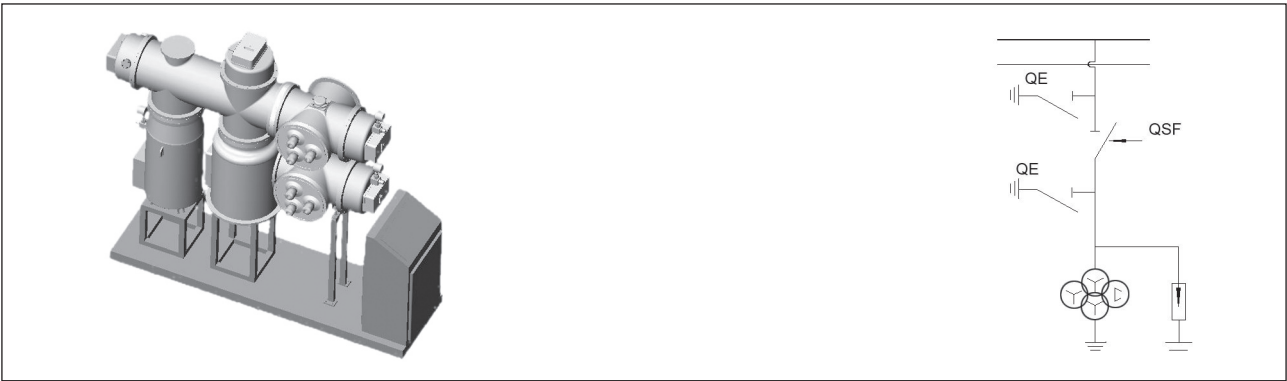
技术要求/Item	单位/Unit	技术参数/Technical specifications			
系统最高工作电压(有效值)/Highest service voltage (r.m.s.)	kV	126			
避雷器额定电压(有效值)/Rated voltage (r.m.s.)	kV	96	100	102	108
标称放电电流(8/20 μs)/Normal discharging current (8/20 μs)	kA	10			
避雷器持续运行电压(有效值) Continuous operating voltage (r.m.s.)	kV	75	78.7	9.6	84.2
陡波冲击电流10kA下残压(峰值) Steep current impulse residual voltage, 10kA (crest)	kV	≤280	≤291	≤297	≤315
雷电冲击电流10kA下的残压(峰值) Lightning impulse residual voltage, 10kA (crest)	kV	≤250	≤260	≤266	≤281
操作冲击电流残压(峰值) Switching impulse residual voltage (crest)	kV	≤213	≤221	≤226	≤239
直流1mA参考电压 Reference voltage at D.C. 1mA (kV, crest)	kV	≥140	≥145	≥148	≥157
2ms方波冲击耐受电流20次(峰值) Rectangular impulse withstand current twenty times in 2ms (crest)	A	800			
1.1倍持续运行电压下局部放电量 Partial discharge quantity under 1.1 times of continuous service voltage	PC	≤5			
雷电冲击耐受(峰值)/Lightening impulse withstand voltage (crest)	kV	550			
工频1min耐受(有效值) Power frequency withstand voltage for 1min. (r.m.s.)	kV	230			

