

# SHVS

XGN55-40.5kV

气体绝缘金属封闭开关设备(C-GIS)



**沈阳高压成套开关股份有限公司**

SHENYANG HIGH VOLTAGE COMPLETE SWITCHGEAR Co.,Ltd

## 简介

沈阳高压成套开关股份有限公司（原沈阳高压成套开关厂）在八八年被国务院授予“国家二级企业”的称号。是国家定点生产 35KV 及以下金属铠装高、低压开关柜、组合式抽屉开关柜和气体绝缘金属封闭式开关柜的国家大中型专业生产企业。是为大型发电厂、变电站、轨道交通、城乡电网、石油、化工、钢铁、大型建筑提供无污染、免维护成套电器设备制造企业。

我公司被中华人民共和国科学技术部定为“国家 863 计划应用示范企业”及“全国 CAD 应用工程示范企业”，企业全面实现了 ERP 管理、先后投资设备引进，拥有国内第一套世界顶级芬兰“FINN POWER SG5”18 轴数控液压柔性面板冲、剪联合加工单元和意大利“BC2550”26 轴数控液压柔性面板折弯单元，实现了敏捷制造。产品受控于严密的质量保证体系---世界三大认证机构之一挪威船级社（DNV）ISO9001 质量管理体系、14001 环境管理体系认证。产品不但占据国内市场而且远销孟加拉、苏丹、塞内加尔、美国、马尔代夫等国，其中孟加拉大达卡输变电工程为国家创汇 1385 万美元。

国内首家研制生产具有自主知识产权的 XGN55-40.5kV 气体绝缘金属封闭开关设备（C-GIS）在南京地铁招标项目中一举中标。打破了地铁项目长期由国外产品垄断的局面，相续中标深圳地铁、沈阳地铁、重庆地铁和大连地铁等，成为国内唯一能与国外同类产品抗衡的供电设备。

沈阳高压成套开关股份有限公司全体员工团结拼搏、开拓进取、为实现轨道交通供电设备国产化、发展民族工业、壮大国民资本、作出巨大贡献。

## Summary and Framework

Shenyang high voltage complete switchgear Co.,Ltd is the National Second Grade Enterprise in 1988. It is a specialized works approved by State Ministry of Machine-building and Ministry of Energy Resource in manufacturing instrument of the 35KV and below Hi-Voltage Switchgear and Lo-Voltage Switch Cabinets, it's Medium-sized Enterprise by State, the products has served in power station, substation, electric railway, underground, power system, Petroleum-Chemical, iron, building .

We are “State 863 plan CIMS Demonstration Enterprise 、State CAD Application Demonstration Enterprise”, and now it has computer-controlling machines and other advanced equipment imported from Italy, South korea, switzerland,Finland including the first Shear Genius 5 Flexible Management System(FMS) and Automatic Bending Cell BC2550 and CNC Busbar Poressing machine and Surface Treatment Line and Static Electron Plating Line and Computerized Intergement Design 3D System Processing Center which have achieved the advanced levels in China. The enerpriase had been certified ISO 9001 and 14000 International Quality Certification by DNV (Norway) and Lloyd's Register Quality Assurance Limited (England). which are sold well through the country many of them are exported to Bengal ,Burma and Maldf etc. the enterprise gained \$ 13,850,000 US dollar for state as Bengal DESA substation project.

## 一、综述

XGN55-40.5kV(Z)气体绝缘金属封闭开关设备(简称C-GIS)是我公司引进国外先进技术,根据我国电网的特殊性而研制生产的高品质产品。其部分技术性能、指标均高于国外同类产品。首家通过国家级“CMA”检测中心产品型式试验和产品鉴定,并由国家行业归口部门授予型号颁发证书及型号使用证书。此设备适用于所有输配电系统作为单、双母线接受和分配电能。在系统正常运行和故障情况下实现控制、测量及监控。与其它产品在技术性能、经济适用性等方面综合比较优势显著。该产品符合 IEC60298、IEC60480、IEC60056、DL/T791、GB3906、GB311.1、GB1984、GB11022、GB6162、GB12022、DL404 等标准。

### 1.1、环境条件:

- 1.1.1、周围空气温度:最低温度-40°C,最高温度 60°C,24 小时日平均气温不超过 45°C。
- 1.1.2、海拔高度:不超过 5000 米。
- 1.1.3、相对湿度:日平均值不大于 95%;月平均值不大于 90%。
- 1.1.4、地震烈度:不超过 8 度。
- 1.1.5、污秽等级:适用于污秽Ⅲ级和凝露场所。

### 2.1、产品特点:

2.1.1、模块化设计:将相同的高压元件组成若干标准模块。通过模块组合可以满足各种单、双母线的接线要求,可根据要求进行扩展且不涉及 SF<sub>6</sub>气体的任何操作。相同规格的零部件互换性强便于维修。