四、标准间隔/IV Module Bay

保护间隔1/Protection bay 1



保护间隔2/Protection bay 2



电缆进出线间隔1/Cable incomer/feeder bay 1



电缆进出线间隔2/Cable incomer/feeder bay 2



电缆进出线间隔3/Cable incomer/feeder bay 3



母联间隔/Busbar coupler bay

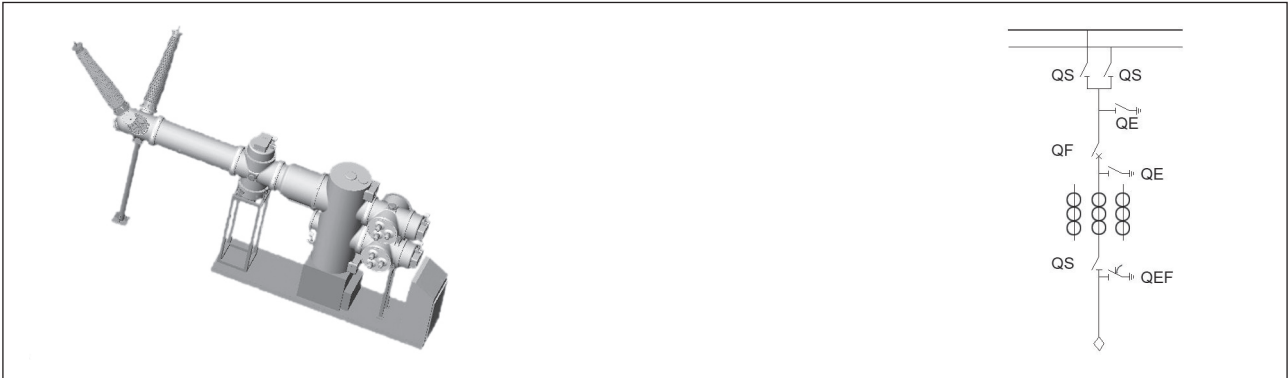


双母线套管进出线间隔1/Bushing incomer/feeder bay of double busbar 1



双母线套管进出线间隔2/Bushing incomer/feeder bay of double busbar 2





六、订货须知

1. 客户先提供准确的主结构线图，注明各元件的必要技术参数、进出线方式和相序、进出线间距及各元件的电气联锁表。若有特殊要求，如外壳颜色、操作电源、辅助触点数量等应一并提出。
2. 双方进行技术协商，以便就结构、布置等技术问题加以讨论和确认。此后，即可签定合同。
3. 签订合同的同时，应一并确定客户所需的辅助设备的品种和数量、设备运输方式等事项。
4. 签合同后，我公司进行方案设计，并向客户提供必需的土建设计资料和二次设计资料，双方确认上述资料后，分别进行施工设计，并及时交换必要的图纸和磋商。双方紧密配合，保证工程的顺利进行。

VI Instructions for placing orders

1. The users should firstly provide a detailed main wiring diagram indicating the necessary parameters of each component, method and phase sequence as well as interval of incoming and outgoing wiring, electrical interlocking meter of each component. If there are any special requirements, such as color of paint, power supply for operation, numbers of auxiliary contacts, and so on, they should be pointed out along.
2. Both parties should have technical consultation so as to conduct discussion and make confirmation on the structure, layout and

other technical issues. Only this, can they sign a contract.

3. When signing a contract, the following items should be confirmed: types and components of auxiliary equipment, mode of transportation etc.
4. After signing a contract, we are responsible for the solution design and providing customers with the necessary materials on civil engineering design and secondary design. After both parties confirm the above-mentioned materials, they shall start construction and design, respectively, and timely exchange the necessary drawings and have consultation. Both parties should work together so as to ensure the project can proceed smoothly.

提示:

本说明书所涉及的内容，包括文字、图形、参数等，如做任何修改，恕不另行通知！

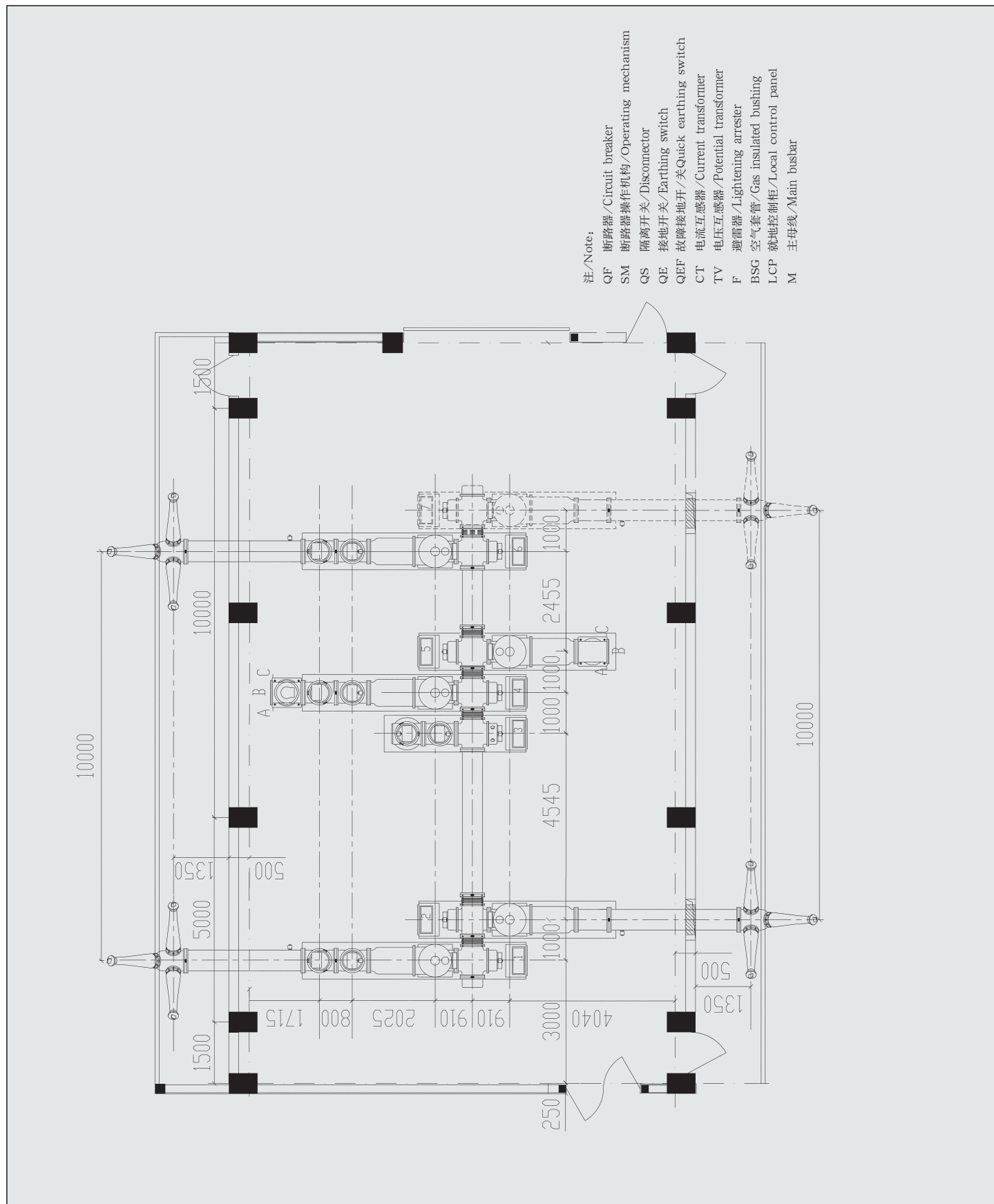
注意人身健康与安全，加强环境保护，做好包装物及废弃物的处理！

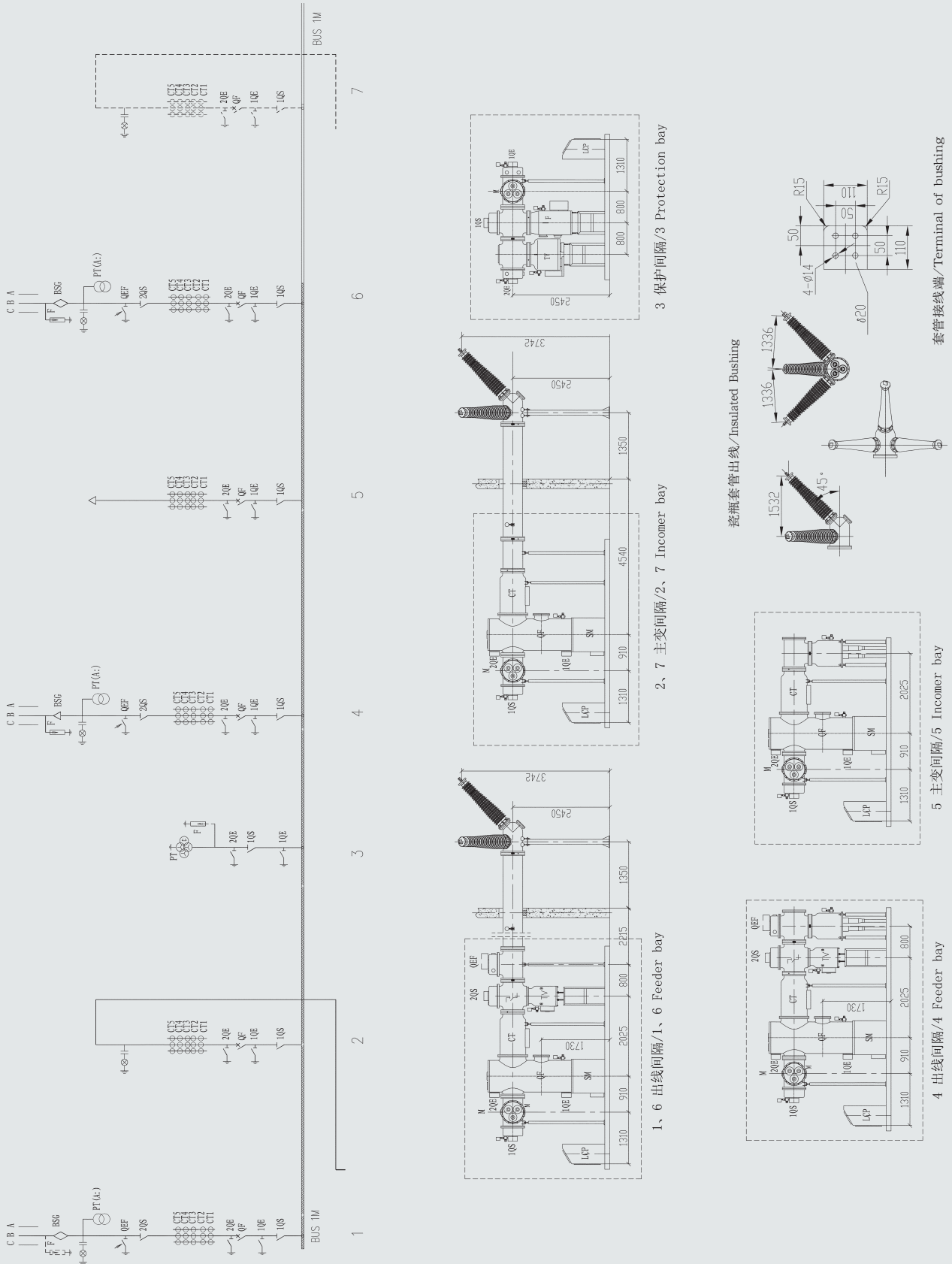
Note: All the contents covered in this specification, including words, diagram, parameters