2.1.2、高压电器元件密闭于各自独立的 SF<sub>6</sub>气室中,额定充气压力 0.05Mpa。最低运行压力 0.03Mpa(已通过型式试验的产品是在最低运行气压 0.03Mpa 的试验条件下进行的),SF<sub>6</sub>气室材质为不锈钢,采用激光自动焊接机焊接而成。可开启的不锈钢气室盖板为凹槽式结构,镶长效密封胶圈密封。气体年泄漏率<0.1%,气密性可保持 40 年不补气。全寿命周期为 40 年,产品为免维护,但又具备可维护的性能,符合国情(此技术为我公司专利技术)。

2.1.3、各功能单元与真空断路器及三工位隔离开关的操作机构等采用三维设计(CAD)和辅助工程设计(CAE)进行动态最优化的应力分析,解决了间隙中的最小和最大摩擦或弹力因素所产生的影响,简化结构,减少运动零部件的数量及部件间的摩擦。诠释了“简单”就是可靠的新观念。

- 2.1.4、采用三工位隔离开关,实现合、分、接地三种功能,结构紧凑,实现了一机多能。
- 2.1.5、电缆用 T 形电缆插头或一字电缆插头连接,适用多根电缆进、出线。
- 2.1.6、与气箱一体化 3AHx(灭弧室垂直安装)真空断路器具有高机械与电气寿命、免维护等性能。
- 2.1.7、具有独特的符合我国电力系统必备的五防机械联锁和电气联锁功能与运行状态显示功能。

2.1.8、采用智能型二次控制和保护系统,对开关进行操作、测量及监控。减少了维护成本,增强了系统的可靠性。

## Summarize

XGN55-40.5kV(Z) Compact Gas-insulated Metal Enclosed Switchgear (as for GIS) is our factory's high quality production according to the particularity of our national electricity network and introduced by advanced technology from foreign country. The partly technique performance and guideline of Switchgear is over to the same one compare with foreign productions. We have passed the national production appraisal and award the production model, certificate and production model certificate by the Department of National Industry.

The Switchgear is used to the power plant and its distribution electricity system act as single and double busbar to accept and distribute the electricity energy. It carry out control measure and inspection. It shows a remarkable advantage compared with the other production on the technique performance and economy applicability.

The switchgear is carry out the standard of national and industry line such as GB3906、GB311.1、GB1984、GB11022、GB6162、GB12022、DL404、DL/T791, etc.

### 1、Service condition:

- (1) Ambient temperature:  $-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$ .
- (2) Altitude:  $-2000\text{m} \sim +5000\text{m}$ .
- (3) Humidity: Not higher than 95% in 24 hours.
- (4) Earthquake intensity: Not over to 8 degree.
- (5) Dirtiness Degree: suitable to 3 degree and dew.

### 2、Characteristics

- (a) Modularization design, put the same high pressure components into the same standard module. It is satisfied to the versatility requirement of single and double busbar connection. It can expand the connection according to the requirment and no need to any operation of SF6 gas. At the same time the parts of the same compartment have a strongly interchange and easy to servicing.

- (b) The pressure components is sealed in each independent SF<sub>6</sub> gas room. Its rating charge pressure is 0.04 Mpa. The lowest running pressure is 0.03 Mpa. (The passed model test production is processing in the condition of lowest running air pressure 0.03 Mpa test.) . The material of SF<sub>6</sub> chamber is made of stainless steel which jointing by laser automatically. The active chamber cover is a frame of groove style and inlay long effect seal loop imported from Japan.

Annual air leak rate is less of than 0.1%.No need to fill air at gas denseness till 40 years. A period of life is 40 years. It is realize to free-maintenance and maintenance in need. It is accord with national situation ( This technology is our factory's patent).

- (c) The operation organ of each function unit, vacuum and three work position insulate switch is adopt of CAD and CAE design and have a optimization dynamic stress analyze.

It has solved least and most friction and bounce factor in clearance and simple the structure and reduce the friction between the quantity of move parts and components. Annotation a simple is the reliable new concept.

- (d) Adopt of three work position insulate switch to realize three functions of open, close and earthing. Its structure gather together and be realized one machine multi-functions.

- (e) The cable is jointing with T shape cable plug or 一 shape cable plug which of suitable to multi-pieces ingoing and outgoing cable line.

- (f ) The whole-system Siemens3AHx (Upright of installation) vacuum breaker have a character of long life mechanism and electric.

- (g) Be provided with necessary five-protection force mechanism interlocking and move state display function accord with national electric power system.

- (h) The intelligentized secondary system could control and protection unit self to carry out all the operation of opening and closing.

And shows all running state and measurement of equipment. Assure its real time monitor and inspection, reduce the maintenance cost and enforce the dependability of system.