etc, can be modified without prior notice.

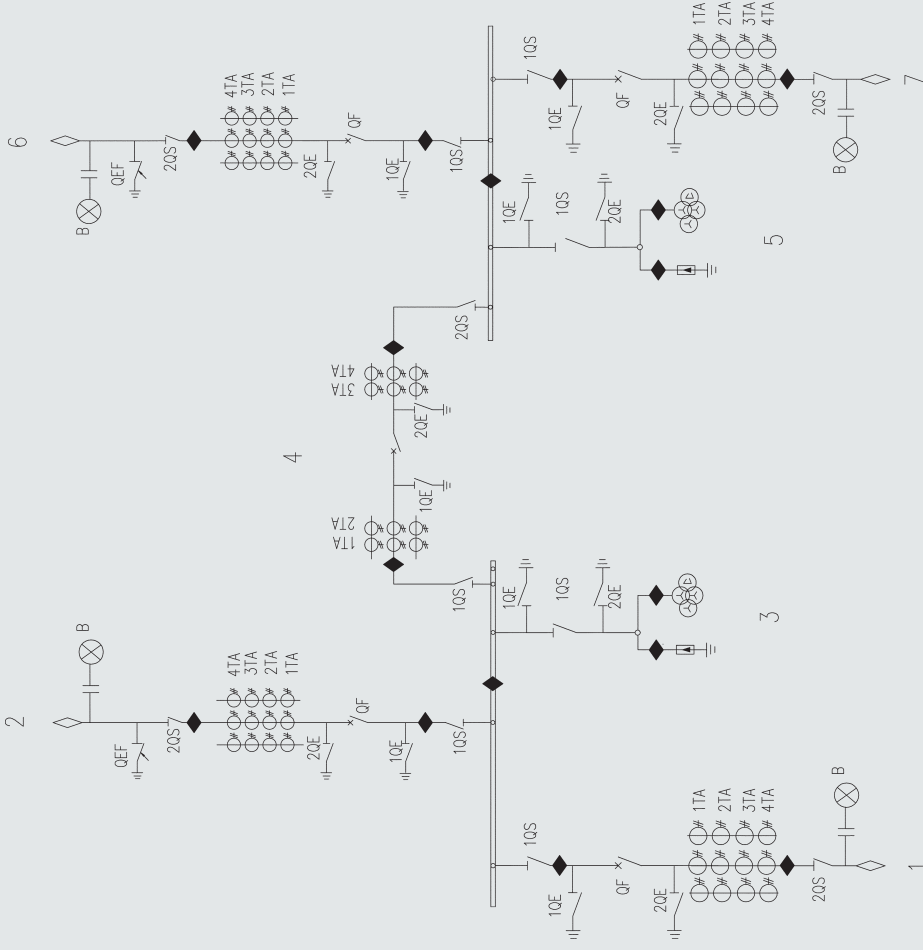
Sweet hint: Attach importance to human health & safety. Strengthen environment protection. Properly dispose of the wrapped and wastes.