### 3. 产品优势：

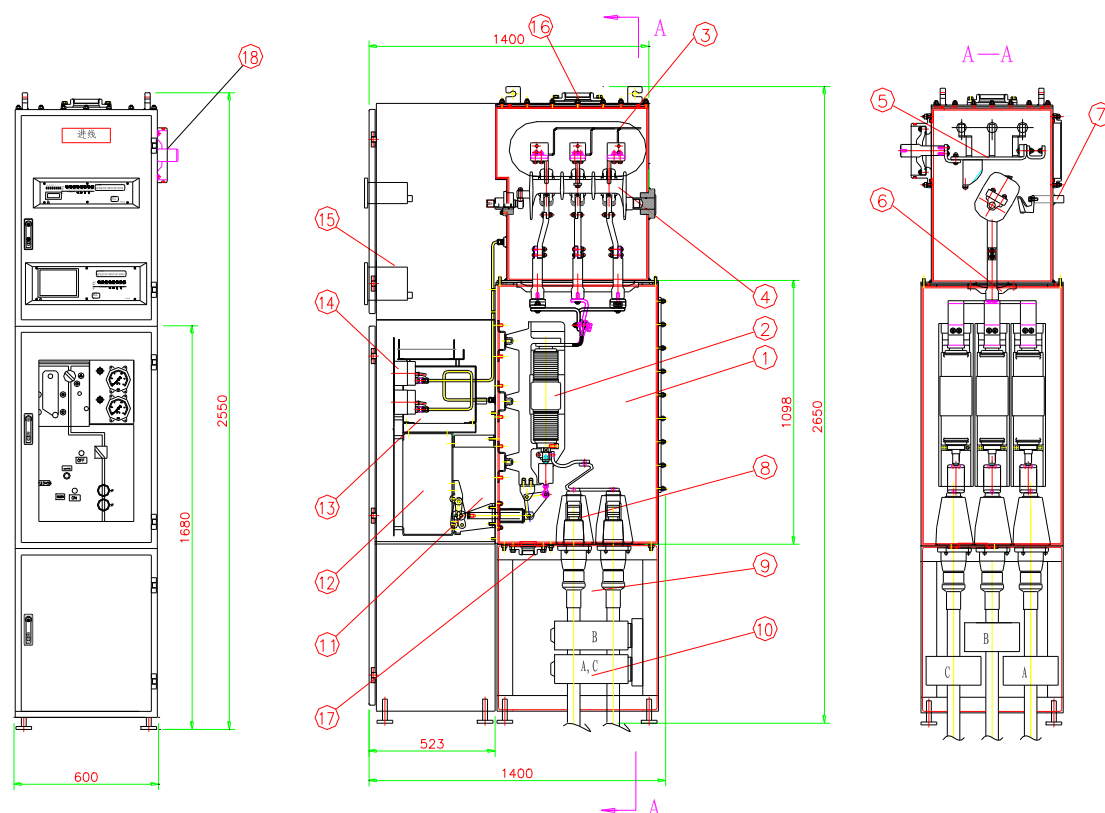
安全性	<p>安全型设计，防止柜内气体的泄露和吸湿。（防护等级为 IP67）</p> <p>符合电力系统要求，必备的机械五防联锁和电气联锁，有效的防止误操作。</p> <p>各自独立功能的任一单元小室发生内部故障，仍可确保系统安全运行。</p> <p>附有可以确认各功能单元在各种运行状态的指示功能。</p> <p>当发生燃弧时，确保操作者的安全。（内部压力增高时，自动释压）</p> <p>机械寿命：30,000 次</p> <p>电寿命：额定电流下开断次数 10,000 次</p> <p>额定短路开断电流 50 次（详见型式试验报告）</p> <p>零表压下可安全运行。</p>
经济性	<p>三维辅助设计（CAD）和辅助工程优化设计(CAE)，对产品进行了动态分析、最优化的应</p> <p>力分析和热分析，产品为免维护型具有可维护功能，节省运营费用。</p> <p>简单的设计理念，使产品结构紧凑、减小体积、节省占地面积、节省土建投资。</p>
适用性	<p>运行方式灵活分单母线，双母线布置方式详见一次系统图。</p> <p>环境适应性强，最低-40℃, 最高+60℃，湿度 95%。</p> <p>不受环境影响，高海拔：5000m 以下，低海拔： -2000m 以上。</p> <p>气箱全封闭式，适用于各种恶劣工业运行环境，如：III污秽、凝露等场所。</p> <p>独特的安装底脚可调整性，根据现场情况灵活移动柜体，不受安装基础的局限。</p> <p>比现有的封闭配电柜重量更轻（仅为现有开关柜的 1/3 左右）。</p> <p>比现有的封闭式配电柜体积更小（体积是 1/4，占地面积是 1/5）。</p> <p>配用数字化智能仪表，显示多样化，同时也可实现四遥与通讯的实时监控功能。</p>