五、工程实例 / V Project example 1

1. 工程实例1 / Project example 1

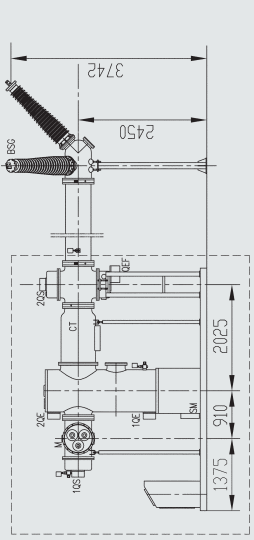




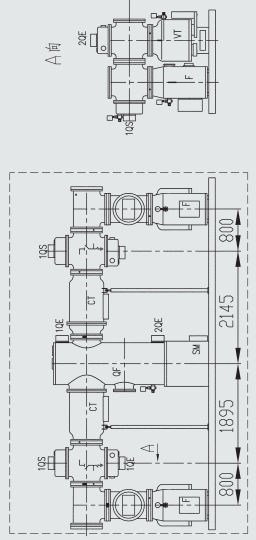


注/Note:

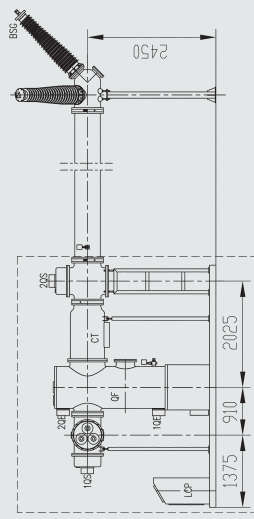
- QF 断路器/Circuit breaker
- SM 断路器操作机构/Operating mechanism
- QS 隔离开关/Disconnecter
- QE 接地开关/Earthing switch
- QEF 故障接地开/关Quick earthing switch
- CT 电流互感器/Current transformer
- TV 电压互感器/Potential transformer
- F 避雷器/Lightening arrester
- BSG 空气套管/Gas insulated bushing
- LCP 就地控制柜/Local control panel
- M 母线/Main busbar



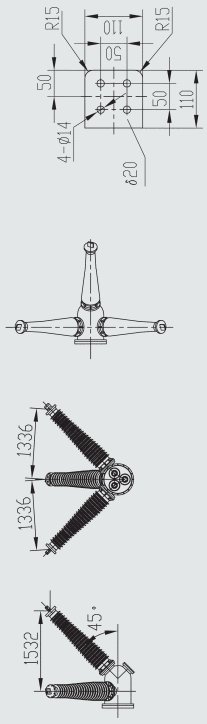
2.6 间隔/2.6 Bay(s)



3.4,5 母联保护间隔/Busbar protection bay(s)