### 3. Production advantage

Safety	<p>With air leakage protection and humidity exhausting, safe type design ( IP67)</p> <p>Essential mechanical and electrical 5 –protection interlocks to protect form mis-operation.</p> <p>Under trouble condition in any compartment the whole system can run safely.</p> <p>With indicators to show the running states of each unit.</p> <p>Operator protection under air leakage condition (automatic pressure reduction as inner pressure raises.)</p> <p>Mechanical life:30,000 times</p> <p>Electrical life:10,000 times</p> <p>Tripping with rated short circuit current: 50 (see the test report for detail)</p>
Economy	<p>Design with 3-dimension CAD and CAE. Dynamic and optimum tension analysis and heat analysis. Becoming maintain-free and low cost.</p> <p>Simple design concept.; compact and minimized; less room occupation; low foundation construction cost.</p>
Suitability	<p>Applicability: Active running method such as single basbar and double basbar, please see the primary plan about its disposal method.</p> <p>Strongly condition adaptability. From <math>-40^{\circ}\text{C}</math> to <math>+60^{\circ}\text{C}</math>.humidity 95%.</p> <p>Not in effect of the condition. High altitude is below 5000m and low altitude is above -2000m.</p> <p>Complete closed air chamber and suitable to all bad industry running condition such as the place of III degree dirtiness and dew. etc.</p> <p>Special adjustable mounting basement; box easy moveable; unlimited by foundation.Lighter than normal metal-clad switchgear (1/3 weight of the normal one)</p> <p>Smaller than normal one.(1/4 of the normal one in size;1/5 of normal one in occupation)</p> <p>With intelligent meters; multi-display; meanwhile can also carry out 4 remote control and real time monitoring.</p>

## 二、 产品结构及主要技术参数 Construction and main technical data

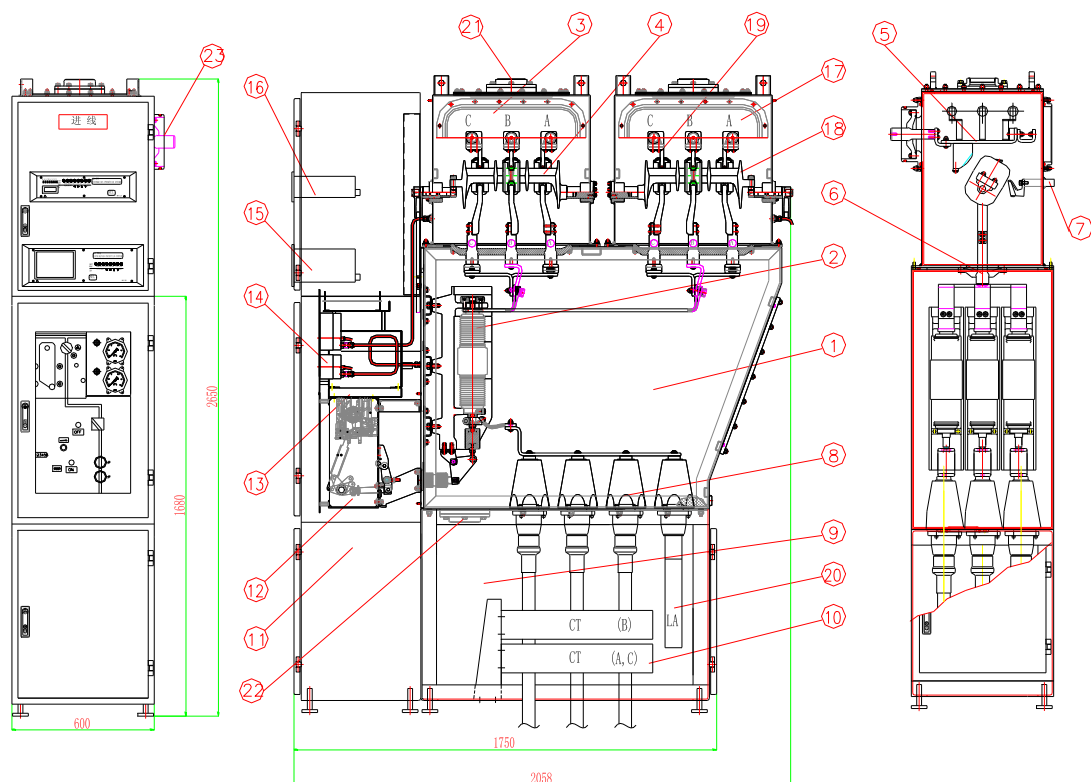
### 1、 GIS 单母线开关柜结构图 Single busbar construction diagram



- |    |             |   |
|----|-------------|---|
| 1  | 断路器气箱       | VCB gas compartment   |
| 2  | 真空灭弧室       | Vacuum  |
| 3  | 母线及隔离开关气箱   | Bus and switch gas compartment                                |
| 4  | 三工位开关       | Three position switch   |
| 5  | D 型母线       | D type bus  |
| 6  | 环脂环氧绝缘导套    | Epoxyresin insulator tube                                     |
| 7  | 接地母线        | Earth bus   |
| 8  | 插拔式电缆头      | Cable terminal plug-in  |
| 9  | 电缆室         | Cable compartment   |
| 10 | 电流互感器       | CT  |
| 11 | 机构室         | Mechanism compartment   |
| 12 | 断路器操作机构     | VCB operation mechanism                                       |
| 13 | 三工位开关操作机构   | Three position switch operation mechanism                     |
| 14 | 密度表         | Densimeter  |
| 15 | 综合保护测控装置    | Auto protection   |
| 16 | 三工位开关气箱泄压装置 | Three position switch gas compartment pressure release device |
| 17 | 断路器气箱泄压装置   | VCB gas compartment pressure release device                   |
| 18 | 干式母线开关柜连接装置 | Dry bus switchgear connection device                          |



## 2、GIS 双母线开关柜结构图 Double busbar construction diagram



- |    |              |   |
|----|--------------|---|
| 1  | 断路器室         | VCB compartment   |
| 2  | 真空灭弧室        | Vacuum  |
| 3  | I 段母线三工位开关室  | I section bus and three position switch compartment           |
| 4  | I 段三工位开关     | I section three position switch                               |
| 5  | D 型母线        | D type bus  |
| 6  | 环脂环氧绝缘导套     | Epoxyresin insulator tube                                     |
| 7  | 接地母线         | Earth bus   |
| 8  | 插拔式电缆头       | Cable terminal plug-in  |
| 9  | 电缆室          | Cable compartment   |
| 10 | 电流互感器        | CT  |
| 11 | 下仪表室         | Meter compartment below                                       |
| 12 | 断路器操作机构      | VCB operation mechanism                                       |
| 13 | 三工位开关操作机构    | Three position switch operation mechanism                     |
| 14 | 密度表          | Densimeter  |
| 15 | 综合保护测控装置     | Auto protection meter device                                  |
| 16 | 光纤差动保护装置     | Different protection device                                   |
| 17 | II 段母线三工位开关室 | II section bus and three position switch compartment          |
| 18 | II 段三工位开关    | II section three position switch                              |
| 19 | D 型母线        | D type bus  |
| 20 | 可触摸插拔式避雷器    | Surge arrester plug-in(can be touched)                        |
| 21 | 三工位开关气箱泄压装置  | Three position switch gas compartment pressure release device |
| 22 | 断路器气箱泄压装置    | VCB gas compartment pressure release device                   |
| 23 | 干式母线开关柜连接装置  | Dry bus switchgear connection device                          |