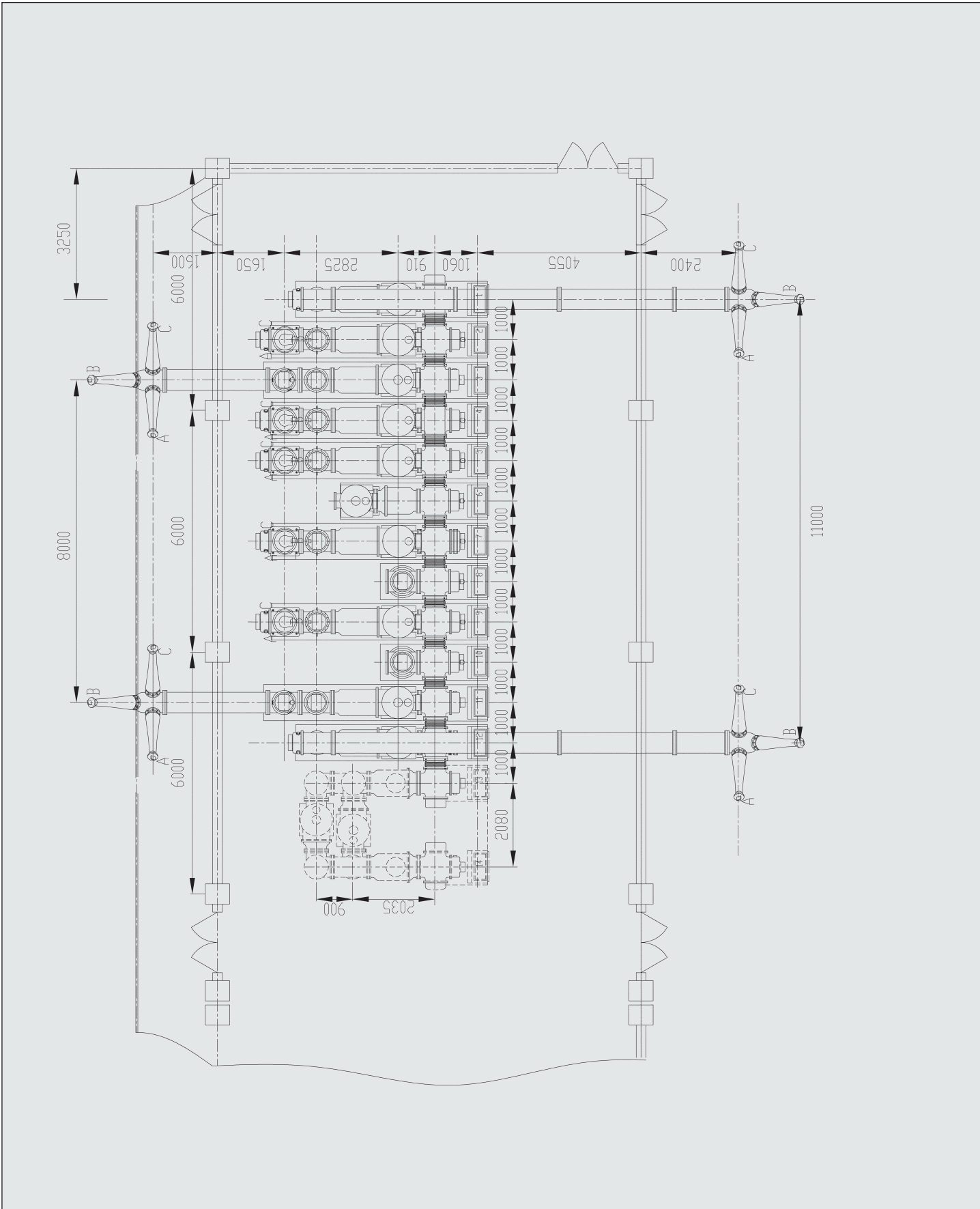


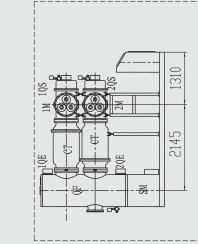
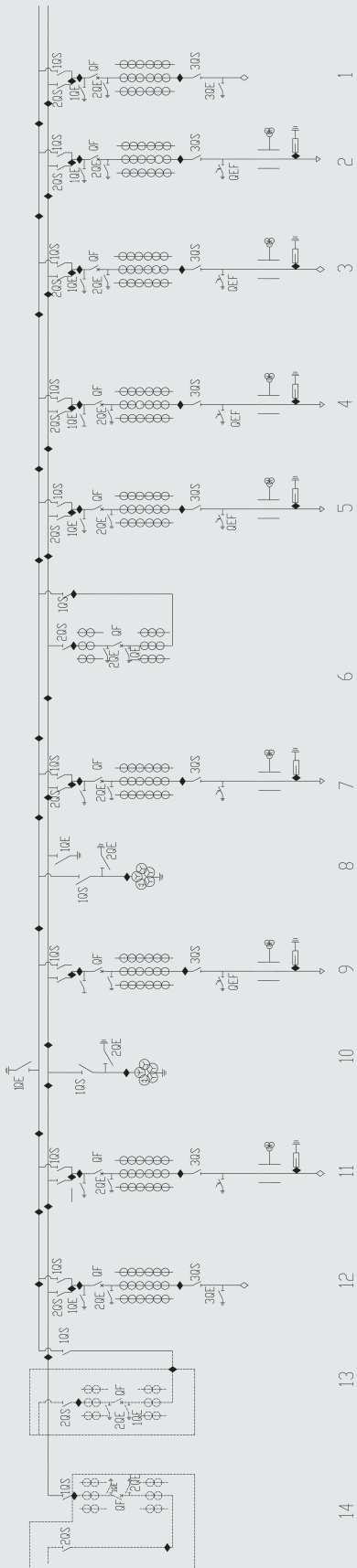
1.7 间隔/1.7 Bay(s)



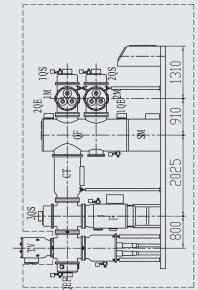
瓷瓶套管出线/Insulated Bushing
套管接线端/Terminal of bushing

3. 工程实例3 // Project example 3

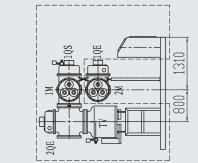




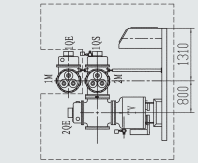
6 母联间隔/6 Busbar coupler bay



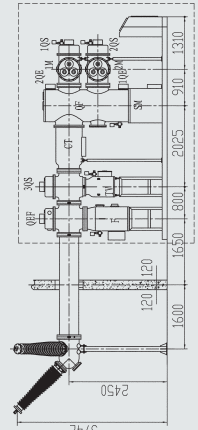
2.4.5.7.9 Feeder/Cable incomer bay



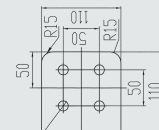
8 保护间隔/Protection Bay



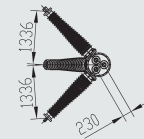
10 保护间隔/Protection Bay



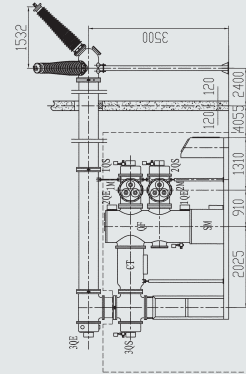
3.11 出线套管间隔/Bushing feeder bay(s)



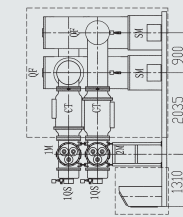
套管接线端
Terminal of bushing



瓷瓶套管出线
Insulated Bushing



1.12 主变进线间隔/Feeder bay(s)



13 间隔/Bay

- 注/Note:
- QF 断路器/Circuit breaker
 - SM 断路器操作机构/Operating mechanism
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 - QE 接地开关/Earthing switch
 - QEF 故障接地开/关Quick earthing switch
 - CT 电流互感器/Current transformer
 - TV 电压互感器/Potential transformer
 - F 避雷器/Lightening arrester
 - BSG 空气套管/Gas insulated bushing
 - LCP 就地控制柜/Local control panel
 - M 主母线/Main busbar