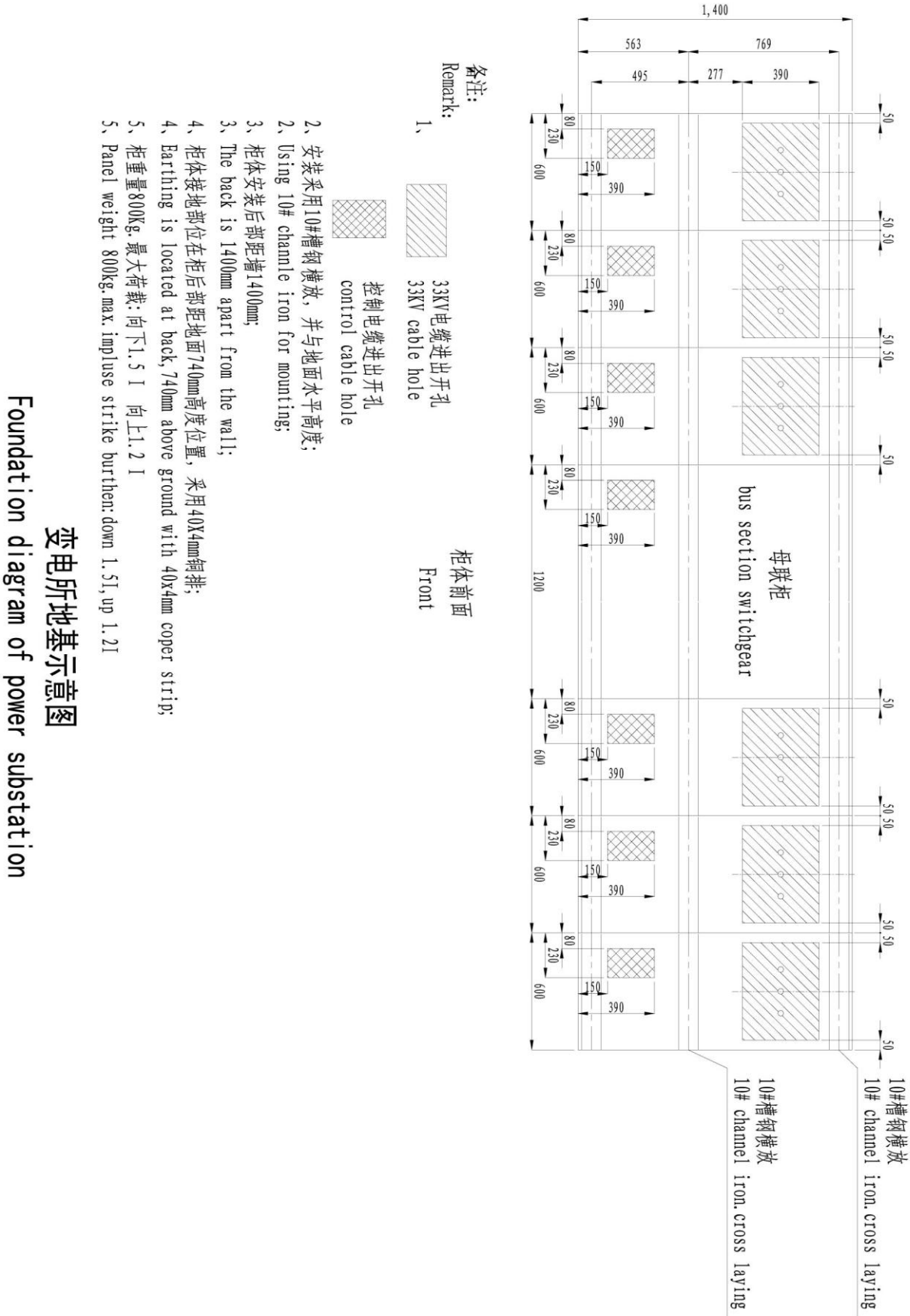
## 3、主要技术参数 Technical data

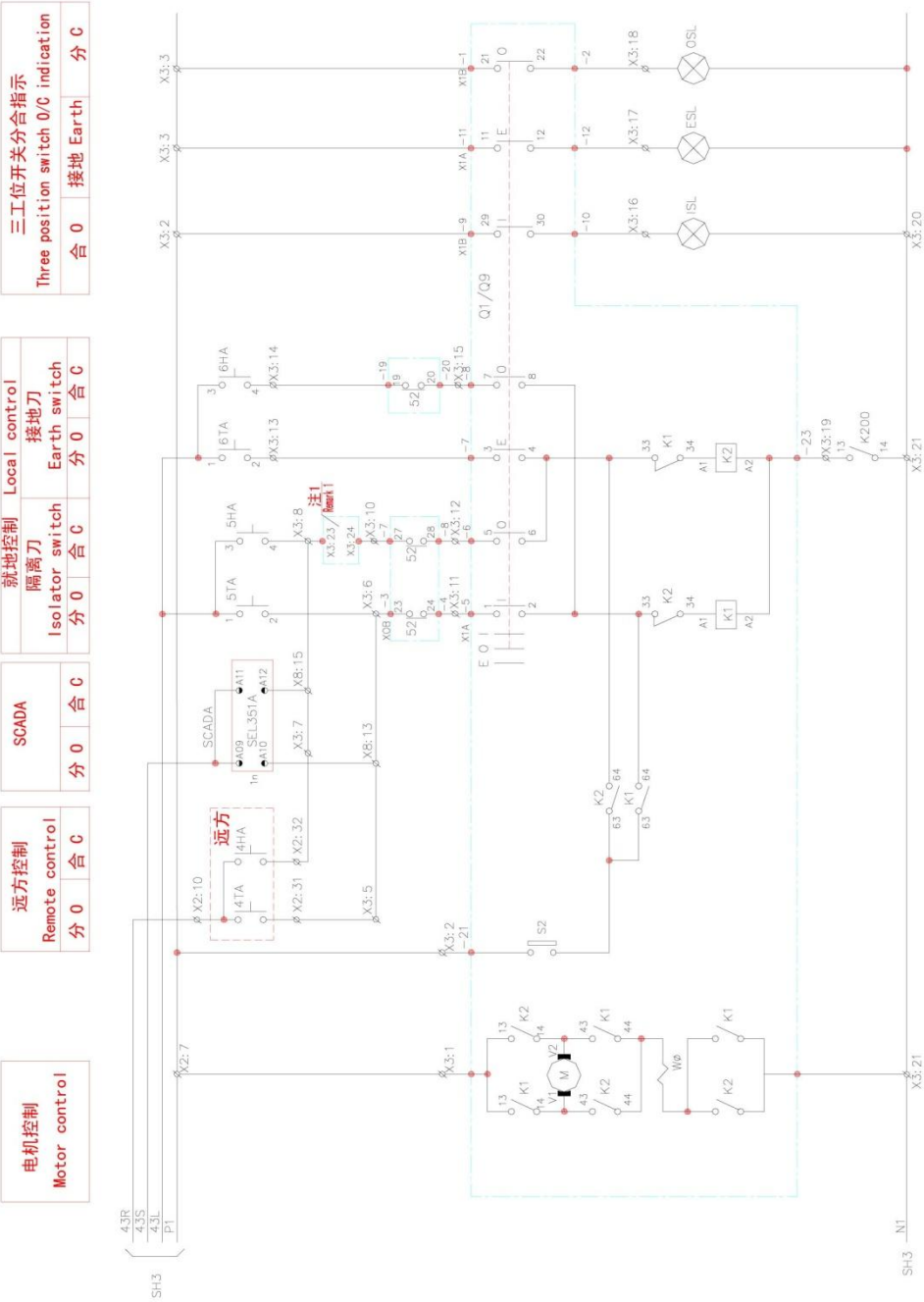
项 目 Items		单位 unit	XGN55-40.5KV (C-GIS)
额定电压	Rated voltage	KV(有效值) (r.m.s)	33
额定电流	Rated current	A	630/1250/1600/2000/2500
额定频率	Rated frequency	HZ	50/60
额定短时工频耐受电压 Short time Withstand Voltage Ud (Imin )	相间, 相对地 Phase to phase, Phase to earth	KV(有效值) (r.m.s)	118
	隔离断口 Open contacts	KV(有效值) (r.m.s)	118
额定雷电冲击耐受电压 lighting impulse withstand voltage Ud	相间, 相对地 Phase to phase Phase to earth	KV(峰值) (peak)	218
	隔离断口 Open contacts	KV(峰值) (peak)	218
额定短路开断电流 Rated short circuit interrupting current		KA	25/31.5/40
额定短路关合电流 Rated short circuit making current.		KA	63/80/100
额定短时耐受电流 Rated short time current.		KA	25/31.5/40
额定短时耐受时间 Rated short time duration		S	4
额定峰值耐受电流 Rated peak withstand current		KA	63/80/100
外壳防护等级 Closure protection grade.			充气壳体 IP67, 仪表室 IP42 Air compartment : IP67 Meters compartment: IP42
年漏气率 Air leakage/year		%	≤0.2
每相主回路电阻 Resistor/phase		μ Ω	≤250
额定气箱内充气压力(20℃时表压) Rated air pressure(under 20℃)		Mpa	0.05
气箱内最低运行压力(20℃时表压) Rated min.air pressure(under 20℃)		Mpa	0.03
机械寿命 Mechanical life	额定操作顺序 Operating order		O-0.3s-CO-180s-CO
	额定操作次数 Number of operation	次 times	30,000
电寿命 Electrical life	额定短路开断电流 Rated short circuit Interrupting current.	次 times	50
	额定电流下开断 Rated current interrupting	次 times	10,000
额定控制电压 Rated control voltage		V	DC110/220
重量 Weight		Kg	800Kg
外形尺寸 Dimension(W x D x H)		mm	600X1,400X2,550

### 三、方案图 Scheme diagrams

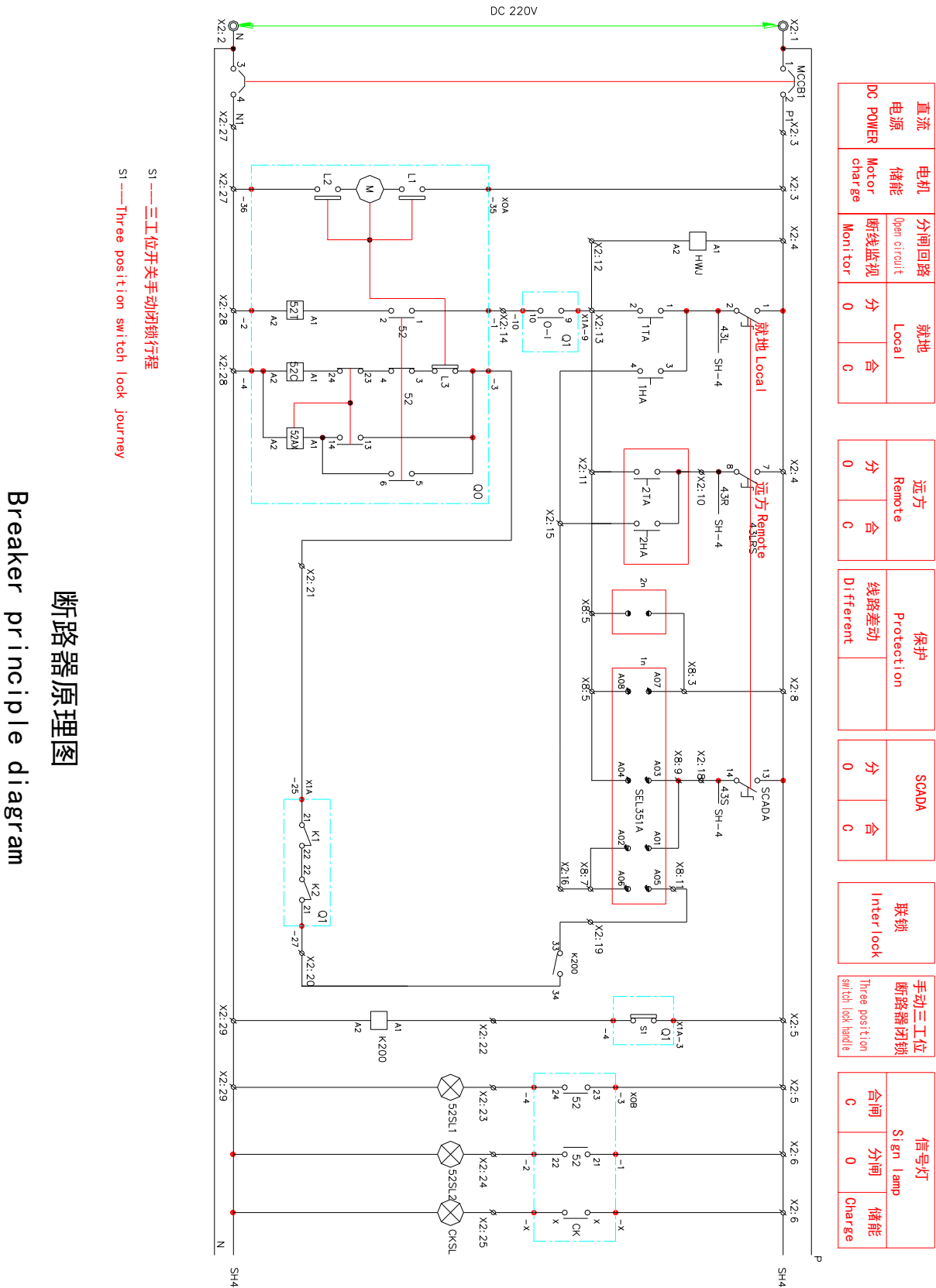
方 案 图 Scheme diagrams	01	02	03	04	05	06
主接线图 Single line diagram						
主要电器设备						
三工位隔离开关 Three position switch	2	1	1	1	1	1
断路器 VCB	1	1	1	1	1	1
电流互感器 CT	3	3	3	3	3	3
高压熔断器 HR						
电压互感器 PT					3	
避雷器 MO						3
柜体尺寸(宽*深*高) Dimension (WxDxH)	600*1750*2550	600*1400*2550	700*1400*2550	700*1400*2550	600*1400*2550	600*1400*2550
额定电流 (A) Ie	630~2000	630~2000	630~2000	630~2000	630~2000	630~2000
用途 Use	上隔离双母线 double bus insulator above	上隔离出线 outgoing insulator above	下隔离进线 incoming insulator below	下隔离出线 outgoing insulator below	进(出)线+PT incoming(outgoing)+PT	进(出)线+避雷器 incoming(outgoing)+arrester

方 案 图 Scheme diagrams	07	08	09	10	11	12
主接线图 Single line diagram						
主要电器设备						
三工位隔离开关 Three position switch	1	2	1	2	1	1
断路器 VCB	1	1	1	1		
电流互感器 CT	3	3	3	3		
高压熔断器 HR		3			3	3
电压互感器 PT		3			3	3
避雷器 MO	3	3				3
柜体尺寸(宽*深*高) Dimension (WxDxH)	700*1400*2550	1200*1400*2550	1000*1400*2550	1200*1400*2550	600*1400*2550	800*1400*2550
额定电流 (A) Ie	630~2000	630~2000	630~2000	630~2000	630~2000	630~2000
用途 Use	进(出)线+避雷器(下方) incoming(outgoing)+arrester (below)	进线+PT+避雷器 incoming+PT+arrester	上进线 incoming above	母联 bus section	进线+PT incoming+PT	PT+避雷器 PT+arrester





三工位原理图  
Three position principle diagram







国内第一条“FMS FINN-POWER”柔性面板加工生产线



# 国家二级企业

NATIONAL SECOND CLASS ENTERPRISE



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